

THE WALL STREET JOURNAL.

This copy is for your personal, non-commercial use only. To order presentation-ready copies for distribution to your colleagues, clients or customers visit <http://www.djreprints.com>.

<http://www.wsj.com/articles/beyond-the-internet-innovation-struggles-1439401576>

ECONOMY | CAPITAL ACCOUNT WSJ PRO

Beyond the Internet, Innovation Struggles

Alphabet (née Google) shows the limits of technological advances in moving the needle on productivity



Google's high-profile project to create self-driving cars is the sort of money-losing venture the company is looking to ring-fence from its profitable tech core. The move illustrates both the potential and limits of innovation. *PHOTO: TONY AVELAR/ASSOCIATED PRESS*

By **GREG IP**

Aug. 12, 2015 1:46 p.m. ET

Google's decision to separate its profitable businesses from its money-losing "moonshot" ventures has offered a window into why American productivity is struggling despite so much exciting technological innovation.

The things at which Google and its peers excel, from Internet search to mobile software, are changing how we work, play and communicate, yet have had little discernible macroeconomic impact. Productivity—the goods and services a worker produces in an

hour—grew just 0.4% per year over the past five years, one of the slowest stretches in the period since World War II. This is troubling, because over the long run productivity determines our standard of living.

What explains this paradox? Techno-pessimists think the benefits of the Internet and social media are overblown; optimists think the productivity stats don't capture them.

But there's an alternative explanation. Transformative innovation really is happening on the Internet. It's just not happening elsewhere.

Google has poured money into exotic ventures involving contact lenses, drones and driverless cars, but none has yet yielded a commercially viable business. Its reorganization was aimed at impatient shareholders who want to identify which of Google's businesses really do generate cash.

In a new study, Michael Mandel of the Progressive Policy Institute notes that previous innovation waves straddled numerous disciplines: information processing, transportation, medicine, energy and materials. There's a reason why, in the 1967 film "The Graduate," Dustin Hoffman's character is told "there's a great future in plastics." The development of thermoplastics in the 1930s and 1940s made possible products that are now ubiquitous in business and household life.

Where are the comparable advances in materials today? The Nobel prize was awarded in 1987 for the discovery of high-temperature superconductors—material that can carry electric current without resistance at temperatures above extreme cold. But as Mr. Mandel notes, few commercial superconductor applications are on the market. Nanotechnology—building materials out of microscopic particles—has found its way into tennis balls and odor-resistant fabrics but hardly measures up to steel or plastic in its breadth of uses.

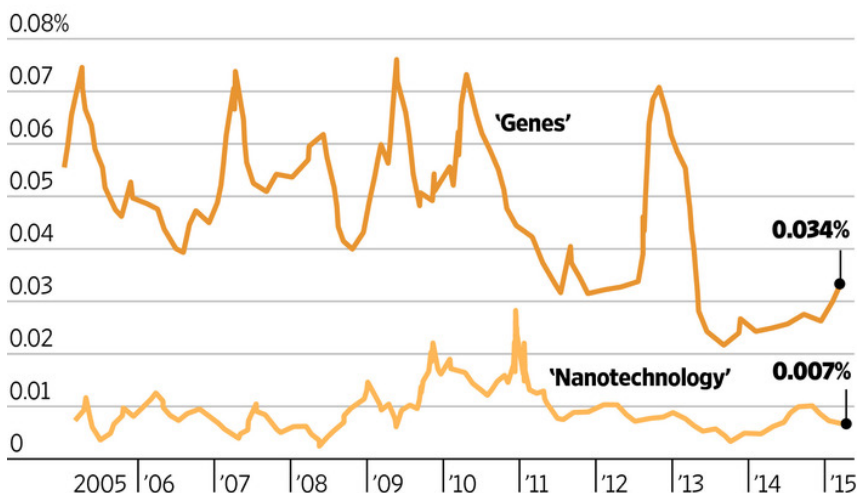
The staggering sums invested in biosciences haven't yielded breakthroughs comparable to antibiotics in the 1930s and 1940s. The human genome was sequenced more than a decade ago. Yet as Mr. Mandel notes, there is still no approved gene therapy for sale.

Quantifying innovation is difficult: Government statistics don't adequately measure activities that only recently came into existence. Mr. Mandel circumvents this problem by surmising that innovation leaves its mark in the sorts of skills employers demand. For example, the shale oil and gas revolution is apparent in the soaring numbers of mining, geological and petroleum engineers, whereas the ranks of biological, medical, chemical, and materials scientists have slipped since 2006-07.

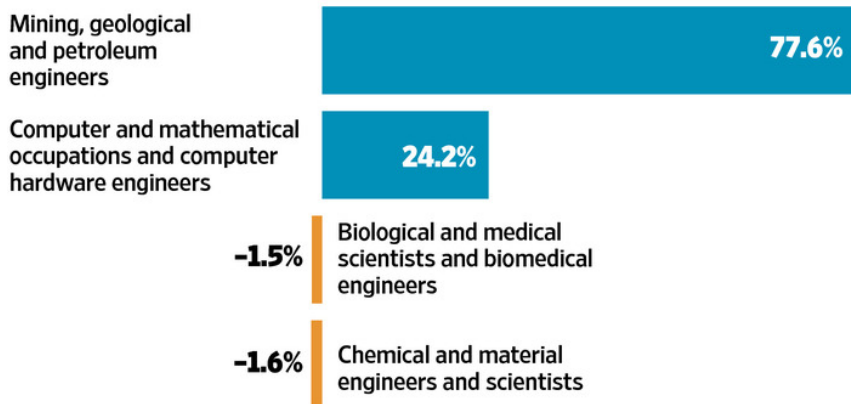
Where the Jobs Aren't

Judging by job listings, prospects for life and materials sciences are much less promising than high tech.

Percentage of job listings on the site indeed.com that mention 'genes' or 'nanotechnology' in their description



Change in employment for select occupations, 2006-07 to 2013-14



Source: Michael Mandel, Progressive Policy Institute

THE WALL STREET JOURNAL.

Screening job postings on Indeed, a job website, Mr. Mandel finds that the proportion mentioning “Android” (Google’s mobile operating system), “fracking” and “robotics” has risen notably in the past four to six years. But the proportion mentioning “composite materials,” “biologist,” “gene” or “nanotechnology” has trended down. His conclusion: Today’s economy is “unevenly innovative.”

The buzz over how smartphones have changed so many things obscures how many more they haven’t. Techno-optimists argue that ride-sharing app Uber is improving car rides in ways not captured by productivity data.

But economists at J.P. Morgan note that Americans spend about 10 times as much on air

travel as on taxi and livery cabs, and productivity statistics don’t capture ways in which the quality of air travel has deteriorated: Economy class seats are about 2 inches narrower than in the 1990s, rows are 2 to 5 inches closer together, planes are fuller and delays more frequent. Jetliners may carry passengers more safely and cheaply but don’t reach their destination any faster. Boeing’s state-of-the-art 787 Dreamliner is no faster than the 707, which entered service in 1958.

There’s no simple explanation for why innovative breakthroughs outside technology have been so elusive. One reason may be that industry must devote more of its innovative efforts to ensuring its products are safer and less environmentally harmful,

which is good for society but doesn't raise productivity. Mr. Mandel notes that in 2000, the Food and Drug Administration had 12 employees for every 1,000 in the industries it oversees; now, it has 18. He thinks the FDA could spur innovation by considering how much more efficiently a new therapy can be administered, not simply its efficacy relative to one already on the market.

Another explanation is that as knowledge accumulates, truly transformative discoveries become harder. A 2012 article in Nature Reviews Drug Discovery found that the number of new drugs approved per \$1 billion spent on research and development had halved roughly every nine years since 1950.

Drug approvals, in particular for cancer, have risen since 2012, but Jack Scannell, one of the Nature article's authors, says a fundamental problem remains: As the stock of existing, effective drugs expands, research and development gravitates toward rarer or more difficult diseases. Successful new therapies tend to benefit relatively few people.

Of course, innovation is unpredictable. The Internet boom was a surprise, and similar breakthroughs in gene therapy, nanotechnology, drones and driverless cars may be around the corner. Alphabet, the renamed Google, could yet make a mint on one of its "moonshot" ventures.

In the meantime, don't expect the grim trend on productivity to change.

Write to Greg Ip at greg.ip@wsj.com

Copyright 2014 Dow Jones & Company, Inc. All Rights Reserved

This copy is for your personal, non-commercial use only. Distribution and use of this material are governed by our Subscriber Agreement and by copyright law. For non-personal use or to order multiple copies, please contact Dow Jones Reprints at 1-800-843-0008 or visit www.djreprints.com.