10

TRUTH: SOCIAL

"Seek the truth
Listen to the truth
Teach the truth
Love the truth
Abide by the truth
And defend the truth
Unto death."
JOHN HUS (C. 1373–BURNED AT THE STAKE 1415)

In this chapter, we consider truth from a broad social perspective. By "social" we mean situations involving large numbers of people who know very little about each other.

Distinctions between Science and Engineering

Scientists pursue the truth of general physical law, attempting to uncover underlying principles that govern the natural world. While practical applications may help motivate the work, gaining knowledge for its own sake forms an important goal. Science is a social endeavor, with humanity as a whole sharing in its fruits.[1] Hence, the free interchange of data and ideas forms a core value of science, and the scientist must attempt to share methods and data as completely and accurately as possible.

Engineers, however, pursue the truth of practical applications, applying known principles to invent better substances, devices, or processes. Engineers concern themselves more with using knowledge than with gaining knowledge for its own sake. While engineering is also a social endeavor, the fruits need not be held in common by humanity as a whole. The engineer (or employer) often wants to claim some direct benefit from what was discovered, and may need to keep methods and data within the organization.

Of course, these distinctions are extremely oversimplified. No clear boundary separates science and engineering. Indeed, words like "applied science" and "engineering science" find widespread use. Furthermore, many scientists in the corporate world submit routinely to restrictions on publication, while many engineers in the university environment publish as freely as they like. Despite these inadequacies in our description, however, the fact remains that we can take two distinct approaches to knowledge about the physical world. One perspective seeks knowledge mainly for its own sake and emphasizes communal sharing, while the other seeks knowledge mainly for its practical utility and emphasizes private advancement. Let's look at each approach more fully.

Approach to Knowledge in Science

Centuries ago, scientists often did their work in relative isolation—sometimes not even publishing their work. Today, however, scientists usually work as part of teams, and results are frequently published in journals after review by peer scientists. This interconnectedness among researchers forms the basis for the "institution of science." Over the centuries, the institution of science has developed the following customary attitudes about truth concerning the physical world.[2]

Universalism: Science requires that all valid claims about the physical world be tested by repeatable observations and remain unaffected by the personal or social characteristics of the researcher. That is, valid claims must be objectively true regardless of social class, race, religion, and the like.

Communal ownership: Science seeks to add all discoveries to a common human heritage of knowledge for everyone. Thus, a scientist cannot control the use or communication of a discovery except to withhold part or all of it just long enough to allow the normal publication process to proceed. That way the scientist will at least gain public recognition as the discoverer. The scientific community in general should try diligently to make its findings available to everyone without barriers of cost or geographical distribution.

Disinterestedness: Science tries to seek and publish knowledge without undue influence by economic, political, or ideological considerations. Of course, an individual scientist may pursue research partly out of curiosity, benevolence, desire for recognition, and the like. However, the results of the effort need to stay untangled from those motivations.

Organized skepticism: Claims to scientific truth carry little weight unless supported by verifiable evidence. While new claims resting on little evidence need not be dismissed completely, those claims should be considered merely tentative. Conversely, even well-accepted theories sometimes have to be modified or rejected on the basis of new evidence.

These customary attitudes sound fine in theory. Does practice meet the theoretical ideal?

Recognition from Scientific Publication

Most scientists pursue their work at least partly from interior desires to learn, to create, and to share the fruits of discovery for the benefit of humankind. However, many scientists also derive their motivation from exterior rewards as well. Since communal ownership of scientific knowledge usually keeps a scientist from making much money from a discovery, the exterior reward for innovation lies mainly in public recognition. This recognition goes to those who show they were first to observe and recognize the significance of important new knowledge.

The reward for publishing first gives a healthy energy and originality to many scientific pursuits. While recognizing this fact, scientists commonly remain suspicious of efforts to win professional or public fame.[3] Sigmund Freud, who first put psychology on a sound scientific footing, described the reward for publishing first as an "unworthy and puerile" motivation for scientific effort.[4] Nevertheless, people deeply need concrete expressions of approval for what they do. Scientists are no exception. Deep down, relatively few are completely convinced of the basic worth of their work.[5] As a result, the drive to publish first can become an end in itself rather than a means to creativity. Is it really such a big deal when one scientist publishes a few days or weeks before someone else? Some observers assume these problems have become common only recently. Yet even a superficial reading of scientific history shows otherwise. Over fifty years ago, the noted sociologist of science Robert Merton put it this way[6]: "The fact is that all of those firmly placed in the pantheon of science—Newton, Descartes, Leibniz, Pascal or Huygens, Lister, Faraday, Laplace or Davy—were caught up in passionate efforts to achieve priority and to have it publicly registered."

Whereas some scientists find this competition invigorating, others prefer to avoid it by choosing relatively "unpopular" fields. Sigmund Freud and Max Planck described with nostalgia the early days of their research in neglected areas—days in which they could work out their most important ideas without the pressures of competition.[7] Unfortunately, this approach often just leads to obscurity. Several decades ago the psychiatrist Lawrence Kubie pointed out, "success or failure, whether in specific investigations or in an entire career, may be almost accidental, with chance a major factor in determining not what is discovered, but when and by whom. . . . Yet young students are not warned that their future success may be determined by forces which are outside their own creative capacity or their willingness to work hard."[8] Some scientists learn this hard truth only through painful experience. A fraction of these withdraw from the effort altogether. More commonly, however, idealism just shrivels slowly and eventually dies. Kubie posed the hard question that remains fresh today: "Are we witnessing the development of a generation of hardened, cynical, amoral, embittered, disillusioned young scientists?"

Black and Gray in Scientific Practice

Clearly the pressures of publishing first run directly counter to some of the ideals of science regarding truth. What sorts of actions offend against these ideals?

Publishing data obtained by fraud or falsification is clearly wrong. Such actions strike at the core of scientific truth. Of course, we have to distinguish between incorrect reports and fake ones. The scientific literature is full of results that turned out to be wrong due to accidental errors. Falsified data may or may not violate physical law; the important point is that the researcher makes them up. Fraudulent data come in several varieties, and again may or may not agree with the laws of nature. Here the important point is that the data are not collected by the stated method. The fraud usually involves deleting or massaging in a way that Charles Babage once called "cooking" and "trimming."[9] While cooking or trimming data without cause is clearly unethical, more difficult ethical problems arise when scientifically plausible reasons exist to throw out or rescale certain data. Sometimes instruments have obvious but intermittent problems. Other times, changes in protocol creep into the experiment, either by design or by error. Some experiments are just too time consuming or expensive to repeat. Given the length limitations imposed by some journals, it may prove impossible to explain every detail of the analysis. In the end, the scientist has to exercise prudent judgment in reporting—the literature does not benefit from avalanches of questionable data.

Plagiarism is also a clear wrong. Plagiarism involves directly copying or paraphrasing someone else's words or results without proper citation. Most people might agree you would be plagiarizing if you wrote the following without citing Z. Z. Jones:

> *From your paper of today:* "Gases like H_2 and He do not obey the RCV equations for pressure-volume behavior under extreme conditions."

From Z. Z. Jones's published paper of 1995: "Light gases like hydrogen and helium depart from the RCV expressions describing pressure-volume behavior under extreme conditions."

In your text, the sentence structure and wording match those of Jones too closely, and you are describing something that is not widely known by most scientists. On the other hand, you need not cite someone else if you are writing about something most people know and if your wording differs sufficiently from what another person has written. For example, most people might agree you would be safe if you wrote the following:

From your paper of today: "Atoms are made of a dense nucleus containing protons and neutrons surrounded by a cloud of electrons."

From Z. Z. Jones's published book of 1995: "Atoms comprise a heavy nucleus with neutrons and protons together with a surrounding haze of light electrons.

Many scientists include in their definition of plagiarism the fairly common practice of deliberately failing to cite distinct but closely related work by others. The ethical judgment of course depends heavily upon how closely related the work is.

No one knows how common plagiarism is in the published literature. However, it's interesting that accusing someone of stealing scientific ideas seems to be more common than the stealing itself![10] Accusations of plagiarism have been well known since the time of Descartes in the 1500s, who was falsely accused of stealing ideas from Harvey, Snell, and Fermat in physiology, optics, and geometry, respectively.[11] Not all such accusations are malicious. The human mind often tends to take new ideas and package them into old boxes, thereby making them look familiar.

Approach to Knowledge in Technology

As we discussed earlier, technology seeks to apply knowledge to make items of value for the society at large. Several motivations may drive the need for such items, including monetary profit or national defense. Of course, there may also be the felt need to work selflessly for the common good, that is, benevolence.

Only benevolence can coexist successfully with all four customary attitudes of science: universalism, communal ownership, disinterestedness, and organized skepticism. Motivations of profit or national defense require that at least the ideal of communal ownership be modified or abandoned, and possibly the ideal of disinterestedness as well. These changes are not necessarily bad, and can take place in full harmony with the virtues. For example, fairness may require that key elements of an invention be kept secret so that the inventor can reap some reward for creativity. Prudence may require that details of a weapon system be kept secret from an unfriendly nation.

Intellectual Property

In the commercial world where most scientists and engineers work, it's sometimes difficult to decide when useful knowledge should be kept secret or when an inventor should control that knowledge. In the United States and many other countries, balancing between truth and fairness is done by laws governing intellectual property. Before discussing intellectual property at length, let's look a little more closely at the idea of property ownership in general. First, we should note that "ownership" differs from "possession." While "possession" refers to actual control of something, "ownership" refers only to the rights to that control. Thus, if a thief steals your calculator, that person possesses your calculator even though you still own it. Given that you own something, what kinds of rights do you have? Moral and legal scholars disagree on the exact list, but most accept that you have the right to:

1. enjoy or use it yourself
2. say who else may use it and how
3. enjoy income from its use
4. give it to someone else by sale, inheritance, or gift
5. change or modify it
6. destroy it

Approaches to intellectual property vary from nation to nation. However, the United States provides the following legal protections: patents, copyrights, and trade secrets. Let's examine the main features of these three kinds of protection. (Trademarks are also a kind of intellectual property, but they do not involve the kind of knowledge that concerns us here.)

Patents: These have historically covered inventions (like machines), substances (like various chemicals) and processes (like a method for synthesis). Recent legal decisions have extended protection to certain life forms created by advanced genetic techniques. If you hold a patent, you have the right to decide who may use, produce, or sell the patented item. However, the protection extends only to the design or application of the idea, not to the theoretical basis. Thus, you cannot prohibit publication of descriptions of the idea, and cannot prevent development of the idea into still more patentable ideas. Patents are granted only after a lengthy process of examination where you must provide specific instructions for making or applying the subject of the idea, and must prove that the idea is new and not obvious to someone trained in the field. Patents provide protection for only about twenty years.

Copyrights: These cover specific ways of expressing ideas in words. Copyrights have historically covered written books and articles, but recent legal decisions have extended protection to pictures and computer software. If you hold a copyright, you can decide who may copy the specific form of your product, but you cannot control the substance of the ideas the product contains. For example, in compilations of data you can copyright only the form of the compilation, not the data themselves. If there is only one way to express the idea (as in mathematical notation), a copyright cannot be granted. Unfortunately, this distinction between form and content becomes very fuzzy for computer software, making copyright law hard to apply in this area. Unlike patents, copyrights can be granted even if the item is not new. You can get your own copyright if you can show that you arrived at the form independently of the previous copyright. Copyrights are granted under some conditions without the filing of any forms at all, although holders can pursue legal remedies more easily by following a few simple steps for formal copyright registration. Copyrights provide protection until fifty years after the death of the last surviving author.

Trade secrets: These do not carry the same formal legal weight as patents and copyrights. No filing of any kind is required. However, many legal jurisdictions recognize that patentable ideas, lists of customers, cost and pricing data, plans for new products, and the like have commercial value when kept secret, even in the absence of formal legal protection. The value of the secret depends on how much effort someone would need to discover it independently. If you have a secret and have made diligent attempts to prevent disclosure, the courts may uphold your right to exclusive use even in the event of loss (usually due to employee disloyalty or espionage). When enforceable, trade secrets provide protection forever.

There are many good reasons for a society to protect intellectual property: for example, to encourage innovation and to prevent "free-riding" on a good idea.[12] Sometimes intellectual property laws clearly work against the best interests of the public at large; in such cases, the government steps in to minimize the difficulties. Copyright law, for example, puts special restrictions on the rights of authors by permitting "fair use" copying for purposes like news reporting, scholarship, and teaching. The law also compels authors to license certain works at noncompetitive prices under some narrow circumstances. In creating these restrictions, the law seeks to limit the financial gain of authors to that which is sufficient to promote continued innovation. In another vein, various "right-to-know" laws have been enacted around the United States in response to the public need for monitoring the environmental impact of the chemical industry. Some jurisdictions require submission of detailed data about chemicals used and created to health professionals and (to a lesser extent) to employees, even if such data are trade secrets. While such laws attempt to offer some protection to manufacturers through confidentiality agreements and the like, in the end secrecy is greatly compromised for the sake of oversight in the public interest.

A Real-life Case: Copying Music Illegally Using the Internet

For decades U.S. copyright law has protected the rights of composers and performers to the fruits of their musical creativity and skill. Under most circumstances it is illegal to electronically copy a recorded version of a musical performance. The right to distribute or sell such performances lies with the copyright holder. Of course, private tape recording of copyrighted music has been practiced for quite some time, to the dismay of musical recording companies. However, a new method for copying on a wider scale has become available with the increasing popularity of the Internet.

The copying is typically done using a digital form of data compression called MPEG Layer 3, or MP3 for short. Freely available software takes the large amount of data stored on a compact disk and compresses it into memory space nearly a factor of 30 smaller. The resulting file of a few megabytes in size is relatively easy to load and transport over the Internet. Freely available software can then decompress the file in real time, permitting respectable-quality playback over speakers at the receiver's end. Tracker software exists that permits interested people both to advertise their compressed "library" and to see what others have. Attempts to foil such schemes have proven difficult, especially with small-scale operators.

Recording companies claim to lose $300 million annually to this form of copying. They also claim that new artists get hurt because while their music may become widely distributed via MP3 technology, their compact disks suffer slow sales. Thus, the artists could lose their financial backing.

- How seriously wrong do you believe it is to employ MP3 technology for copying?
- How much attention do you think the government (which enforces copyrights) should give to the problem?

References

Baroni, Michael. "Rounding Up the Posse in a Lawless Frontier." *The New York Times*, 8 June 1997.

Chervokas, Jason. "Internet CD Copying Tests Music Industry." *The New York Times*, 6 April 1998.

"The desire for fame is the last infirmity cast off by even the wise."

CORNELIUS TACITUS (C. A.D. 55–117), *HISTORIES*, BOOK IV

Notes

1. Robert K. Merton, "The Normative Structure of Science," *The Sociology of Science* (Chicago: University of Chicago Press, 1973), 267–278.

2. Ibid.

3. Even the incomparable Isaac Newton wrote, "If I have seen farther, it is by standing on the shoulders of giants." (Written in a letter to Robert Hooke, who was challenging Newton's claim to have invented the theory of colors.) From Alexandre Koyre, "An Unpublished Letter of Robert Hooke to Isaac Newton," *Isis* 43 (December 1952):312–337, on 315.

4. Sigmund Freud, quoted by Robert K. Merton in "Behavior Patterns of Scientists," *The Sociology of Science* (Chicago: University of Chicago Press, 1973), 325–342, on 338.

5. Merton, "Behavior Patterns of Scientists," 339.

6. Ibid., 335.

7. Ibid., 333.

8. Lawrence S. Kubie, "Some Unsolved Problems of the Scientific Career," *American Scientist* 41 (1953):596–613, 42 (1954):104–112.

9. Charles Babage in an 1830 writing, quoted by Robert K. Merton in "Priorities in Scientific Discovery," *The Sociology of Science* (Chicago: University of Chicago Press, 1973), 286–324, on 310. Fortunately, the ideal of universalism provides a useful check on such behavior. If the field of study commands sufficient interest to draw other researchers, these can repeat the stated method and at least highlight results that are incorrect.

10. Merton, "Priorities in Scientific Discovery," 313.

11. Ibid.

12. For detailed arguments regarding the morality of intellectual property, see Arthur Kiflik, "Moral Foundations of Intellectual Property Rights," in *Owning Scientific and Technical Information*, Vivian Weil and John W. Snapper, eds. (New Brunswick, N.J.: Rutgers University Press, 1989), 219–240.

Problems

1. Write a page or two describing an ethical dilemma that involves some aspect of truth on a social level that you have encountered in a job you've had. (If you've been lucky enough never to have been confronted with a problem like this, describe one that a friend or relative of yours has had.) Recommend what action you think you (or your friend/relative) should have taken, and give reasons for and against that recommendation. Note: you don't have to say what was actually done in real life (unless you want to)!
2. Each case below has a question after it.
   a. List the options/suboptions available to the main character who has to make a decision, together with the event tree flowing from each option.
   b. Recommend what you think the character should do.

CASE 10.1 Withholding Procedural Steps in Scientific Publications

"So how's it going?" asked Professor Warren Clark as he walked up to his undergraduate research assistant Leah Nonlibet. "Are you almost finished with that data set?"

Leah nodded. "Uh-huh. I should be done next Monday for sure."

"That's great!" Clark exclaimed approvingly. "We'll start writing it up for publication right away. I've been wanting to get in print for the past month. This stuff we're doing with metal-silicon compounds should really put us on the map in the mineralogy community!"

"Weren't we on the map before?" inquired Leah.

"Well, yes. But Leah, Nosce te Ipsum University is not a major research powerhouse. We don't get that much respect. A lot of my colleagues in the geology department here don't even publish. With a couple of graduate students, helped out by undergraduates like yourself, I run one of the biggest programs here." Clark waved his hand toward the rest of the laboratory. "And one of the most heavily instrumented. Still, compared with people in my field at other institutions, my operation is pretty shoestring."

"So why is this new magnetic phase we found so exciting?" asked Leah.

"Something like it has been predicted by the theorists for years," replied Clark excitedly. "But no one has ever found experimental confirmation. Now we have it. It has implications for how the Earth's magnetic field is generated, since there's so much silicon and other metals down there."

"Professor Clark, I'm only an hourly worker, but I still took some of the data for this paper. Does that mean I get my name on it as a coauthor?"

"Of course!" Clark beamed. "You deserve it! The lead author will be Marcus, since as the graduate student he took most of the data. But you'll still be in on the writing if you want. And you have to approve the final version anyway, as do all the authors." Clark then paused, and continued more deliberately. "We'll have to be careful how we write this. I have several experiments planned over the coming year or so to follow up on what we've done. The ideas behind them are pretty obvious—anyone in the field would expect to see this kind of follow-up. The trouble is, once we send our paper to a journal for peer review, it's almost certain that some of my competitors who see it will jump to try those experiments right away. They have a lot more resources than I do, both people and money. They can get the work done in half the time. That will leave us out in the cold."

"What are you going to do? Can't you just hold this paper until you get everything done?" queried Leah with concern.

Clark shook his head. "No, it's too dangerous. We stumbled onto this new crystal phase by accident, and someone else could do the same. It's never worth much to be the second to publish a discovery. No, my idea is this. Remember that one key to making this phase is precise control of the cooling step? We have to do it in stages after that hot annealing, right? Well, I figure we'll just be vague about how we do that. We'll say something like, 'the material was cooled slowly over three hours to room temperature.' In fact, we have to cool one hour at 900 degrees Celsius, thirty minutes at 500 degrees, and ninety minutes at 400 degrees before quenching suddenly to room temperature. As we learned, a normal linear cooling program won't work."

Leah frowned. "Professor Clark, is that right? I mean, I thought a scientific paper was supposed to tell enough of what you did so that other people can reproduce your work."

Clark tensed. "Leah, it's not like we're lying. Our words are literally accurate. It's true they don't tell everything, but we'll fix that up when we publish those experiments from the next year or so. By doing things this way, it should slow down my competitors enough so we can get that work into print first. They can wait a year or two to hear the whole story." Clark looked at Leah gravely. "I assume you'll be agreeing to this strategy."

◆ Should Leah agree?

CASE 10.2 Ignoring Outlying Data Points

"Well, things are turning out better than I thought!" exclaimed Professor Warren Clark to his undergraduate laboratory assistant Leah

Nonlibet. "I had no idea your optical absorption data would complement Marcus's magnetic data for our new crystal phase so well! Now we should be able to announce our discovery of this new metal-silicon phase in two papers going to different journals. That way we can advertise to more of the geology community."

Leah smiled modestly. "I never thought I would get my name on two papers as just an undergraduate," she chuckled.

Clark beamed. "Well, you deserve it. You worked hard. Say, let's have a look at that spectrum again." Leah showed him the paper. It plotted light absorbance versus wavelength for the new material they had created. "Yup. It's clear as day!" Clark continued. He traced along the plot with his finger. "Look at this. The absorbance is low at long wavelengths, then jumps way up here, and continues to increase slowly as we get into the ultraviolet. Classic behavior for a semiconductor!"

Leah's smile transformed into a frown as she listened. "But Professor Clark," she began with hesitation. "The absorbance doesn't stay high throughout the ultraviolet. See this point here? Down at 300 nanometers. The absorbance drops a lot."

Clark waved his hand. "Oh, that can't be. It makes no sense. Semiconductors don't act that way. There must be a mistake in the measurement, or maybe an instrument malfunction. Try it again," he observed offhandedly.

"But I did!" Leah persisted. "Don't you see? There are two data points there. I did them on separate days, and they lie within each other's error bars."

Clark grew slightly exasperated. "Leah, it can't be. Semiconductors absorb strongly at wavelengths shorter than the one corresponding to their bandgap energy. It's not a controverted point. Oceans of data are out there to support it, backed by solid theory. The predictions out there for this crystal phase say it should be a semiconductor. Plus, Marcus's data for both magnetic behavior and electrical conductivity show classic semiconducting behavior. He even gets the temperature dependence right. And every shred of your optical data except at 300 nanometers says the same thing. If you can't get reasonable numbers for 300 nanometers, we'll just publish the work with them deleted. The graph doesn't need those data to show what we want."

Leah's voice hardened. She stood up and crossed her arms. "Professor Clark, this is a new material. We can't be completely sure exactly what it is. You can't throw out these two points at 300 nanometers on the basis of any statistical analysis—you know, t-tests. And you can't throw them out just because they don't fit your theory. They have to stay in. We can't be deceptive when we publish in the open literature."

Clark's face reddened slightly as he sought to suppress his anger.

"Leah, there's nothing deceptive about dropping these points. Yes, we owe it to the scientific community to honestly report what we did. But we also owe it to them to exercise sound judgment in discriminating good data from bad. It does no one any good to publish data we know is junk, even if we label it as junk. The literature doesn't have space for junk. And about statistical analysis—that doesn't mean much here. Statistics assume random errors, which the narrow spread of your other data shows is not a big factor here. You have a systematic error. Since your glass optics start absorbing near 300 nanometers, I think it has something to do with that." Clark eyed Leah. "Plus," he added, "you're new at this game. You just learned this experiment a few weeks ago. I could tell from the way you looked just now that you didn't even know about glass absorption. I've been doing experiments since before you were born. When it comes to interpretation, I think you need to leave it to me."

Leah dug in her heels. "I did the experiment carefully," she declared. "I stand behind my data. And with due respect, I don't like how you approach publishing. It's very self-serving. First, you decide to withhold details about our preparation procedure to keep your competitors from squeezing you out. That was hard enough for me to swallow. But now you want to throw out my data. With no good reason. I won't stand for that, and as a coauthor I won't agree to it! The points stay in unless we can identify an error to justify dropping them!"

"Leah, we don't have time for that. Someone would have to check the whole optical system. You don't have the experience to do that yet, and the other graduate students are too busy already. We might have to buy new extended-range optics, which I can't afford for the sake of one stupid measurement. And it would take months for me to get around to doing it myself!"

"You can't publish lies, no matter how long it takes to find the truth!" declared Leah firmly.

◆ What should Professor Clark do?

Case 10.3 Reporting Toxic Discharges to the Government

"How did work go today at Tripos? You haven't said much about it in a couple of weeks," Todd Cuibono asked his girlfriend Emily Laborvincet as they sat eating supper in the restaurant. He watched as her face wrinkled. "That bad, huh?"

Emily nodded. "Todd, I'm only a sophomore. And working part time this semester. But ever since the owner of Tripos had that car accident that put her in the hospital, I've just gotten slammed with responsibility . . . so many hard decisions to make."

Todd pursed his lips. "You haven't said much about them. The last one you told me about was a while back when you had trouble with that guy who wanted a little bribe in return for giving you his company's account. Actually, you never told me what you finally did."

Emily sighed unhappily. "Well, the owner wasn't in good enough shape to ask. Since I'm the only one around to do the accounting now, I had to make the decision. I just gave him what he wanted."

"Yeah, I told you that was the best thing. No one will ever find out. And Tripos still made a good profit."

Emily looked at Todd with contempt. "This stuff just doesn't bother you at all, does it?"

Todd shrugged. "Nobody likes to do it, but it's part of life. So what's on your mind today?"

Emily sighed again. She paused and eyed Todd warily. "We had a chemical spill today at Tripos."

"What spilled?"

"Benzene. A drum fell off the back of a truck just outside the building. We lost about 12 pounds."

"Anyone hurt?"

Emily shook her head. "No. We were worried about a fire, but luckily it didn't happen. Actually, most of the stuff finally just sank into the gravel."

"So what's the big deal? It's not that expensive, is it?"

Emily stared at Todd in exasperation. "Todd, you're a chemical engineer! You should know the problem. Benzene can cause cancer. And the city of Exodus has an ordinance about spills. You're supposed to report them if they're over a certain size. This is just over the limit. And there's real paranoia about spills in this city after that big spill at Acme last month. The press is licking its chops for another feeding frenzy. Todd, Tripos just had a fire a few weeks ago. The owner is still in the hospital. We only have a few dozen employees. We can't cope with a media circus right now."

"If I remember, benzene isn't a very potent carcinogen. And it's pretty volatile. You'll probably lose most of it to the air. Does anyone know?"

"Just me, the truck driver, and one other worker who was near the loading dock. Everyone else was inside. The smell was a little strong for a while, but it's not bad now," replied Emily.

"No use hanging out your dirty laundry, then," declared Todd. "There's no upside to it. No one got hurt, and no one is likely to. The stuff isn't that nasty. Tripos has to survive, and right now when it's weakened it needs to keep its image polished."

Emily glanced around to ensure no one was listening. She then glared at Todd again with disdain. "You truly don't care, do you?

Here I'm worried about poisoning people, and maybe about breaking the law, and all you can think about is image!"

Startled by Emily's vehemence, Todd sat back in his chair. "I know about poison and I know about the law," he protested. "You asked for my opinion, and my opinion is that the spill is small, the poison isn't serious, and Tripos should try to survive."

"Actually, I didn't ask for your opinion," Emily growled though her gritted teeth. "You're the one who asked how things were going. I told you, and you offered your advice for free." Todd stared at her in blank perplexity. Emily calmed herself slightly. "I know we need to survive," she continued. "Your suggestion isn't totally unreasonable. It's just that whenever I ask you about anything, you worry about two things. Looking out for yourself, and presenting a good image. You run after these things so much, nothing else seems to matter. I mean, take image. You're always the most neatly dressed guy in any class. Just impeccable. Every day. And every word you say is chosen so carefully—except sometimes around me—calculated not to offend, and not to tip your cards too much. Everyone else thinks you're so mature, so smooth. It's not healthy to obsess that much about what people think of you."

"Emily, I don't understand what you're talking about. Let's pay the bill and go," Todd replied in a tense monotone.

◆ Should Emily report the spill?

The authors thank Joseph G. Seebauer of Lubrizol Corp. for providing some of the technical background of this case.

Case 10.4 Plagiarism

"You wanted to see me again?" asked Celia Peccavi as she glided up after class to Terence Nonliquet, the teaching assistant for Comp Sci 110. "This term paper you handed back had a note on it."

Terence drew a deep breath. "Yes, Celia, once again you're doing what you're not supposed to on assignments."

"Oh?," she exclaimed as she drew back with mock surprise, hand over her heart. "You must think I'm such a villain!"

"I don't know if you're a villain or not," replied Terence testily. "I do know that you must have copied some of this paper out of some book."

"Terence, last time you accused me of copying Jacklyn's homework," Celia responded with pretended anger. "But your evidence was weak. You only took off 15 percent, although you shouldn't have taken off any. I hope your evidence is better this time."

"My evidence was fine last time. I should have taken off more. This time, the paper reads too choppy. Some of it is written like a normal sophomore would write, and some of it is very high quality."

"So? I wrote part of it when I was tired, and part when I was rested." Celia retorted. "That's not very firm evidence. If you think I copied, you have to show what book I got it out of."

"OK. Look at this sentence," Terence contended, pointing to a spot on her paper. "It reads, 'Massively parallel processing finds use in a wide variety of practical applications, including weather forecasting.' That's word-for-word out of the text by Jenkins on reserve for this course in the library. I checked."

Celia raised her eyebrows. "That's the best you can do? It's a pretty generic sentence. Anyone could say it."

"I think the preponderance of evidence weighs against you," countered Terence.

"Well, that's fine," Celia shot back with a hint of mockery. "So you're going to take off points because I can't prove I didn't copy? Isn't that getting things backward?"

Terence's voice turned slightly preachy. "Authors have a right to their ideas and words. If you use them, you have to reference them according to accepted conventions."

"There, you go again . . . Mr. Principle!" laughed Celia. "I do so like a man with principles!"

"Celia, plagiarism is a serious matter."

"And you're waaay too serious," purred Celia, eyes twinkling. She moved a step closer. "I think I can guess why. A little trouble with your girlfriend these days? You used to talk about her in class last semester. Now . . . never!" Celia's voice grew seductive. "Anyway, she sounds like such a stick in the mud."

"Leah is none of your business," Terence snapped, recalling unhappily his recent string of arguments with her.

"You're right. She doesn't matter to us." Celia whispered. "I'll make you another deal. Just like the one I offered over Christmas. Just one date. Go out with me just once, and I'll drop this class. I promise—scout's honor!"

"Celia, we were talking about plagiarism . . ." Terence broke in.

"Oh, that," said Celia matter of factly. "I told you Terence, your evidence is weak. Last time you took off a few points on that kind of claim. I didn't tell my uncle then, but I swear I will this time. As department head, he can make your life very unpleasant." She turned to leave. "Think about it."

- ◆ What should Terence do?