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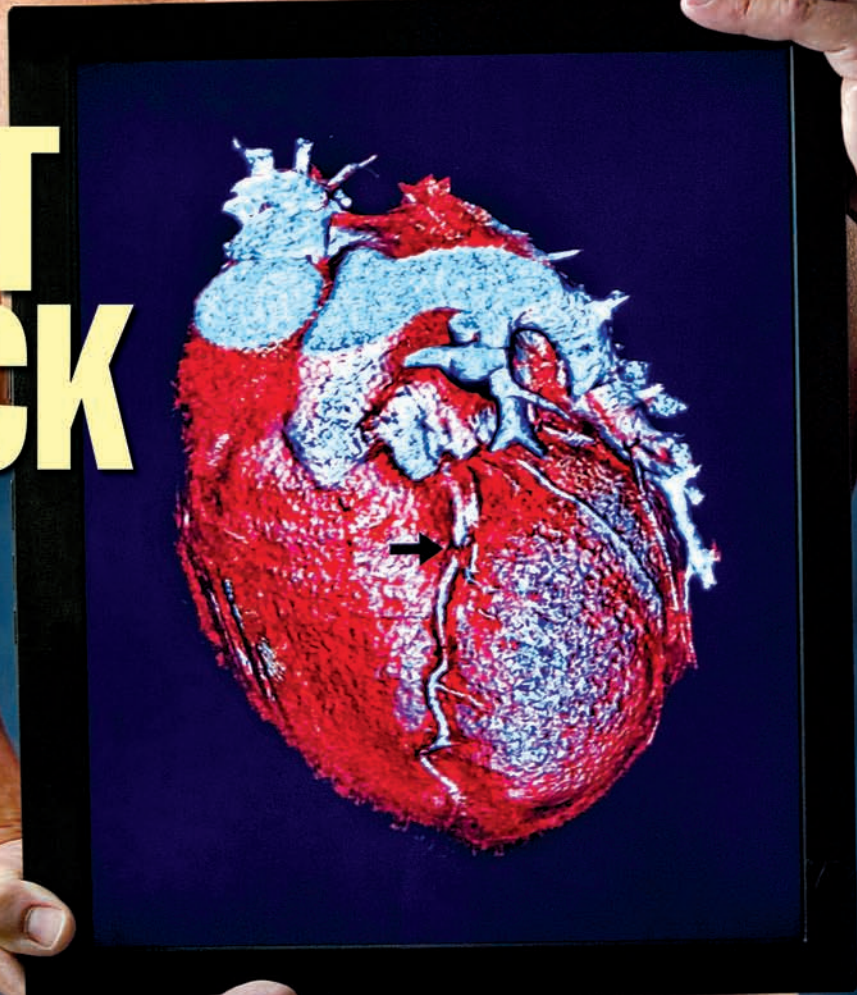
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Mike Fackelmann, 50, holds a scan of his heart, which revealed a major blockage of a coronary artery (arrow)

ON THE FRONTIER OF SEARCH

Get ready for a wave of new features—from 3-D satellite pics of your house to news tailored to your “clickstream.” A guide to innovative engines

By **TERRY MCCARTHY**

YOU LAND LATE IN THE EVENING IN a city where you know nobody. You did not have time to book a hotel, your luggage has not turned up on the carousel—and the plane’s air conditioning gave you a sore throat. What to do?

With your cell phone, you first Google your suitcase—it has a small implanted chip that responds to radio waves with a GPS locator—and it turns out that your luggage has been deposited 200 yds. away in the next terminal. As you walk over, you search for a hotel room; the screen of your cell shows you pictures of several hotels in your price bracket, with views from individual room windows. Your search engine gives you a list of pharmacies that are still open at this hour, and tells you that your favorite blues band will be playing at a festival in the city’s park over the weekend. The engine can search your desktop back home, and it reminds you that a college friend e-mailed you a year ago to say he and his wife were moving to this city (you had forgotten). You decide to invite them to the festival.

What you have just tasted is the future of search. It will change the way humans interface with computers and make today’s methods seem as outmoded as telex machines and brick-size mobile phones. “Search will ultimately be as good as having 1,000 human experts who know your tastes scanning billions of documents within a split second,” says Gary Flake, one of just seven Distinguished Engineers at Microsoft, who

are paid to think big thoughts. “It will model the human brain.”

To be sure, you can already access an estimated 10 billion pages of online text—thanks to Google, Yahoo!, MSN and other search engines. Americans conducted more than 48 billion searches in July—a 22% increase over July of last year, according to a study by comScore Media Metrix. But who needs 14,120,000 results in response to a simple question? People don’t want a list—they want an answer.

So the battle is on for the next generation of search, which will be smarter and more tailored to the individual, embrace video and music—and be accessible from any device with a chip. By 2010, search-engine advertising will be a \$22 billion industry worldwide, up from an estimated \$8 billion today, according to Safa Rashtchy, a senior analyst with Piper Jaffray in San Francisco. It’s the reason search has become the most hotly contested field in the world of technology.

While Google is still the forerunner in search, with 36.5% of the queries, Yahoo! is a strong runner-up, with 30.5%, and MSN stands at 15.5%, according to comScore Media Metrix. In mid-August, Google announced that it plans to raise an additional \$4 billion to fund its next round of growth. The Big Three are investing aggressively in search technology, and with their deep pockets, they are likely to remain the innovation and market-share leaders for some time to come. But a crop of new start-ups, mostly clustered in Silicon Valley and Seattle, offer a glimpse of the next frontier of

search, where imagination has no limits.

PICTURE AND VIDEO Now that still and moving images are increasingly digitized, they too can be searched with a click. Singingfish, acquired by America Online (which is owned by Time Warner, TIME’s parent company) two years ago, can search AOL’s video library of 15,000 titles, plus millions more over the Web, by looking for their titles and other attached identifying text, known as their metadata.

A more futuristic image search, which can scan and recognize facial images, is being developed by Massachusetts-based Viisage. It focuses on unique marks on the human face—cheekbones, tip of the nose—and can cross-reference pictures with databases, much to the interest of law-enforcement and intelligence agencies. In Florida, the Pinellas County sheriff’s office has outfitted troopers’ cars with a system that uses Viisage technology. If a trooper sees someone acting suspiciously, the officer can take a digital image of the person, upload it to a database of criminals, and get back any hits. How hard is it for bad guys to game the system with a beard, a baseball cap or colored contact lenses? Mohamed Lazzouni, the company’s chief technology officer, says they would have to change their bone structure to spoof the technology.

CELL PHONES Mobile search is mostly done today with limited text messaging, but by 2008, when more than 75% of new cell phones globally are expected to be Internet-ready, searching the Web on the go will be standard. On the street, and want to find out the nearest movie theater? Or get sports results? Pankaj Shah’s mobile service 4INFO, which the 32-year-old launched this February in Palo Alto, Calif., will give you all the information—for free—by text or Internet on your cell phone. Yahoo! also offers such local information.

Want to know more about what you see in front of you? Boston-based Mobot has developed technology that maps the features in a picture taken with a cell-phone camera and matches it to a database of images. “Within a decade, it will be inconceivable that you lived in a world where you couldn’t interact with the objects around you—taking a picture and getting back information about it or making a purchase—using a mobile device,” says Mobot marketing vice-president Lauren Bigelow. Yahoo! has 61% of the mobile Web market with 15 products, including search, and has developed a technique that simplifies Web pages for small mobile screens.

QUESTIONS AND ANSWERS Search en-

gines are good at matching words across websites but have struggled with nuance to answer questions in everyday language. Google today can answer basic factual queries. The next step is semantic search—looking for meaning, not just matching key words. Oren Etzioni, a University of Washington computer scientist, uses language-analysis programs to power KnowItAll, which scans documents for facts—Oswald killed J.F.K., for example. So far, KnowItAll has extracted 900 million facts—enabling it to answer questions. Nosa Omoigui, 33, a former Microsoft researcher, founded Bellevue-based Nervana, which analyzes language by linking word patterns contextually to answer questions in defined subject areas, such as medical-research literature.

USER-GENERATED One of the fastest-growing search techniques is tagging, a grassroots phenomenon whereby users label websites with descriptive tags, building a network of knowledge dubbed folksonomy—a taxonomy of knowledge organized by ordinary folk. Yahoo! was quick to spot this trend, and in March bought Flickr, a photo website organized with a communal tagging model. Bradley Horowitz, Yahoo!'s technology director, says the company wants to apply search across all its user-created content. The tagline? "Better search through people."

AUDIO Exactly when in the movie did Clark Gable say, "Frankly, my dear, I don't give a damn"? Blinkx.TV can track down that video clip in a matter of seconds.

Speech-recognition technology is improving so rapidly that the company founded by 27-year-old Suranga Chandratillake can capture the audio tracks of videos and turn them into searchable text—making any recorded spoken words immediately searchable.

Atlanta-based Nexidia has developed technology that can phonetically map human speech, and it may ultimately recognize individual voices. So far, Nexidia is selling its system to government intelligence agencies and telephone customer-service centers. Outsourcing companies with call centers can use the software to search for phrases such as "Can you repeat that?" and "I don't understand you," then listen to the entire call to troubleshoot. Much of the company's work is classified, but Nexidia says its Arabic language model is in wide use today in Iraq. Helping compensate for the shortage of Arabic linguists in the U.S. intelligence community, Nexidia's technology can "listen" to audio and alert linguists to phrases that are of concern.

SATELLITE Online maps are widely available but now, because pictures are easier to understand than maps, satellites are changing the game. Since buying Keyhole last fall, Google has launched Google Earth, which offers searchable satellite views of the planet. A9.com, Amazon's search subsidiary, sent trucks around 22 U.S. cities with digital cameras linked to laptops to photograph every street. So far it has 35 million pictures, which will be overlaid on maps. Microsoft is combining the approaches from the air—

its Virtual Earth project is flying planes over cities to take pictures. The aim is to have views from all directions so users can circle buildings onscreen—a bit like being in a video game. "This is going to a fully immersive virtual-reality experience," says Erik Jorgensen, general manager of MSN Local Search and MapPoint.

PERSONALIZED One of the hottest and most controversial new areas is designing software that will get to know individuals' interests, mostly through their search history—the clickstream. Findory, a Seattle-based news-search site launched in January 2004, provides access to news stories and blogs. As you start searching for certain types of stories, the site gradually learns about your preferences, and the home page evolves to mirror your interests. Google includes a similar feature in its most recent desktop search tool, called Sidebar, which was released last week. The technology makes some consumers uneasy: How much do you want your computer to know about you?

It may be too late to worry about that. Search has already changed our lives. After all, who you are on a Google or Yahoo! search pretty much defines who you are these days. Search is "forcing us to reconsider what it means to be a public person," says John Battelle, co-founder of *Wired* and author of *The Search*, due out in September. "Search is everything and will be everywhere." Coming soon to a chip near you. —With reporting by Amanda Bower, Laura Locke/San Francisco