

# Google X: Secret lab for 'moonshot' research

March 12 2014

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In a rare public speech, Google Inc. CEO Larry Page once suggested the tech industry needs "safe places where we can try out new things" without rules or interference. Some people thought he was describing a futuristic fantasy, perhaps a remote desert island where robots roam free.

But Page already has the next best thing in Google X, the secretive skunk works where company scientists get plenty of resources and free rein to work on things like self-driving cars, Internet-connected balloons and flying power generators.

At a time when other tech companies have trimmed research budgets or focused tightly on their core business, Google's X division is pursuing a range of seemingly outlandish ideas. And while much of it is hush-hush,

the X projects that have been announced publicly may push the envelope even further than Google's ventures into ultrafast fiber networks, industrial robotics and high-tech home thermostats.

"They're doing a lot of incredibly weird stuff," said Rob Enderle, analyst at the Enderle Group, "but they're rolling in money." Google made \$13 billion profit on \$60 billion in sales last year, mostly from online ads. "That gives them a lot of latitude in what they invest in."

While the X division is housed in two nondescript office buildings near Google's main campus, it's been compared to "Willy Wonka's Chocolate Factory" by the man who runs it on a daily basis. Eric "Astro" Teller, an entrepreneur and scientist who reports to Google co-founder Sergey Brin, once described his staff as "Peter Pans with Ph.D.s."

"They understand that their mission is to think really audaciously, to incubate magic," Teller said in a speech last year, adding that X's goal is to "have an impact on the world and then worry later about making money on it."

The message is classic Page and Brin. Google's co-founders built their powerful Internet search engine as grad students and, as they enter middle age, still espouse a passion for ideas that sound like science fiction.

Consider the [driverless cars](#), often seen near Google's headquarters or zipping up and down Highway 101. Brin and Page have said they're convinced that cutting-edge sensors and navigational software can eliminate thousands of traffic accidents now caused by human error.

Critics question how that relates to Google's core business, although some analysts believe Google might sell more ads if people spend more time checking email and surfing online in their cars.

Teller describes the mandate for X this way: Identify some really big problems that Google might be able to solve by applying technology in a radically new way.

"There's this open question of what Google is going to be, a decade or more from now," Teller said in an interview. "Google X isn't the only answer to that question, but it was built as a place to do some of the exploration to find some great new problems for Google to tackle."

As head of X, Teller is known as Google's "captain of moonshots" - a reference to Page's penchant for ambitious projects that promise big impact. Teller, a grandson of pioneering physicist Edward Teller, got the nickname "Astro" from high school friends who thought his spiky haircut looked like artificial turf.

Driverless cars were the first big project at X: Page and Brin created the division in 2010 as a lab for computer scientist Sebastian Thrun after meeting him at a Pentagon-sponsored robotic vehicle contest. (The unit's official name is (x), with brackets, because it was originally a placeholder to be filled in later.) Thrun left in 2012 for an online teaching startup, but Page and Brin decided X should explore other ideas that caught their interest, like wearable computers.

They recruited an electrical engineering professor, Babak Parviz, who had published research on using lenses to display images. Soon they brought on more engineers, software developers and stylish designers to refine what came to be called Glass.

Despite some external skepticism, Juniper Research estimates sales of "wearables" could reach \$19 billion in 2019. Teller said the project's biggest challenge is grappling with "what it feels like to be human and what it feels like to interact with technology."

Other X projects seem less philosophical, but no less ambitious. There's the airborne Makani wind turbine - actually, a pair of turbines mounted on a 28-foot wing designed to fly in circles at 1,300 feet, so it can generate electricity and send it by cable to the ground.

Another aerial endeavor is Project Loon, which is exploring whether a network of low-cost, high-altitude balloons carrying radio gear can deliver Internet service to developing countries.

"It's exciting. We have the license to go and try stuff that really might not work, but if it does, it can change the world in big ways," Richard DeVaul, the project's chief technical architect, told the San Jose Mercury News last year.

Google announced last month that another X team has produced a prototype contact lens embedded with a tiny chip to monitor glucose in human tears, so diabetics don't have to prick their fingers several times a day.

The division is working on more "moonshot" ideas but they're not ready to be disclosed, Teller said. He declined to reveal X's budget or the size of its staff. Google spent \$8 billion, 13.3 percent of its revenue, on research and development companywide last year.

Teller said X projects are evaluated on their potential for big impact, rather than immediate profit. But there may be other dividends, said Paul Saffo, a veteran tech forecaster and Silicon Valley observer.

Google's image gets a boost when people see the company working on high-tech solutions to human problems, Saffo said. And projects like self-driving cars can provide new data about users and their surroundings, which may benefit Google's information-driven business.

Teller said two other projects have "graduated" from X after producing new technology for indoor mapping and computerized image-recognition, which were handed off to Google's maps and search divisions.

The downside? Google risks losing focus by pushing in too many directions, warned Pivotal Research analyst Brian Wieser. With most of the X projects, "I've not heard any compelling argument as to what these have in common."

Most investors aren't worrying, as long as Google keeps churning out profit. Analyst Colin Gillis of BGC Partners said Google just needs one or two "hits" for its "moonshot" strategy to pay off. And as the Internet industry evolves, he said, "They're going to need new sources of revenue."

X hasn't produced a clear financial hit yet, Gillis said. But that hasn't fazed Page and Brin. "They're going to do these projects," Gillis said. "That's one thing they have made pretty clear."

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