

BY STEVEN LEVY

SHORT OF "YOU'RE UNDER arrest" there are very few things that the leaders of a young technology company would like less to hear than "Bill Gates thinks you've kicked his butt and now he wants your business." But Sergey Brin and Larry Page don't seem ruffled at all. Hanging out one day in their spacious new headquarters, the two young cofounders of Google are calm, even confident, in the face of a rising tide of competitors, technology challenges and the tricky process of using the principles of disorganization to build a substantial company out of one unquestionably brilliant idea.

Let's face it—it's good to be Google. Every minute, worldwide, in 90 languages, the index of this Internet-based search engine created by these Stanford doctoral dropouts is probed more than 138,000 times. In the course of a day, that's over 200 million searches of 6 billion Web pages, images and discussion-group postings. Searches for golf clubs, song lyrics, tomorrow night's blind date, recipes and the unaltered screen shots of Janet Jackson's Super Bowl boo-boo. Amazingly, the majority of those queries evoke satisfactory, even revelatory, results. Google has changed the way the world finds

business visionary, won't sit down: he's bothered by a mild injury incurred by his hobby of gymnastics. As Brin stretches, 31-year-old Page, the guardian of Google's secret-sauce search techniques, tells a story.

"I was researching big computer networks the other day, networks," he says. "I put this really strange query into Google, and got this research paper with the exact things I wanted. Which would have been a many-hour process normally. It took all of 30 seconds. I gave it to a bunch of people in the company, and now we have this project. It's very likely that I wouldn't have done that at all if it had been more difficult. I think the value of that can be very large, making the world more efficient."

Exactly. Google has made such eureka moments as common as sneezing. Who hasn't had such a revelation on Google, whether the discovery was an old girlfriend's whereabouts or a cutting-edge treatment for a rare disease? Amazing to consider that less than a decade ago, search was a backwater, deemed not very interesting and certainly not very profitable. Instead, Internet companies put their energy into developing feature-laden "portals." Then came Larry and Sergey, and search became the center of the Internet universe. "Search is the ultimate killer online app," says Bob Davis, former CEO of Lycos. "The Internet without search is like a cruise

the results for a given query, or buried a few hundred mouseclicks back—you can count on a thriving online trade. A horde of new companies has arisen whose services focus on performing all the tweaks and playing all the tricks that supposedly get your Web site listed higher on Google's results pages. (Google constantly fine-tunes its system to frustrate such manipulating.) If you can't afford to hire one of those firms, buy the latest offering in a famous series: "Search Engine Optimization for Dummies."

So it's no surprise that all the companies that missed out the first time around are now gearing up for the Search Wars, a clash that will be waged with algorithms, measured by terabytes and scored by click-throughs. Gunning for Google are Internet giants, clever new start-ups and an 800-pound gorilla in Redmond, Wash. They might not have gotten it at first, but now it seems terribly obvious. "Search has always been essential to people's lives," says Jeff Weiner of Yahoo. "We're all trying to seek happiness—a new car, a job, a spouse... it's how we live."

What does Brin think of the gathering forces? He ... stretches. "I've seen companies obsessed with competition, say, with Microsoft, that keep looking in their rear-view mirror and crash into a tree head-on because they're so distracted," he says. "If I had one magic bullet, I wouldn't spend it



In six years, two students turned a simple idea into a global phenomenon. Now competitors are searching for a way to dethrone the latest princes of the Net.

things out, and enticed it to look for things previously considered unfindable.

Not only has Google very famously become a verb, but Silicon Valley is holding its collective breath for the seemingly inevitable IPO, when Google will become a synonym for another word: wealthy. Still, even without a market cap, the two Google guys recently made the Forbes billionaire list.

Here they are, outlining their plans for getting all the world's information on their thousands of servers and delivering it to anyone who can peck a query into a search field. Brin, 30, the ruminative Russian-born son of a math professor who is Google's

missile without a guidance system."

The rest of the industry has noticed. Boy, has it noticed. To quote the numbers, Safa Rashtchy at Piper Jaffray reports that annual search revenues are just under \$4 billion today (about a billion of that is Google's) and will almost triple over the next four years. But those figures don't reflect search's real impact; those empty query fields on search pages are the front doors to the Internet. If you're not indexed by Google, you pretty much don't exist. And if you're a business with a high page rank—a key metric that determines whether your site will be displayed high in

on a competitor. I'd spend it to make sure we're executing as well as we possibly can. I think we're doing a pretty good job."

The folks at Yahoo can't disagree. Just over a year ago those at the archetypical Internet portal realized that while the world was bowing before the altar of search, their company had little more than an overtaxed Web directory and two pieces of paper licensing other people's search technology (including you know whose). People didn't Yahoo anybody—they Googled. And for the folks at Yahoo, that could not stand.

It cost more than a billion dollars—most of it buying technology—but Yahoo is now



oogle

VISIONARIES: Google's co-founders Page and Brin aren't blinking, despite the looming competition

making its bid to be a Google buster. Earlier this year it unveiled a rebuilt engine, which spits out results comparable to the other guys'. The long-term strategy is to tap the treasure house of information that lives elsewhere on the busy Yahoo portal. So your search might draw from Yahoo's traffic reports, shopping services, maps, financial data and hot Britney gossip. "Search results are not enough," says Weiner. "We're going to add another layer." (Last week, Google fired back by announcing an e-mail service, called Gmail, that offers more free memory than Yahoo's.)

Part of Yahoo's new technology portfolio is Overture, a company that pioneered an advertising practice that certain search

purists regard as blasphemy: mingling "paid inclusions" with the results normally delivered in response to a search query. "We never claimed it was a better approach for doing research on 18th-century Spain," says Ted Meisel, who came to Yahoo as head of Overture. "But if you're trying to buy a power washer for your back deck, it's a pretty good way to find what you need." Now Yahoo has begun a Content Acquisition Program (CAP) that establishes a controversial relationship between its search business and companies that want to appear in the results pages. In exchange for a fee, companies can provide feeds of its pages to Yahoo's search index. Weiner says that such pages won't get unfair considera-

tion, but critics are questioning whether the practice affects the integrity of the results. (Google's ads appear alongside its "pure" search results, and are marked as such.) Meanwhile, Google has innovated with a program it calls AdSense, which places ads on Web sites that don't belong to Google—other businesses, nonprofit or academic institutions and even blogs.

Brewster Kahle, founder of the nonprofit Internet Archive, is hoping that at least some of the search world remains beyond the forces of Mammon. After all, when 71 percent of American middle- and high-school students use the Internet as their No. 1 research venue, isn't it a bit disturbing that homework is becoming a sponsored activi-

SOFTWARE

Search-engine translations are still imperfect at best—but new statistical methods could help raze the Tower of Babel

Lost in Translation

BY MAC MARGOLIS AND
JONATHAN ADAMS

Frank Sinatra's rendition of the tune "The Girl From Ipanema" might not have been a hit if it weren't for Norman Gimbel, the songwriter who translated the Portuguese lyrics into singable English. Had Sinatra run "The Girl" through Google instead, the tune never would have made it onto vinyl. As the saying goes:

Traduttore, traditore—the translator is a traitor.

That holds especially for machine translation, or MT—the software that translates Web pages for the likes of Google and AltaVista.

In recent years a handful of search engines have come to dominate the globe, even though at best they do a poor job of translating Web pages. This performance gap is keeping millions of non-English-speaking people from getting access to English-language Web pages—which currently account for about 35 percent of the billions of Web pages now available via search engines. If engineers can solve some of the more vexing problems of machine translation—and many think they eventually will—it could transform the competitive landscape for search-engine firms.

It will also be the biggest advance in MT since U.S. Sovietologists used computers to make sense out of Russian-language documents during the cold war. They made swift advances, but couldn't crack the tougher problems—the ambiguities of meaning and the complexities of grammar, to name two. With the advent of the Internet and powerful computer chips, their technology made its way to the common man, warts and all. In recent

**Tall and tan and young and lovely,
The girl from Ipanema goes walking
When she passes each one she
passes goes—ahh**

-Normal Gimbel's translation,
'Girl From Ipanema'

**It looks at, that prettier thing, fuller of favor
She is it, girl, who conies and that she passes,
In a candy rocking, the way of the sea. Young
woman of the golden body**

-Google translation,
'Girl From Ipanema'

years MT firms like Systran of San Diego, California, which currently supplies Google and AltaVista, and Language Weaver of Marina del Rey, California, have incorporated advances in linguistics and statistics to render texts in languages from Croatian to Mapudungun, spoken by the Mapuches in Chile. Still, these are incremental improvements, not a breakthrough.

That may soon change. In the 1990s, IBM researchers developed so-called statistical MT programs, which take identical texts in two different languages and apply statistics to "learn" how to translate between them. This method is used for high-end translation services, and has begun to trickle down to the search engines. The so-called

war on terror has also unleashed funds from the U.S. Defense Department, which is anxious to improve the translation of texts in Arabic and other languages. "We're more aware now that the rest of the world is important to us, and we now have the resources available to us," says David Yarowsky, head of Johns Hopkins University's machine-translation efforts. Re-

searchers have recently made programs that can translate entire phrases rather than one word at a time and handle trickier grammar. And in the next year or two they expect big improvements in the way machines translate the names of people, places and organizations, which now cause computer hiccups.

That would leave plenty of tough problems, including ambiguity and anarchic "jumble"—jokes, creative phrasing, and colloquialisms—that stymies the most powerful machines. But researchers are confident that machines will eventually match the quality of human translators. Yarowsky's goal at Johns Hopkins is to develop, within the next five years, programs that can translate 100 languages to the point where a Brit could get the gist of, say, an editorial in Bengali. When those advances make their way to search engines, the Internet will truly pull the world together.

With ANDREWEHRENKRANZ in Paris

ty? Kahle is encouraging an alternative. He provides the infrastructure for would-be search wizards to create their own "open source" (noncommercial) engines. "I'd like to see a Google a month," he says.

Competitors are popping out of the woodwork and even coming back from the dead. One rival is a rejuvenated AskJeeves, a onetime dot-com bubble casualty. In 2001 it acquired the technology and the engineering team behind the highly regarded search technology of Teoma.

Of course, Google's biggest problem may well be (cue soundtrack from "Jaws") Microsoft. Bill Gates is constitutionally unable to countenance the idea that a cheeky Silicon Valley start-up can claim even the mildest role as an Internet gateway. Last autumn Gates told NEWSWEEK that his company's complacency in search was a grave error that would soon be corrected. "We didn't make it as much of a priority as we should have," he said. "We recognized that, and we're on the job." At the World Economic Forum earlier this year, he was even more frank: "[Google] kicked our butts," he said. The last time Microsoft felt similarly embarrassed—when it failed to notice that the Internet was kind of going to be a big thing—Gates started a companywide jihad that didn't stop until his competitor, Netscape, was eviscerated.

This time, Googlers claim that it's the Softies who are out of their league. Anna Patterson, a Stanford search wizard recruited by both companies (she chose the Googleplex), had the chance to evaluate Microsoft's talent. Not impressed. "It's a bunch of people at the first grade," she says. "Eight junior programmers who don't know anything about search."

Microsoft's answer: just wait. "I'm more than glad to have people underestimate what we can do," says the VP in charge of Microsoft's search effort, Yusuf Mehdi. "You can't remotely discount the level of technical talent we have devoted to this."

Though Microsoft hasn't announced the details of its search strategy, an outline

is taking shape. The first step involves transforming the lackluster search engine it currently uses in MSN. "We're taking our time to architect a next-generation system that answers people's questions, an end-to-end system that will leapfrog what's out there today," says Mehdi. Subsequent stages involve tapping into the company's unique advantages—the software used by hundreds of millions of people to run their computers and create their documents. To Microsoft, search will involve everything on your own machine and other databases to which you have access. Gates has recently been demoing a program called Stuff I've Seen, which uses "memory landmarks" to search through e-mails, pho-

essing and desktop, is positioned to launch such an approach. And the radically revamped file-handling system planned for the next version of Windows, code-named Longhorn, is well suited to handle complicated searches. In short, Microsoft wants to offer a richer version of search than Google can deliver—even before you type a query into a search field.

Google's CEO and chairman Eric Schmidt—brought in by Brin and Page as the designated adult to run the company—doesn't think Google will suffer the same fate as Netscape. "This search stuff is very hard to do, and it's really very hard to do at the kind of scale that Google does it at. People will have multiple choices, and our



SERVING UP DATA: Google indexes billions of sites on its servers in its Mountain View, California, headquarters

tographs and documents.

The next step might well be called "Stuff I *Should* See." It involves another process cooked up by its think-tank people called Implicit Query. "Too often, searching means stopping what you're doing, open a browser and type in a query," says researcher Eric Horvitz. His alternative is software that figures out what you might want to ask for, depending on what you're doing. Only Microsoft, which provides most people's mail software, word proc-

goal is to get as many of those choices as possible to be Google."

The winners will be the ones who innovate best, because the major breakthroughs in the field are yet to come. "Search is not a solved problem," says Udi Manber, CEO of A9, a new search company formed by Amazon.com that will focus on e-commerce. "Ten years from now, what we're doing now will look pretty primitive."

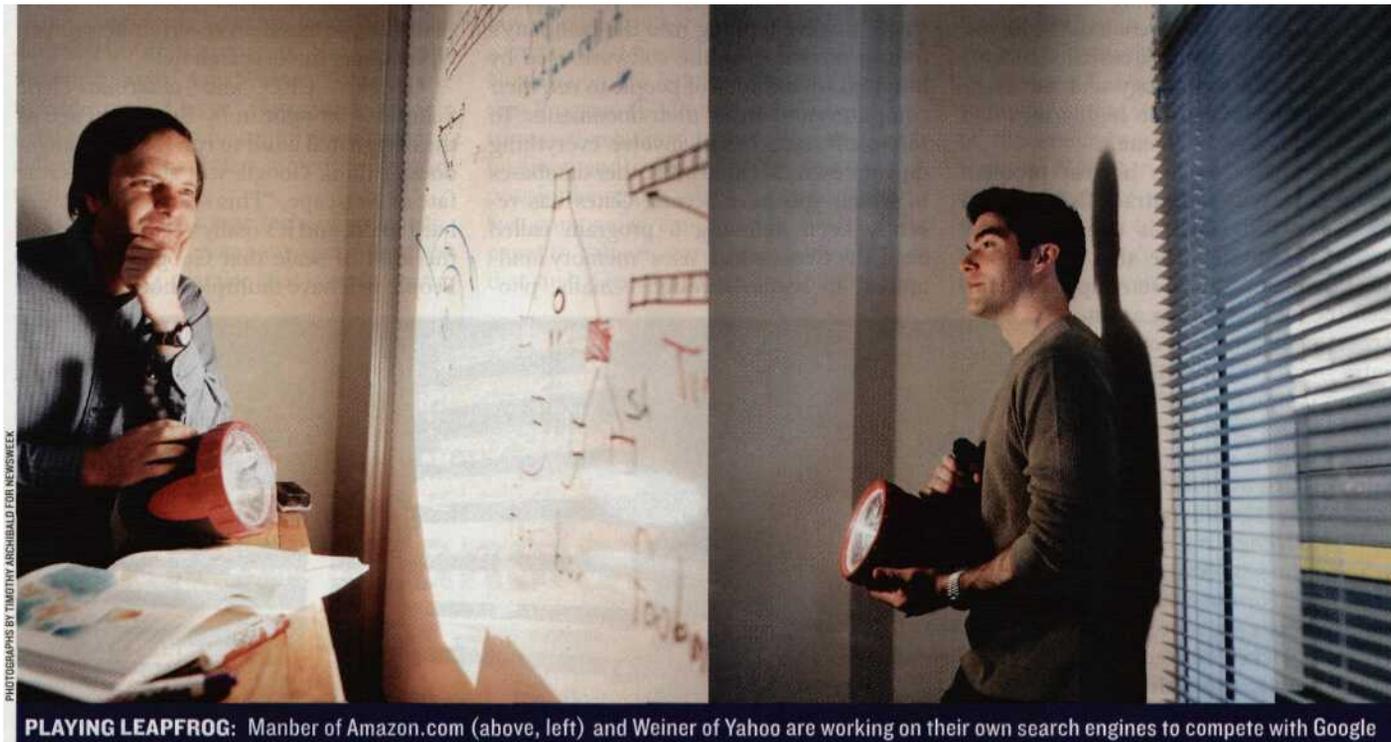
Sergey Brin agrees. "I think we're pretty far along compared to 10 years ago," he says.

'We didn't make [search] as much of a priority as we should have, We've recognized that, and we're on the job.'

BILL GATES, CHAIRMAN, MICROSOFT

I've seen companies so obsessed with competition that they keep looking in their rearview mirror and crash into a tree'

SERGEY BRIN, COFOUNDER, GOOGLE



PLAYING LEAPFROG: Manber of Amazon.com (above, left) and Weiner of Yahoo are working on their own search engines to compete with Google

"At the same time, where can you go? Certainly if you had all the world's information directly attached to your brain, or an artificial brain that was smarter than your brain, you'd be better off. Between that and today, there's plenty of space to cover."

Indeed, over the next few years search will evolve in a number of key areas, and Google faces big competition in all of them.

DEEP CONTENT. Searching the Web can yield amazing results, but they're still limited and skewed. "What's on the Web is extremely ephemeral," says Kahle. "Very little of it was written before 1995." Amazon took a giant step to address this with its Search Inside the Book feature that lets people query a library of 120,000 tomes. Despite the pay-for-content controversy, Yahoo's CAP is an intriguing attempt to lure content providers not on the public Web to submit to its indexes. "It might take a decade or two to put all the world's information into Google and do things with it," says engineering VP Wayne Rosing. "But it's an achievable goal."

MULTIMEDIA. Google has an Image Search function with almost a billion pictures. Microsoft researchers in China are going full blast to create software that searches through pictures—possibly identifying faces and locations. Meanwhile, a Washington,

D.C., start-up called StreamSage has created breakthrough technology that searches audio and video broadcasts by analyzing speech. And AOL, whose search strategy is to build features on top of Google technology, recently bought an audio-video search operation called Singingfish.

PERSONALIZATION. A search engine that knows you're a sports-car buff is more likely to give you auto sites when you query the word Jaguar. Google here is at a disadvantage compared with places like Yahoo and Amazon, which know a lot about their customers.

LOCALIZATION. Last week Google introduced its local search, which produces a map when you type in a category (say, "restaurants") and a ZIP code. But again, Yahoo and MSN have loads of information about where its users live. The breakthrough here might come in a marriage of search engines and cell phones.

ARTIFICIAL INTELLIGENCE. "The ultimate goal is to have a computer that has the kind of semantic knowledge that a reference librarian has," says Google technology director Craig Silverstein. But truly smart search engines are probably decades away.

Google's plan to keep up in these areas is to unleash its brain power in two ways. First, its engineers try to whittle down a

rolling list of the Top 100 tasks, determined by Brin, Page and other top execs. Then, as dictated by Google's self-professed "bottom-up" management style, those wizards are permitted to spend 20 percent of their time working on projects of their choosing. Often these ideas wind up becoming part of the Google collection of features, as was the case for the popular Google News. Another breakout project was Orkut, a social-networking service designed by a young engineer named Orkut Buyukkokten. "My dream is to connect all Internet users so they can all relate to each other," he says.

Typical Google big-think. But skeptics are saying that Google's increasingly varied roster of services shows that *the* company is losing focus. And that its bottom-up style causes chronic disorganization. CEO Schmidt isn't worried. "I believe the disorganization is a feature," he says. "The culture of companies is set early, and if you changed it, you'd lose all of the great things. This model has worked very well for us."

The confidence is reminiscent of the mood at another Mountain View, California, company in 1996: Netscape. Schmidt rejects the comparison. "The best check on hubris," he says, "is your competitors." And now, the Google guys have plenty of 'em.

With BRAD STONE in San Francisco