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Also: After the Credit Crunch · Economic Forecasting

the BYTES *of* INVENTION

Our traditional

system of

protecting

intellectual

property

searches for

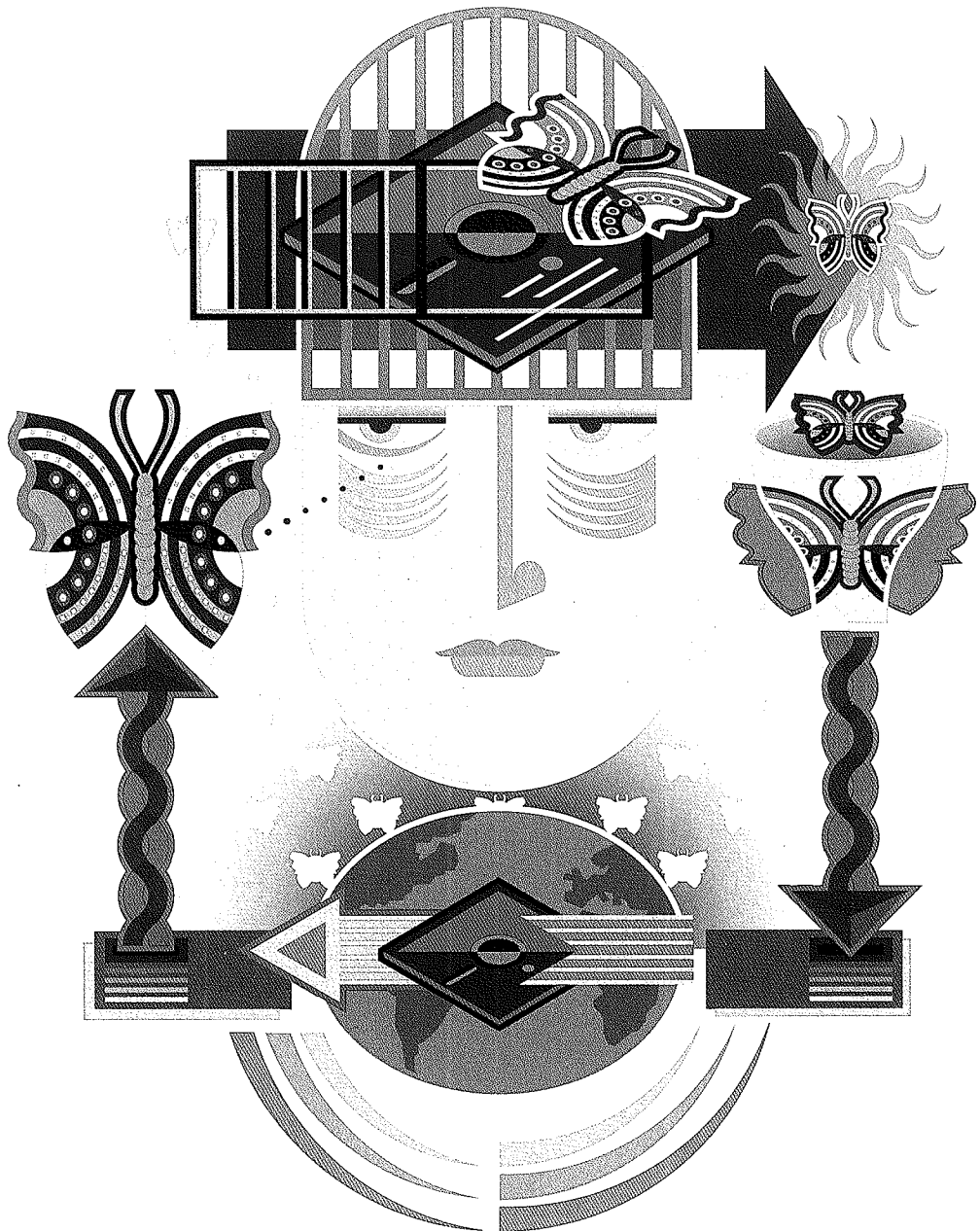
ways to

absorb

exotic new

digital

creations





“Congress shall have power ... To promote the Progress of Science and useful Arts, by Securing for limited Times to Authors and Inventors the exclusive Rights to their respective Writings and Discoveries.”

U.S. CONSTITUTION, ARTICLE I, P. 8, CL. 8

BRUNELLESCHI'S BARGAIN

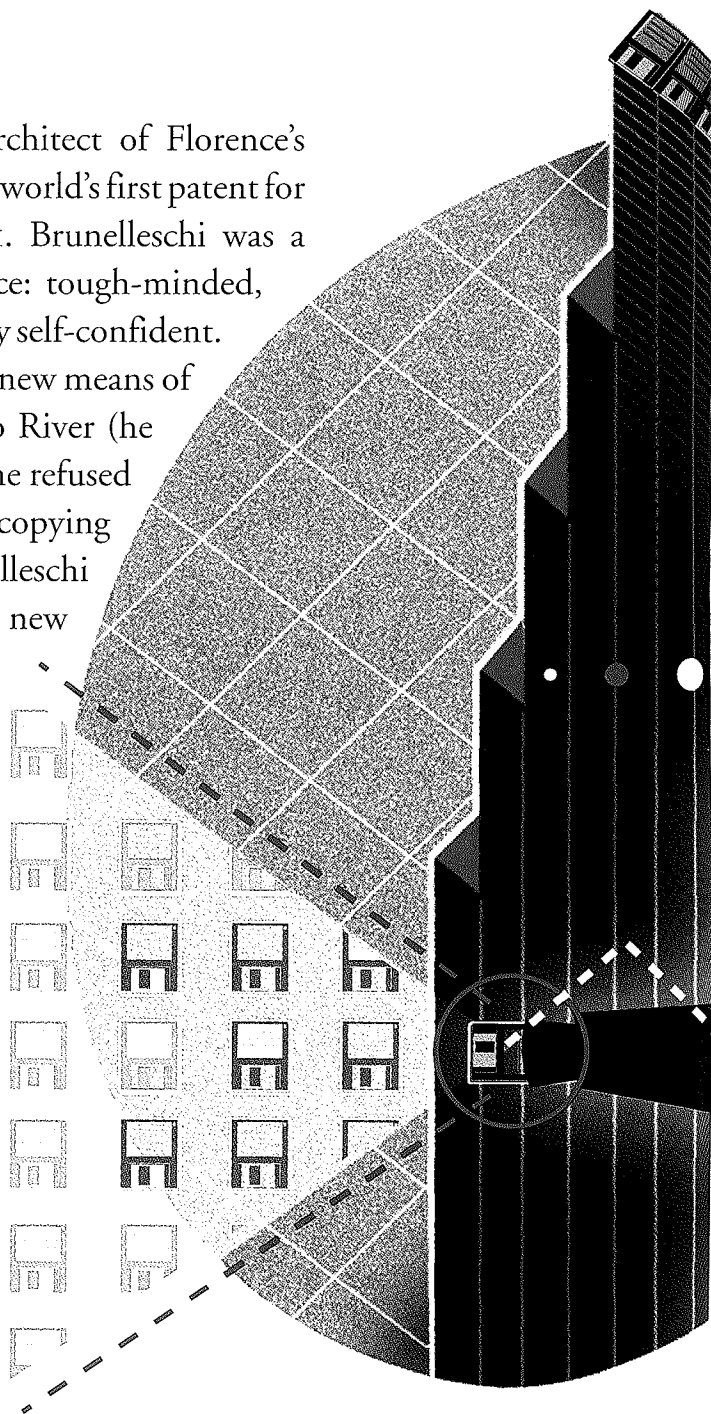
Intellectual property in digital space

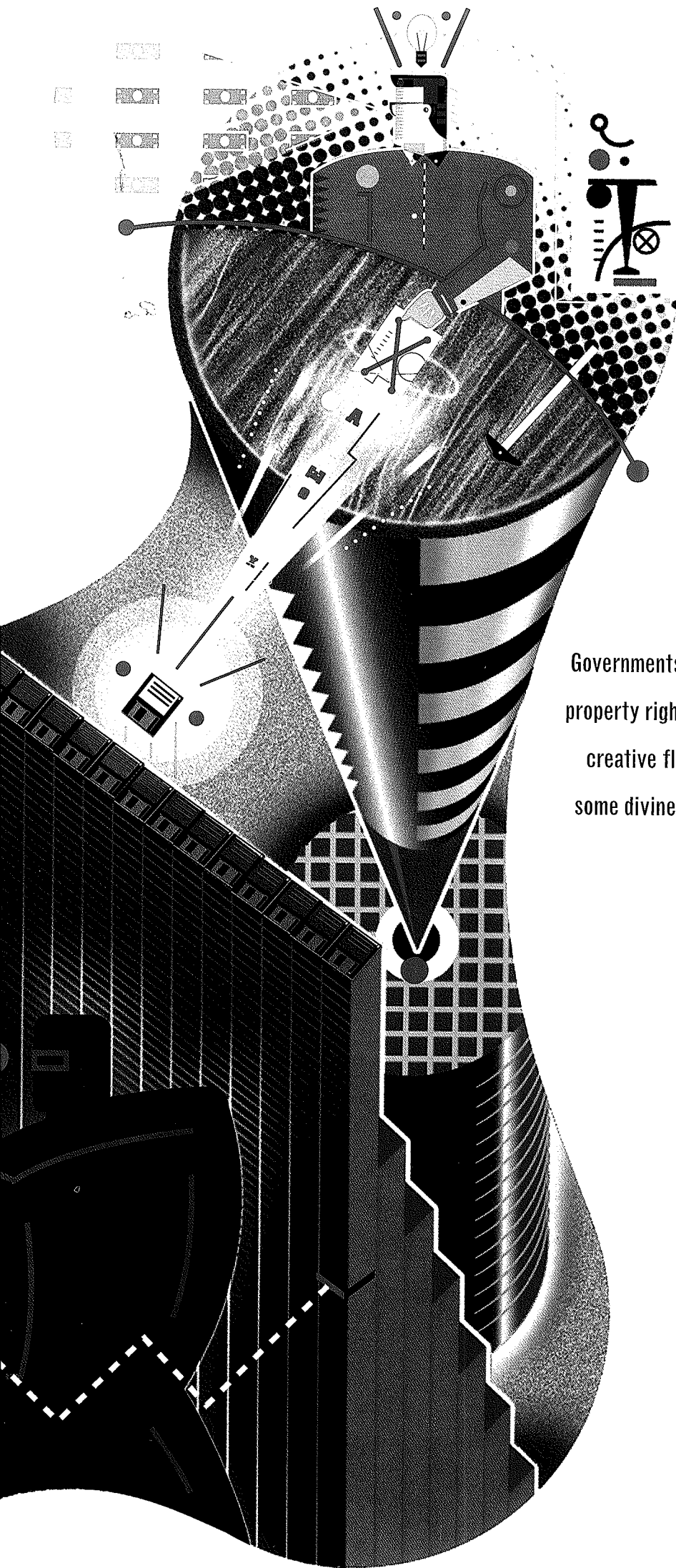
By Steven Sass



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ILIPPO BRUNELLESCHI, the architect of Florence's remarkable cathedral, won the world's first patent for a technical invention in 1421. Brunelleschi was a classic man of the Renaissance: tough-minded, multi-talented, and thoroughly self-confident. He claimed he had invented a new means of conveying goods up the Arno River (he was intentionally vague on details), which he refused to develop unless the state kept others from copying his design. Florence complied, and Brunelleschi walked away with the right to exclude all new means of transport on the Arno for three years. ¶ That Florence acceded to Brunelleschi's demands is hardly surprising. The Italian Renaissance city-states, locked in a struggle for wealth and power, habitually gave monopolies to those who would build a needed bridge or mill, or who introduced some useful craft or industry. They would issue "letters patent" — public declarations that openly (patently) announced the privilege. What distinguished Brunelleschi's bargain was invention — he was awarded the exclusive use of his own creation. ¶ In the 500+ years separating





Brunelleschi's day from our own, the significance of such intellectual property claims has grown enormously. The eclipse of Italian city-states and the rise of Spain, Holland, and France had little to do with intellectual property bargains. But the same could not be said of England's rise and long economic hegemony. James Watt's steam engine, Richard Arkwright's spinning jenny, Henry Bessemer's blast furnace, and other key technologies of the Industrial Revolution were protected by patents. Germany and the United States then elbowed their way to the head of the world economic stage with patented devices such as the sewing machine, the electric light, and the telephone — thus far history's most profitable patent.

In today's high-tech economy, innovative products have assumed unprecedented importance. The market value of many of the world's most successful firms and the economic power of its leading states rest, in large measure, on their ability to

Governments award intellectual property rights to accelerate the creative flow, not to protect some divine right of inventors.

stimulate and appropriate the fruits of invention. To maintain this process, the intellectual property system must strike a delicate regulatory bal-

ance. It encourages investment in research and development and otherwise elicits "the creation and dissemination of fresh signals or messages" (law professor Benjamin Kaplan's phrase) by allowing inventors to monopolize their creations for a set period of time. This raises prices and restricts dissemination, so the system must be careful not to award patents and copyrights for trivial advances. It must also prevent the appropriation of basic scientific, mathematical, and logical concepts — the building blocks that future creators need in order to develop their "signals or messages." Finally, the intellectual property system must strike a balance between initial and follow-on creators. The broader the protection it offers, the larger its incentive to the first, but the higher the barrier to subsequent creators. Because of this inherent trade-off, law professor Robert Merges and economist Richard Nelson have shown, intellectual property systems actually burden industries characterized by cumulative technical development.

The intellectual property milieu is currently undergoing a transformation like nothing since the arrival of movable-type

results) and provide access to each. He had to fashion efficient and natural-seeming tools for the user, from interface display screens to ways to define locations, scroll through worksheets, and enter numbers and text. (Early on, he thought of a mouse with a numerical keypad on top.) Bricklin finished his work in 1979, and came to market with Visicalc for the Apple II computer.

Bricklin then faced Brunelleschi's dilemma: how could he capture the value inherent in the spreadsheet once it was open to public display? Patents are the standard protection for such functional innovations. They protect ideas in the form of a machine, process, article, or material, in contrast to copyrights, which protect particular expressions but not underlying "ideas." Bricklin's lawyers, however, told him the U.S. Patent and Trademark Office did not give patents on programs. They said the government viewed programs as nothing but mathematical algorithms, logical formulations, and "mental steps" — stuff to be kept in the public domain for subsequent scholars and inventors.

So Bricklin turned to trade secret and copyright law — the standard protective devices used in the industry. Bricklin kept his code private, legally speaking. He did not sell Visicalc, or copies of the program, but only licenses to use it, and only to users who agreed not to copy nor pry into his program. Trade secret protection, however, did not cover anything open to public display — his manuals, display screens, and the spreadsheet idea itself. Privacy also rested on the untested "shrink-wrap" agreement, tucked behind the transparent packaging, which informed buyers they were bound to the contract's trade secret provisions upon bursting the wrap.

Copyright was Bricklin's primary protection, and the strongest intellectual

property right in the software industry. He claimed the copyright on Visicalc's manuals, display screens, object code (the binary bits distributed on disk that are transferred to a computer's memory), and source code (the "unpublished" program that lay behind the binary object code).

This, for a time, was enough for Bricklin, due to the tendency toward monopoly in certain mass-market PC programs.

The very condition making piracy so simple — the insignificant cost of producing additional digital copies — meant the largest vendor had

the lowest per unit cost. The largest vendor also enjoyed what economists call "network efficiencies" — a network of users trading tips, data, and workers (and sometimes pirated software), who made up the largest market for support groups, magazines, and add-on products. As users built their businesses around these products, the vendors' position grew stronger. These network efficiencies rested on Visicalc's verbatim program code and interface — even slight deviations could derail the user's investment — and both were protected by copyright. Bricklin, as a result, quickly dominated the spreadsheet market for the Apple II.

Bricklin's position, however, was disrupted by the arrival of the IBM PC in 1981. He was slow to take advantage of the new machine. But his competitors, so long as they refrained from plagiarizing Visicalc, could build on his work and develop rival spreadsheets for this essentially virgin market. Products like Multiplan, Supercalc, and especially Lotus 1-2-3, developed by Mitch Kapor, an ex-Visicalc product manager, quickly pushed ahead. The same monopolistic dynamics that re-

sulted in Visicalc's dominance on the Apple II soon led to a similar success for 1-2-3 on the IBM PC.

Lotus, moreover, had learned certain lessons on how to do business. It maintained a vigorous development pace, for technical change was rapidly depreciating its intellectual property base. It expanded the services and applications offered behind its interface, to keep users happy,

capture new markets, and improve its competitive position. Lotus also defended its position against competitive threats defined, in large measure, by intellectual property law.

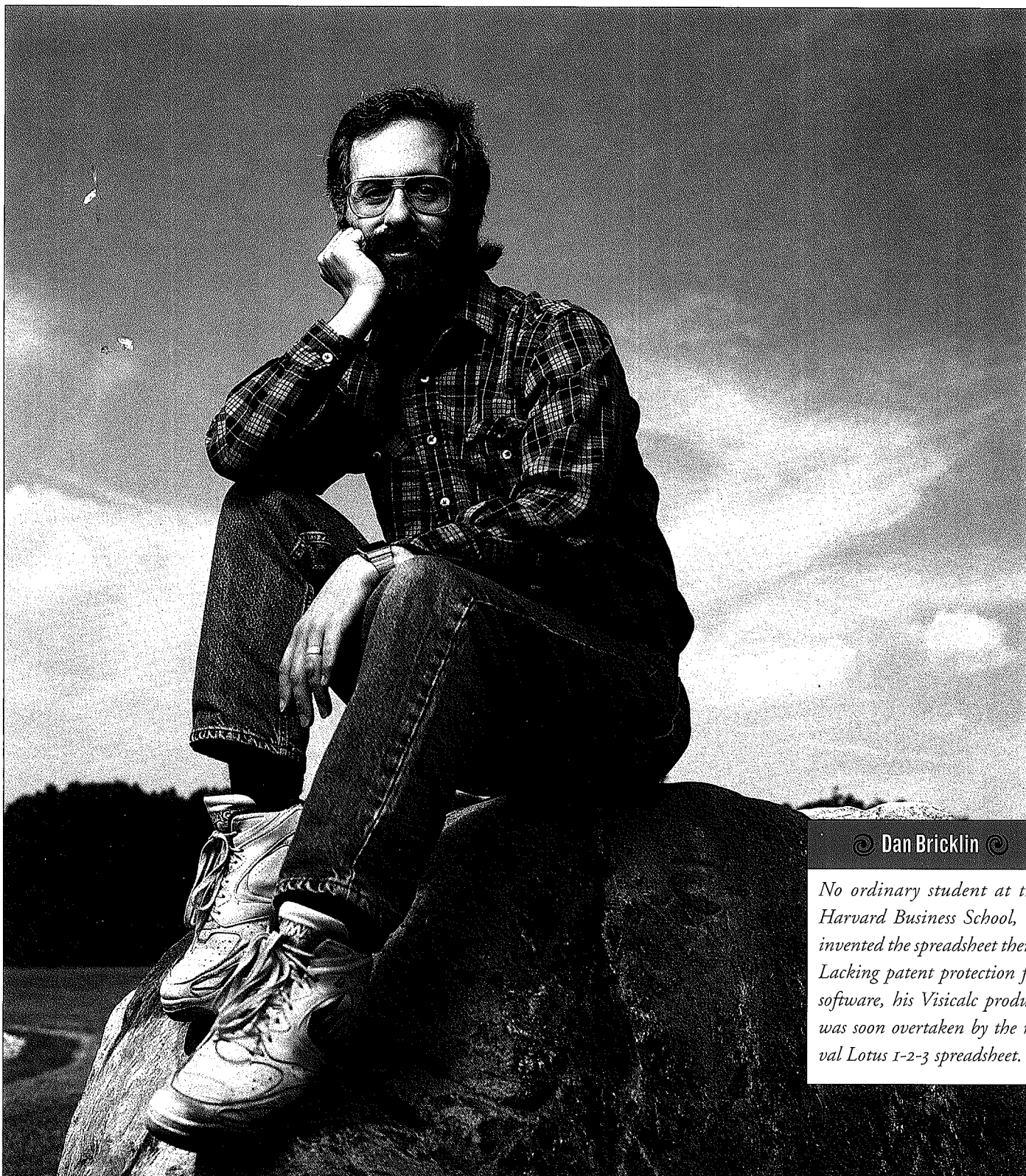
Lotus first had to fend off a frontal assault on its interface launched by Paperback Software and Mosaic Software, vendors of 1-2-3 work-alike spreadsheets. Both firms wrote original program code, but mimicked verbatim 1-2-3's command structure and other key elements of its user interface. In the 1990 case Lotus brought against Paperback, Judge Robert E. Keeton, of the federal district court in Boston, ruled much of 1-2-3's interface unprotectable. He denied protection to the "inverted L" format, finding it tied so closely to the spreadsheet "idea" that to do otherwise would give Lotus control of the spreadsheet itself. Nor could copyright preempt the use of commonplace keys such as "Enter," "+," or "/". But Judge Keeton found significant originality in 1-2-3's menus, command structure, and macro programming language, and barred competitors from mimicking Lotus's "expression" of these spreadsheet interface elements. The decision drove Paperback and Mosaic out of business, and reinforced the commercial value of an "expressive" industry-standard interface.

Microsoft, which fields the highly regarded Excel spreadsheet product, has a special incentive to compete. Microsoft has intellectual property rights over the dominant PC operating system, "MS-DOS" plus "Microsoft Windows," and the bulk of Lotus users must purchase these collateral products to run 1-2-3. By competing in the spreadsheet market, Microsoft forces Lotus to lower its price on 1-2-3 and invest more heavily in research and development. This not only expands sales of 1-2-3, but also collateral sales of DOS and Windows. It also enhances the value of these Microsoft properties in their

Computer programs uniquely straddle the classic intellectual property divide and fall under both patent and copyright law.

The Underside of the Interface Wars

LOTUS, after solidifying its copyright on the 1-2-3 user interface in the Paperback Software case, is now pursuing Borland Software. Borland's "Quattro" spreadsheet, which had offered the 1-2-3 interface as a user "option," still runs 1-2-3's programming language — the basis of numerous automated applications. This complaint is part of a critical shift in the struggle over the interface, observes attorney Paul Gupta, from battles to control access by users, to battles to control access by other software products. How this and other "interoperability" decisions come down, says Gupta, will define a key element in the competition between dominant and secondary firms.



© Dan Bricklin ©

No ordinary student at the Harvard Business School, he invented the spreadsheet there. Lacking patent protection for software, his Visicalc product was soon overtaken by the rival Lotus 1-2-3 spreadsheet.

competitive race against Apple, Unix, OS/2, and vendors of traditional computer hardware systems.

Intellectual property law thus proved influential, and capricious. Had Bricklin been able to patent his spreadsheet (and most practitioners now say he had a shot), he would be extremely wealthy today. He could have forced Lotus and Microsoft to sell their improvements or produce spreadsheets only under license. His narrow copyright claim was sufficient to dominate the Apple II market. But the market judged 1-2-3 best for the IBM PC, and Lotus captured the bulk of the profits generated by Bricklin's genius. Lotus made technical advances, to be sure. Measuring

innovative contribution on a scale from one to 10, however, Bricklin would score 10 and Lotus less. Copyrights hamstringing follow-on inventors far less than patents, and allowed Lotus's improvements to come to market. As Bricklin readily admits, the spreadsheet never would have advanced as far over the past dozen years had he been able to gain a patent.

PROPERTY IN LITERARY MACHINES

The breadth of intellectual property claims has been a matter of contention from the beginning. The earliest English judges to rule on the issue opted for a narrow scope for copyright. They allowed the free publication of abridgments and trans-

lations of another's work, writes Benjamin Kaplan, for each involved a measure of fresh creative effort. The courts then reversed themselves and focus today on material taken, not creativity added. The law now is quick to condemn substantial verbatim takings — as in abridgments. It has far more difficulty, however, deciding whether a similar work is a mere translation — a “non-literal” but infringing derivative. Does “West Side Story” plagiarize “Romeo and Juliet”? When moving into new intellectual areas, the courts generally rely on experts to provide guideposts for detecting such non-literal plagiarism. One of the most influential such experts on computer programs is Professor Randall