

too. Korea had a very significant problem with plane crashes that they have since addressed, by trying to change their pilots' culture.

Q: *Interestingly, in some of the countries you just mentioned, kids are noticeably better at math than North American kids are.*

A: High-school kids in Japan, Korea, Hong Kong, Singapore—principally East Asian kids, I mean—outperform kids from other parts of the world by an enormous amount.

Q: *Why?*

A: My explanation is a cultural one. We have a variety of evidence that suggests that when an Asian school kid sits down with a math problem, the assumption is that he or she can solve the problem simply by trying hard enough, while the Western kid assumes that the problem can be solved only if he or she possesses some innate, mathematical gift. I think that difference in attitude has to do with the very different patterns of agriculture practised in the rice belt in Asia and in the West. Specifically, the cognitive and physical demands of raising rice are so extreme—

Q: *Growing rice is cognitively demanding?*

A: Oh yeah. An Asian rice farmer is required not just to work harder than his or her European, medieval counterpart, but also has far more decisions to make. You do a thousand years of that and you get very different cultural habits that, as it turns out, are beautifully suited to the task of tackling calculus.

Q: *But those countries have enormous urban populations. A lot of those high-achieving kids must come from families who haven't set foot in a rice paddy for generations.*

A: Cultural habits are passed down from generation to generation, and they persist even after the conditions that spawned them are long gone.

Q: *Obviously, these are the kinds of generalizations or stereotypes that upset people.*

A: Generalizations about cultures are useful when they are used with the intent to help, not harm, and when they're specific. If I can learn something about how to teach math in the inner city by making a generalization about Asian culture, I'm going to do it. We would be wilfully blinding ourselves if we didn't take culture into account.

Q: *Speaking of culture, do you think Canadians and Americans define success differently?*

A: I'd like to think Canadians aren't as obsessed with the cult of individualism. When Jeb Bush, George's brother, was running for governor of Florida, he referred to himself as a self-made man. This is a guy whose father was president, his grandfather was a powerful investment banker and his other grandfather was a U.S. senator! You'd be laughed out of town if you tried to make that argument in Canada. **M**

How to be a success

Talent plus practice, practice, practice—and being in the right place at the right time

*Canadian journalist Malcolm Gladwell, 45, has made a career of finding secret patterns behind everyday happenings. His new book, *Outliers* (Little, Brown), argues that the roots of high achievement lie as much in preparation and luck as in talent. Excerpts from *Outliers*:*

BY MALCOLM GLADWELL

In 1971 the University of Michigan had one of the most advanced computer science programs in the world, and thousands of students passed through it, the most famous of whom was a gawky teenager named Bill Joy, who came to the university the year the Computer Center opened. He was 16. He was tall and very thin, with a mop of unruly hair. He had been voted "Most Studious Student" by his graduating class at North Farmington High School, outside Detroit, which, as he puts it, meant that he was a "no-date nerd." He had thought he might end up as a biologist or a mathematician. But late in his freshman year, he stumbled across the Computer Center—and he was hooked.

From that point on, the Computer Center was his life. He programmed whenever he could. Joy got a job with a computer science professor so he could program over the summer. In 1975, he enrolled in graduate school at the University of California at Berkeley. There, he buried himself even deeper in the world of computer software. During the oral exams for his Ph.D., he made up a particularly complicated algorithm on the fly that, as one of his many admirers has written, "so stunned his examiners [that] one of them later compared the experience to 'Jesus confounding his elders.'"

Working in collaboration with a small group of programmers, Joy took on the task of

rewriting UNIX, a software system developed by AT&T for mainframe computers. Joy's version was very good. It was so good, in fact, that it became—and remains—the operating system on which literally millions of computers around the world run. "If you put your Mac in that funny mode where you can see the code," Joy says, "I see things that I remember typing in 25 years ago." And do you know who wrote much of the software that allows you to access the Internet? Bill Joy. He later went on to co-found Sun Microsystems and rewrite another computer language—Java.

Joy's story looks like the triumph of pure genius. But the problem with this view is that the closer psychologists look at the careers of the gifted, the smaller the role innate talent seems to play and the bigger the role preparation seems to play.

Exhibit A in the talent argument is a study done in the early 1990s by the psychologist K. Anders Ericsson and two colleagues at Berlin's elite Academy of Music. With the help of the academy's professors, they divided the school's violinists into three groups. In the first group were the stars, the students with the potential to become world-class soloists. In the second were those judged to be merely "good." In the third were students who were unlikely to ever play professionally and who intended to be music teachers in the public school system. All of the violinists were then asked the same question: over the course of your entire career, ever since you first picked up the violin, how many hours have you practised?

Everyone from all three groups started playing at roughly the same age, around five years old. In those first few years, everyone practised roughly the same amount, about

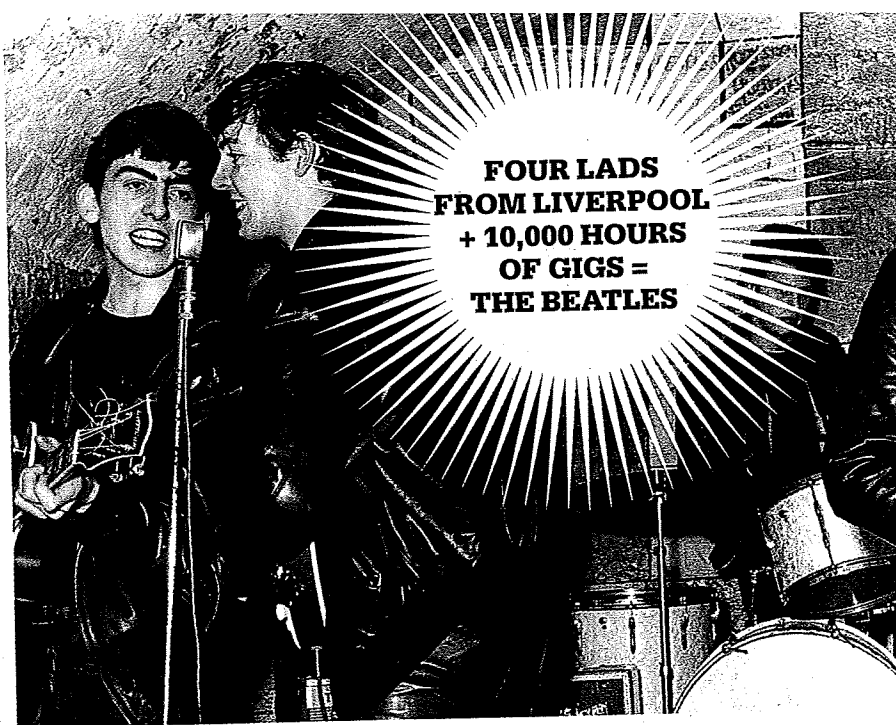
two or three hours a week. But when the students were around the age of eight, real differences started to emerge. The students who would end up the best in their class began to practise more than everyone else: six hours a week by age nine, eight hours a week by age 12, 16 hours a week by age 14, and up and up, until by the age of 20 they were practising—that is, purposefully and single-mindedly playing their instruments with the intent to get better—well over 30 hours a week. In fact, by the age of 20, the elite performers had each totalled 10,000 hours of practice. By contrast, the merely good students had totalled 8,000 hours, and the future music teachers had totalled just over 4,000 hours.

The striking thing about Ericsson's study is that he and his colleagues couldn't find any "naturals," musicians who floated effortlessly to the top while practising a fraction of the time their peers did. Nor could they find any "grinds," people who worked harder than everyone else, yet just didn't have what it takes to break the top ranks. Their research suggests that once a musician has enough ability to get into a top music school, the thing that distinguishes one performer from another is how hard he or she works. That's it. And what's more, the people at the very top don't work just harder or even much harder than everyone else. They work much, *much* harder.

The idea that excellence at performing a complex task requires a critical minimum level of practice surfaces again and again in studies of expertise. In fact, researchers have settled on what they believe is the magic number for true expertise: 10,000 hours.

"The emerging picture from such studies is that 10,000 hours of practice is required to achieve the level of mastery associated with being a world-class expert—in anything," writes the neurologist Daniel Levitin. "In study after study, of composers, basketball players, fiction writers, ice skaters, concert pianists, chess players, master criminals, and what have you, this number comes up again and again. No one has yet found a case in which true world-class expertise was accomplished in less time. It seems that it takes the brain this long to assimilate all that it needs to know to achieve true mastery."

And that's why elite athletic squads have practically no one on their rosters born after September 1. A late-born hockey prodigy doesn't get chosen for the all-star team as an eight-year-old because he's too small, compared to his January- and February-born peers. So he doesn't get the extra practice. And without that extra practice, he has no chance at hitting 10,000 hours by the time professional hockey teams start looking for players. And without 10,000 hours under his



**FOUR LADS
FROM LIVERPOOL
+ 10,000 HOURS
OF GIGS =
THE BEATLES**

The interesting thing about 10,000 hours is that it's all but impossible to reach by yourself

belt, there is no way he can ever master the skills necessary to play at the top level. Practice isn't the thing you do once you're good. It's the thing you do that makes you good.

The other interesting thing about that 10,000 hours, of course, is that 10,000 hours is an enormous amount of time. It's all but impossible to reach that number all by yourself by the time you're a young adult. You have to have parents who encourage and support you. You can't be poor, because if you have to hold down a part-time job on the side to help make ends meet, there won't be time left in the day to practise enough. In fact, most people can reach that number only if they get into some kind of special program—like a hockey all-star squad—or if they get some kind of extraordinary opportunity that gives them a chance to put in those hours.

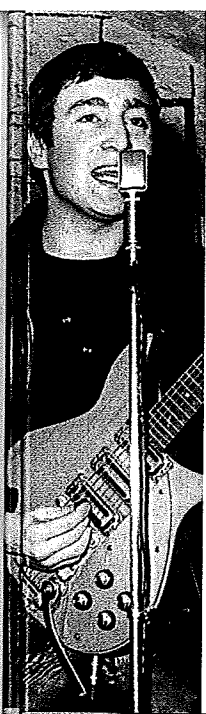
So, back to Bill Joy. It's 1971. He's tall and gawky and 16 years old. He's the math whiz, the kind of student that schools like MIT and Caltech and the University of Waterloo attract by the hundreds. He has talent by the truckload. But that's not the only consideration. It never is. Just look at the stream of opportunities that came Bill Joy's way. Because he

happened to go to a far-sighted school like the University of Michigan, he was able to practise on a computer system that operated by time-sharing instead of punch cards; because the university was willing to spend the money to keep the Computer Center open 24 hours, he could stay up all night; and because he was able to put in so many hours, by the time he happened to be presented with the opportunity to rewrite UNIX, he was up to the task. Bill Joy was brilliant. He wanted to learn. That was a big part of it. But before he could become an expert, someone had to give him the opportunity to learn how to be an expert.

"At Michigan, I was probably programming eight or 10 hours a day," he went on. "By the time I was at Berkeley I was doing it day and night. I was proficient by my second year there. That's when I wrote programs that are still in use today, 30 years later." He paused for a moment to do the math in his head—which for Bill Joy doesn't take very long. Programming in earnest by sophomore year. Add in the summers then the days and nights in his first year at Berkeley. "So, so maybe... 10,000 hours?" he said, finally. "That's about right."

Is the 10,000-hour rule a general rule of success? If we scratch below the surface of every great achiever, do we always find the equivalent of the Michigan Computer Center or the hockey all-star team—some sort of special opportunity for practice?

Consider the Beatles. John Lennon and Paul McCartney first started playing together in 1957, seven years prior to landing in America. And if you look more closely at those years of preparation, you'll find an experience that, in the context of hockey players and Bill Joy and world-class violinists, sounds awfully



familiar. In 1960, while they were still just a struggling high-school rock band, they were invited to play in Hamburg, Germany.

"Hamburg in those days did not have rock 'n' roll music clubs. It had strip clubs," says Philip Norman, who wrote the Beatles biography *Shout!* "There was one particular club owner called Bruno, who had the idea of bringing in rock groups. They had this formula: a huge non-stop show, hour after hour. Many of the bands that played in Hamburg were from Liverpool," Norman went on. "It was an accident. Bruno went to London to look for bands. But he happened to meet an entrepreneur from Liverpool, and he arranged to send some bands over.

ones, at every one. In Hamburg, we had to play for eight hours, so we really had to find a new way of playing."

The Beatles ended up travelling to Hamburg five times between 1960 and the end of 1962. On the first trip, they played 106 nights, five or more hours a night. On their second trip, they played 92 times. On their third trip, they played 48 times, for a total of 172 hours on stage. The last two Hamburg gigs, in November and December of 1962, involved 90 hours of performing. All told, they performed for 270 nights in just over a year and a half. By the time they had their first burst of success in 1964, in fact, they had performed live an estimated 1,200 times. Do you know how extraordinary that is? Most bands today don't perform 1,200 times in their entire careers. The Hamburg crucible is one of the things that set the Beatles apart.

Let's now turn to the story of a Seattle kid in an elite private school. Bill Gates was midway through Grade 8 at Lakeside school when the Mothers' Club started a computer club. "[They] did a rummage sale every year, and there was always the question of what the money would go to," Gates remembers. "Some went to the summer program, where inner-city kids would come up to the campus. Some of it would go for teachers. That year, they put \$3,000 into a computer terminal down in this funny little room that we subsequently took control of. It was kind of an amazing thing." It was an "amazing thing," of course, because this was 1968. Most colleges didn't have computer clubs in the 1960s. From that moment forward, Gates lived

side, a year ahead of Gates. Would the Lakeside computer club, Rona wondered, like to test out the company's software programs on the weekends in exchange for free programming time? Absolutely! After school, Gates took the bus to the C-Cubed offices and programmed long into the evening.

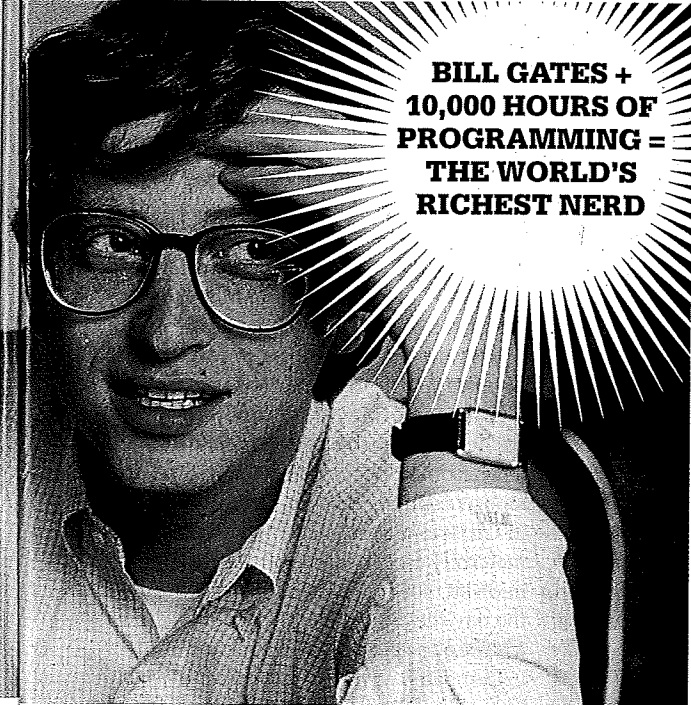
C-Cubed eventually went bankrupt, so Gates and his friends began hanging around the computer centre at the University of Washington. Before long, they latched on to an outfit called ISI (Information Sciences Inc.), which agreed to let them have free computer time in exchange for working on a piece of software that could be used to automate company payrolls. In one seven-month period in 1971, Gates and his cohorts ran up 1,575 hours of computer time on the ISI mainframe, which averages out to eight hours a day, seven days a week.

"It was my obsession," Gates says of his early high-school years. "I'd leave at night, after my bedtime. I could walk up to the University of Washington from my house. Or I'd take the bus. That's why I'm always so generous to the university, because they let me steal so much computer time." (Years later, Gates's mother said, "We always wondered why it was so hard for him to get up in the morning.") The five years from eighth grade through the end of high school were Bill Gates's Hamburg, and by any measure, he was presented with an even more extraordinary series of opportunities than Bill Joy.

And what did virtually all of those opportunities have in common? They gave Bill Gates extra time to practise. By the time Gates dropped out of Harvard after his sophomore year to try his hand at his own software company, he'd been programming practically non-stop for seven consecutive years. He was *way* past 10,000 hours. How many teenagers in the world had the kind of experience Gates had? "If there were 50 in the world, I'd be stunned," he says. "I had a better exposure to software development at a young age than I think anyone did in that period of time, and all because of an incredibly lucky series of events." M

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**BILL GATES +
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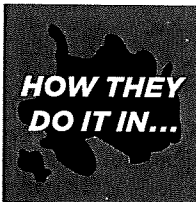


Eventually the Beatles made a connection not just with Bruno but with other club owners as well. They kept going back because they got a lot of alcohol and a lot of sex."

And what was so special about Hamburg? The sheer amount of time the band was forced to play. Here is John Lennon, in an interview after the Beatles disbanded, talking about the band's performances at a Hamburg strip club called the Indra: "We got better and got more confidence. We couldn't help it with all the experience playing all night long. It was handy them being foreign. We had to try even harder, put our heart and soul into it, to get ourselves over. In Liverpool, we'd only ever done one-hour sessions, and we just used to do our best numbers, the same

in the computer room. He and a number of others began to teach themselves how to use this strange new device.

Then a group of programmers at the University of Washington formed an outfit called Computer Center Corporation (or C-Cubed). As luck would have it, one of the founders of the firm—Monique Rona—had a son at Lake-



ITALY: BREEZY STRATEGY WINS SOCCER GAME

Sicilian soccer team Calcio Catania managed to score a goal against Turin on the weekend when three players dropped their shorts to their knees to block the Turin goalie's view of the kick. The team won 3-2, but a former referee coordinator decried the strategy, which Catania has been practising, as "unsportsmanlike and in bad taste." Catania's manager, Pietro Lo Monaco, disagreed: "I don't see where the problem is. Good taste is relative."

ROBERT BURROUGHS/GETTY