6 Intellectual Property

6.1 Intellectual Property and Changing Technology

6.1.1 What Is Intellectual Property?

Have you ever given a CD to a friend that contained a copy of a computer game or a program? Have you ever recorded a televised movie to watch later in the week? Have you downloaded music or a movie from the Web without paying for it? Have you e-mailed a copy of an online newspaper or magazine article to a dozen friends? Have you set up a Web site about your favorite band or actor, with short videos from performances? Do you know which of these actions are legal and which are illegal, and why?

The value of intellectual and artistic works comes from the creativity, ideas, skills, labor, and other nonmaterial efforts and attributes provided by their creators.
Our property rights to the physical property we create or buy include the rights to use it, to prevent others from using it, and to set the (asking) price for selling it.

The key to understanding intellectual property protection is to understand that the thing protected is the intangible creative work—not the particular physical form in which it is embodied.
The owner of a physical book may give away, lend, or resell the one physical book he or she bought, but not make copies (with some exceptions). The right to make copies belongs to the owner of the intangible "book," that is, the owner of the copyright. The principle is similar for software, music, movies, and so on.

Copyrights are granted for a limited, but long, time—for example, the lifetime of the author plus 70 years.

Taking intellectual property by copying is quite different from theft of physical property, and intellectual property law does not prohibit *all* unauthorized copying, distribution, and so on. A very important exception is the "fair use" doctrine.
A specific exception for software allows the owner to make a copy of a program to make a backup ("archival") copy. Uses of copyrighted material that are not authorized by the copyright owner or permitted by one of the exceptions in the law are infringements of the copyright and are subject to civil or criminal penalties.

Patents protect new ideas by giving the inventor a monopoly on the invention for a specified period of time (e.g. 20 years).
In addition to copyright and patent, there are other forms of intellectual property that various laws protect. They include trademarks and trade secrets.

6.1.2 Problems from New Technologies

Electronic media, microprocessors, computer networks, and the World Wide Web created new challenges for protection of literary, artistic, and musical works and computer software. They also created new controversies about how intellectual property law should apply.
Computers and communications technologies made high-quality copying and high-quantity distribution extremely easy and cheap.

Some of the technological factors are the following:

- Storage of all sorts of information (text, sound, graphics) in standard digitized formats;
- High-volume, relatively inexpensive digital storage media, such as hard disks, CD-ROMs, and DVDs (digital versatile disks, also called digital video disks);
- Character scanners and image scanners, which simplify converting printed text, photos, and artwork to digitized electronic form;
- Compression formats, such as MP3 and DivX, that make music and movie files small enough to download, copy, and store;
- The ease of copying digitized material and the fact that each copy is a "perfect" copy;
- The ease of distributing digitized material over computer networks;
- The World Wide Web, which makes it easy to find and download material; and
- Peer-to-peer technology, which permits easy transfer of files by large numbers of strangers over the Internet without any centralized system or service.

Copying of many kinds of intellectual property flourished with the advent of the technologies of the Web.
It is reasonable to estimate losses for the entertainment and software industries in the billions of dollars per year.

Courts and law established the principle that the publisher has the right only to the "first sale" of a copy. The buyer of the book must not make additional copies, but may transfer the purchased copy.
But browsing and transferring a copy on a computer network require the *making of another copy* of the digital work.

As an MIT computer science professor points out "control of reproduction is a means, not the goal." It may be necessary to develop a new legal paradigm to protect the first-sale principle, browsing, and other long-established public uses of information.

6.2 Copyright Law

6.2.1 A Bit of History

A brief history of copyright law will provide necessary background and help illustrate how new technologies require changes or clarifications in law.

The first U.S. copyright law, passed in 1790, covered books, maps, and charts.
The definition of an unauthorized copy in the Copyright Act of 1909 specified that it had to be in a form that could be seen and read visually.
It was based on a court decision in a 1908 case about copying a song onto a perforated piano-music roll.
A person could not read the music visually from the piano roll, so the copy was not judged a violation of the song's copyright, even though it violated the spirit and purpose of copyright.
In the 1970s, a company sued for protection of its chess program, which was implemented on a read-only-memory (ROM) chip because the ROM could not be read visually, a court held that the copy was not an infringement of the program's copyright.

In 1976 and 1980, copyright law was revised to cover software.
Recognizing that technology was changing rapidly, the revised law specifies that appropriate literary works could be copyrighted "regardless of the nature of the material objects… in which they are embodied." A copy is in violation of a copyright if the original can be "perceived, reproduced, or otherwise communicated by or from the copy, directly or indirectly." Film, tapes, discs, and cards are examples of forms in which protected material can be embodied.

One significant goal in the development of copyright law has been the devising of good definitions to broaden the scope of protection to new technologies.
A lot of people will break a law if it is easy to do so and the penalties are weak. In the 1960s, high growth in illegal sales of unauthorized copies of recorded music.
In 1982, high-volume copying of records and movies became a felony.
In 1992, making multiple copies of copyrighted work "willfully and for the purposes of commercial advantage or private gain" became a felony offense. Making or distributing ten or more copies with retail value of more than $2500 within six months became punishable by up to five years in jail.
Fines under some circumstances could be as high as $250,000.
Many software users and attorneys believed that the 1992 law went too far.

The No Electronic Theft Act, passed in 1997, is stricter.
The No Electronic Theft Act made it a criminal offense to willfully infringe copyright by reproducing or distributing one or more copies of copyrighted works with total value of more than $1000 within a six-month period.

Congress passed the Digital Millennium Copyright Act (DMCA) in 1988. This law prohibits the making, distributing, or using of tools (devices, software, or services) to circumvent technological copyright protection for penalties of up to 5 years in prison or a $500,000 fine for a first offense. The anti-circumvention provisions are extremely controversial, because the outlaw devices and software that have legitimate purposes, criminalize actions that do not infringe any copyrights, and (many argue) conflict with freedom of speech.

Generally, creators and publishers of copyrighted works, including print publishers, movie companies, music publishers and sound recording companies (record labels), and the software industry support stronger copyright protection.
The intellectual property industries drafted laws heavily weighted toward protecting their assets.
Libraries and academic and scientific organizations opposed strict rules reducing the public's access to information.
Digital media, and especially widespread public use of the Web and file sharing, focused attention on issues about how much control copyright owners should have.
The electronic Frontier Foundation joined librarians and others to fight what they view as overly restrictive copyright law.

6.2.2 The Fair-Use Doctrine

As the Constitution indicates, the purpose of copyright is to encourage production of useful work. Copyright law and court decisions have attempted to define the rights of authors and publishers consistent with this goal and the goal of encouraging the use and flow of information.

1976 U.S. copyright law lists four factors to consider in determining whether a particular use is a "fair use."

1. The purpose and nature of the use, including whether it is for commercial purposes or nonprofit educational purposes. (Copying for commercial purposes is less likely to be fair use.)
2. The nature of the copyrighted work. (Creative work, such as a novel, has more protection than factual work.)
3. The amount and significance of the portion used.
4. The effect of the use on the potential market for or value of the copyrighted work. (Uses that reduce sales of the original work are less likely to be considered fair.)

6.2.3 Fair-Use Cases

SONY VS. UNIVERSAL CITY STUDIOS

Two movie studios sued Sony for contributing to copyright infringement because some customers used to its Betamax video cassette recording machines to record copyrighted movies shown on television.

The fact that the copying was a private, noncommercial use was significant. The Court said that private, noncommercial uses should be presumed fair unless there was realistic likelihood of economic harm to the copyright holder.

On the issue of the legitimacy of the Betamax machine, the Court said makers of a device with substantial legal uses should not be penalized because some people use it to infringe copyright.

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REVERSE ENGINEERING; GAME MACHINES

Sega Enterprises, Ltd v. Accolade, Inc. in 1992:

Accolade copied Sega's program and decompiled it (i.e., translated it from machine code to a form in which they could read and understand it). This is called *reverse engineering.* Sega sued; Accolade won. Accolade was making new games. The court viewed Accolade's activities as fitting the purpose of fair use, that is, to encourage production of new creative work.

In another 1992 case, *Atari Games v. Nintendo*, the court also ruled that making copies of a program for reverse engineering (to learn how it works so that a company can make a compatible product) was not copyright infringement. It is a fair "research" use.

6.3 Copying Music, Movies, Software, and Books

6.3.1 From Floppies to the Web

More computer memory and gigabytes of disk space, faster computers, new compression formats for files, new storage media, and, of course, the World Wide Web combined to make copying easy, fast, cheap, and ubiquitous.

Many songwriters and bands considered MP3 to be a marvelous tool for promoting their work without the need for a contract with a large record company. But MP3 has no mechanism for preventing unlimited or unauthorized copying. It was an ideal tool for copyright infringement; most trading of MP3 files on the Net was unauthorized.

6.3.2 The Napster Case

Napster opened on the Web in 1999 as a service allowing users to copy songs in MP3 files from the hard disks of other users

It was well known that Napster users copied and distributed most of the songs they traded without authorization. Eighteen record companies sued for copyright infringement and Napster lost.

New technology challenges existing law attitudes about what is acceptable.

Why was Napster so popular? “It’s free!”
Napster used a variety of new technologies to provide flexibility, convenience, and services, in addition to free music.

THE LEGAL ARGUMENTS

The issues in the lawsuit against Napster were the following:

- Was the copying and distribution of music by Napster users legal under the fair-use guidelines?
- If not, was Napster responsible for the actions of its users?

We look at a variety of arguments made by Napster and the record companies.

FAIR USE?

Napster argued that sharing songs via its service was fair use because people were making copies for personal, not commercial, use. Copyright experts said “personal” meant very limited use; say within a household, not trading with thousands of strangers.

The final, and perhaps most important, point is the impact on the market for the songs, that is, the impact on the income of the artists and music companies that hold the copyrights.

Many legal observers thought the large-scale copying on the Napster was illegal copyright infringement, not fair use, and that is how the court ruled.

NAPSTER’S RESPONSIBILITY

The court said Napster was liable because it had the right and ability to supervise its system, including the copyright infringing activities, and it had a financial interest in those activities.

The court ruled that Napster “knowingly encourages and assists in the infringement of copyrights.”

AFTER THE NAPSTER DECISION

The Electronic Frontier Foundation (EFF) concluded that “the copyright industry continues to secure dangerously broad legal precedents against innovative technologies whose full ramifications have not yet been thoroughly considered…”

Peer-to-peer systems, such as Gnutella and Morpheus, present another challenge for the entertainment industry.
Gnutella users thought its decentralization made enforcement virtually impossible. However, the entertainment industry targeted ISPs.

6.3.3 Software Piracy

Billions of dollars worth of software is copied illegally worldwide every year.
Many businesses, organizations, and schools buy one or a few copies of a software package and install it on dozens or hundreds of computers.

The Software and Information Industry Association estimated that the value of software pirated worldwide has been roughly $11-13 billion per year for many years.
Piracy rates are higher than 90% in some countries.

Whole illegal businesses exist to produce, transport, and sell copies of the disks, documentation, and sometimes identical packaging for popular business and personal computer software.
In China, more than two dozen factories allegedly produced millions of pirated compact disks (both software and music CDs), mostly for export to other countries (including the U.S.).
In 2000, Microsoft found that 90% of Microsoft products offered for sale on auction sites in Europe, the Middle East, and Africa were illegal copies. Also in 2000, enforcement agents seized five million units of pirated Microsoft products. Pirated copies of Windows XP, like earlier version Windows before it, appeared in other countries before its official release.

The difference between the legal and the pirate price can be extreme.

Some countries traditionally have not recognized or protected intellectual property, including copyrights, patents, and trademarks. Ignoring foreign copyrights has long been common practice, especially in Asia.

Many countries with high piracy rates do not have a significant software industry.
In countries with few legitimate dealers where it is not unusual to purchase food unpackaged in outdoor markets, customers may not think there is anything unusual (pr wrong) about the way vendors sell software. Another possible reason for software piracy in other countries is that the people are poorer; they cannot afford the high legal price of software.

6.3.4 Ethical Arguments About Copying

Many people who downloaded large numbers of copyrighted songs via Napster and similar services realize they got “something for nothing.” They benefited from the creativity and effort of others without paying for it.

This fundamental distinction between intellectual property and physical property explains why some copying is ethical.
The value of intellectual property is as a product offered to consumers to earn money.

People trade copyrighted music, movies, and software for personal use, but is personal use always fair?

Many people make copies of software for friends who do not want to pay the price of buying one. Many people accept copies from friends.
Should people do this? Would you do this?

Some arguments people make in support of personal copying:

- I cannot afford to buy the product
- The company is a large, wealthy corporation.
- I wouldn’t buy it at the retail price anyway. The company is not really losing a sale.
- Making a copy for a friend is just an act of generosity.
- The violation is insignificant compared to the billions of dollars lost to piracy by dishonest resellers making big profits.
- Everyone does it. You would be foolish not to.

Laws are rarely good guides for ethical decisions.

6.4 Solutions (Good and Bad)

To writers, singers, artists, actors—and to the people who work in production, marketing, and management—the problem is to ensure that they are paid for the time and effort they put in to create the intangible intellectual property products we enjoy.

6.4.1 Technology, Markets, and Law

TECHNOLOGY

Software was the first digital product to be widely copied, so a variety of techniques for protecting software were developed early, with varying success.
In 2001, Microsoft irritated customers with its “activation” feature in Windows XP. (Instructions for disabling this feature appeared on the Internet soon after Microsoft release Windows XP.)

Music companies, movie studios, and book publishers hesitated to deliver digital copies of their products on the Web because they could not prevent mass copying.

When we buy a book, CD, or DVD, we are buying just one copy, not the abstract work. Copyright law prohibits some uses, but we do own the purchased copy, and we may keep it forever, read or play it as often as we like, lend it, rent it, or resell it. Many companies license their software rather than selling copies.

Digital rights-management technologies prevent fair uses as well as infringing uses. Some critics see digital rights management as a significant tool for implementing licensing agreements with restrictive provisions.

MARKETS AND MANAGEMENT

The American Society for Composers, Authors, and Publishers (ASCAP) and Broadcast Music, Inc. (BMI) collect hundreds of millions of dollars a year in fees for live performances and recordings of copyrighted songs played in commercial places.

Software publishers experiment with different pricing policies that might more accurately reflect the usage of a program. For software on networks, metering technology allows a business to pay for usage instead of for users.

ENFORCEMENT

People ignore laws they consider unreasonable, especially if many others do so as well, if it is socially acceptable, and if enforcement is weak.

The BSA pays large rewards for tips leading to successful legal action against software pirates.
In England in 1994, an estimated 45% of all videos sold were pirate copies; by 2000, the rate was below 5%, after an aggressive campaign by an industry group to track down violators, raid swap meets, and prosecute sellers.

6.4.2 Restrictions and Bans on Technology

In its campaign to protect its intellectual property, the entertainment industry has made many attempts to ban, restrict, or tax technologies, devices, and computer programs that make copying easy and have legal uses but are likely to be used widely in ways that infringe copyrights.

LAWSUITS AND TAXES

Digital audio tape (DAT)
DVD players

The Rio machine

THE DMCA VS. FAIR USE AND FREEDOM OF SPEECH

The DMCA prohibits the making, distributing, or using of tools (devices, software, or services) to circumvent technological copyright protection systems used by copyright holders.

The Content Scrambling System, or CSS, is a protection scheme for movies. A 15-year-old programmer in Norway wrote a program, called DeCSS, that defeated the scrambling.
The judge ruled that DeCSS was illegal under the DMCA.
Another court reversed an injunction against publication of DeCSS, as an unconstitutional restraint on free speech.
Eventually a judge ruled that the First Amendment protects software. The inconsistent rulings about DeCSS show how unsettled these issues are.

A team of researchers responded to a challenge by the Secure Digital Music Initiative (SDMI), an industry consortium, to test its digital watermarking schemes (a form of digital copyright protection) for music files.
And planned to present a paper
SDMI threatened lawsuits based on the DMCA
The paper leaked
The Felton case showed that the DMCA and the industry's threats of lawsuits have a chilling effect on publication of research.
The case ended after the recording industry and the government issued statements that lawsuits under the DMCA against scientists and researchers studying access control technologies were not appropriate.

Dmitry Sklyarov

Should we ban or restrict software, a technology, a device, or research because it has the potential for illegal use, or should we ban only the illegal *uses?* Do bans on publishing software violate freedom of speech?

Librarians, universities, and many organizations and individuals oppose the DMCA's ban on circumvention methods because it criminalizes tools that make possible fair use of copyrighted material for research, education, and ordinary consumer uses of information and entertainment. Researchers oppose the ban because it hinders open discussion of the relevant technologies.

The issue of banning or restricting tools that have criminal uses has also arisen in numerous areas unrelated to computing.
Sale of spray paint to minors, chewing gum, guns, drug paraphernalia.
In a free society, which should win: the freedom of people to develop, discuss, and use tools for legal purposes—or prevention of potential crimes?

6.4.3 The Future of Copyright

Opinions vary widely about the future of copyright and about whether technology or law will be the most significant factor in determining its future.

If trading in unauthorized copies is kept “underground,” most people will pay the legal price rather than make the effort to find an illicit site that supplies what they want, learn how to access it, make the extra effort to avoid detection, and risk prosecution for copyright infringement.

6.5 Free-Speech Issues

6.6 Free Software

6.6.1 What Is Free Software?

Free software is an idea, an ethic, advocated and supported by a large loose-knit group of computer programmers who let people copy and modify their software, often without charge, and encourage others to do so. The *free* software means freedom, not necessarily lack of cost, though often there is no charge.

In the 1970s, Stallman began the GNU projects.
Stallman believes that many good programmers would work like artists for low pay because they are committed to their craft. Stallman suggested government grants to universities as another way of funding software.

Linus Torvalds wrote the Linux kernal in 1991.
By 1999, major computer companies, including IBM, Oracle, Hewlett-Packard, and Silicon Graphics, used, supported, and marketed it.

In 2000, IBM place full-page ads in major newspapers announcing that it “embraced Linux and the open-source movement as a pillar of e-business.”

6.6.2 Should All Software Be Free?

“Should free software be the only thing?”
Would it be good if all software were free software? And should we change the legal structure to require it?

Free software is undoubtedly valuable, but does it provide sufficient incentives to produce the huge quantity of consumer software available now?

Would the current funding methods for free software be sufficient?
Would the free-software paradigm support the kinds of consumer software sold in millions of copies?

Stallman believes that proprietary software is ethically wrong. He argues that copying a program does not deprive the programmer, or anyone else, of use of the program.
He also points out that the primary purpose of copyright, as stated in the U.S. Constitution, is to promote progress in arts and sciences, not to compensate writers.

6.7 Issues for Software Developers

Complex questions about how similar one software developer's program may legally be to another's are still unresolved.

6.7.1 Copyright or Patent?

There is disagreement about whether copyright is the appropriate protection mechanism for software. Some argue for patents, some for completely new rules designed specifically for software. There are two aspects to the debate. First, what is the nature of a new program, or a new kind of program? Is it an invention, a new idea? Or is it a "writing," an expression of ideas, algorithms, techniques? Second, what are the practical consequences of each choice in terms of encouraging innovation and production of new products?

The Supreme Court said, in 1972, that software could not be patented because it was abstract. In 1981, it changed position and specified some conditions for patenting software.
The U.S. Patent Office began to issue software patents and courts upheld them.
The Patent Office made mistakes. It granted some patents for techniques that were obvious and/or were already in wide use.
Amazon.com generated a lot of criticism when it sued barnesandnoble.com for violating its patent on one-click shopping. Many in the industry objected that the government should not have granted the patent in the first place.

6.7.2 Similar Software Products

CRITERIA

In a 1986 case, *Whelan Associates v. Jaslow Dental Laboratory,* the court ruled that a program that was very similar to another in structure and performance, although written in a different programming language for a different computer, infringed the copyright on the first program.

A 1987 decision took an extreme position in the other direction. A court ruled in *Plains Cotton Co-op Association v. Goodpasture Computer Service* that only literal copying of code was infringement.

The 1992 decision in *Computer Associates International v. Altai.*
First, identify the purpose of the program, remove from consideration the parts that are in the public domain, are common practice, or are the only efficient way of accomplishing some part; copyright does not protect them. Then compare the remaining parts of the two programs to see how similar they are. Any particular case would need expert witnesses and a complex analysis of the programs. Several subsequent court decisions used this approach.

"LOOK AND FEEL"

Two programs that have similar user interfaces are sometimes called "workalike" programs.
Does a workalike program infringe the copyright of the earlier program it resembles?

In overturning the *Lotus v. Borland* decision, the federal appeals court ruled that menu commands are "a method of operation," explicitly excluded from copyright protection.

The trend of various court decisions is against copyright protection for "look and feel." Various courts ruled that features like overlapping windows, pull-down menus, and common operations like cut and paste are outside the scope of copyright.