Technology Changes

NAS Innovation Policy Forum
December 11, 2015

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CENTER FOR
Law, Science & Innovation

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Innovating law, policy and ethics for science & technology

Change

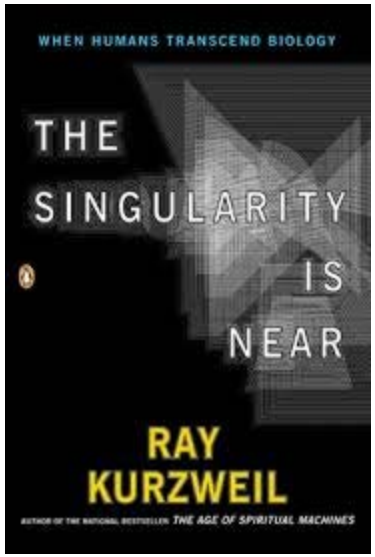
"[P]oliticians – and judges for that matter – should be wary of the assumption that the future will be little more than an extension of things as they are."

– from Jeffery Rosen, Roberts v. The Future, *NY Times*, Aug. 28, 2005

Chief Justice Roberts

Ray Kurzweil: The Law of Accelerating Returns

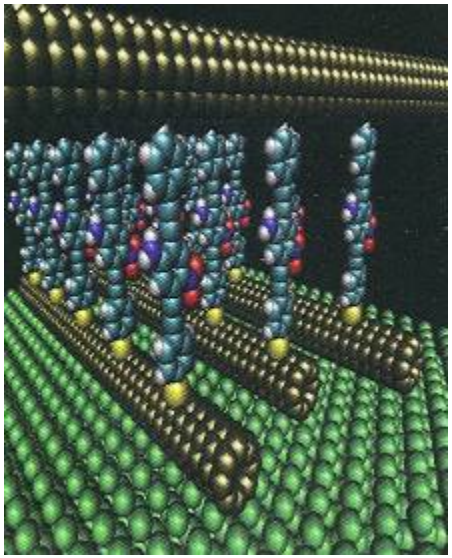
"An analysis of the history of technology shows that technological change is exponential, contrary to the common-sense 'intuitive linear' view. So we won't experience 100 years of progress in the 21st century – it will be more like 20,000 years of progress (at today's rate)."



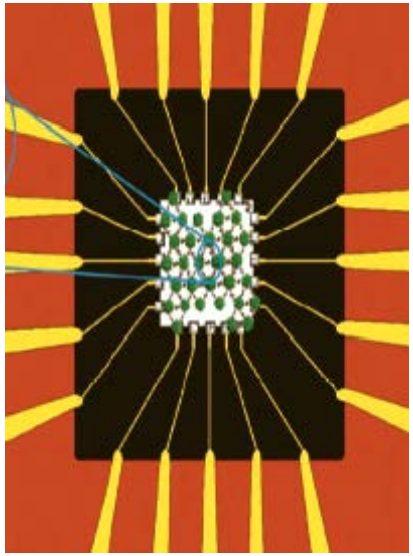
Technology Revolutions of the 20th Century

Early 21st Century: Multiple Converging Technology Revolutions

Biotechnology and Genetics



Nanotechnology

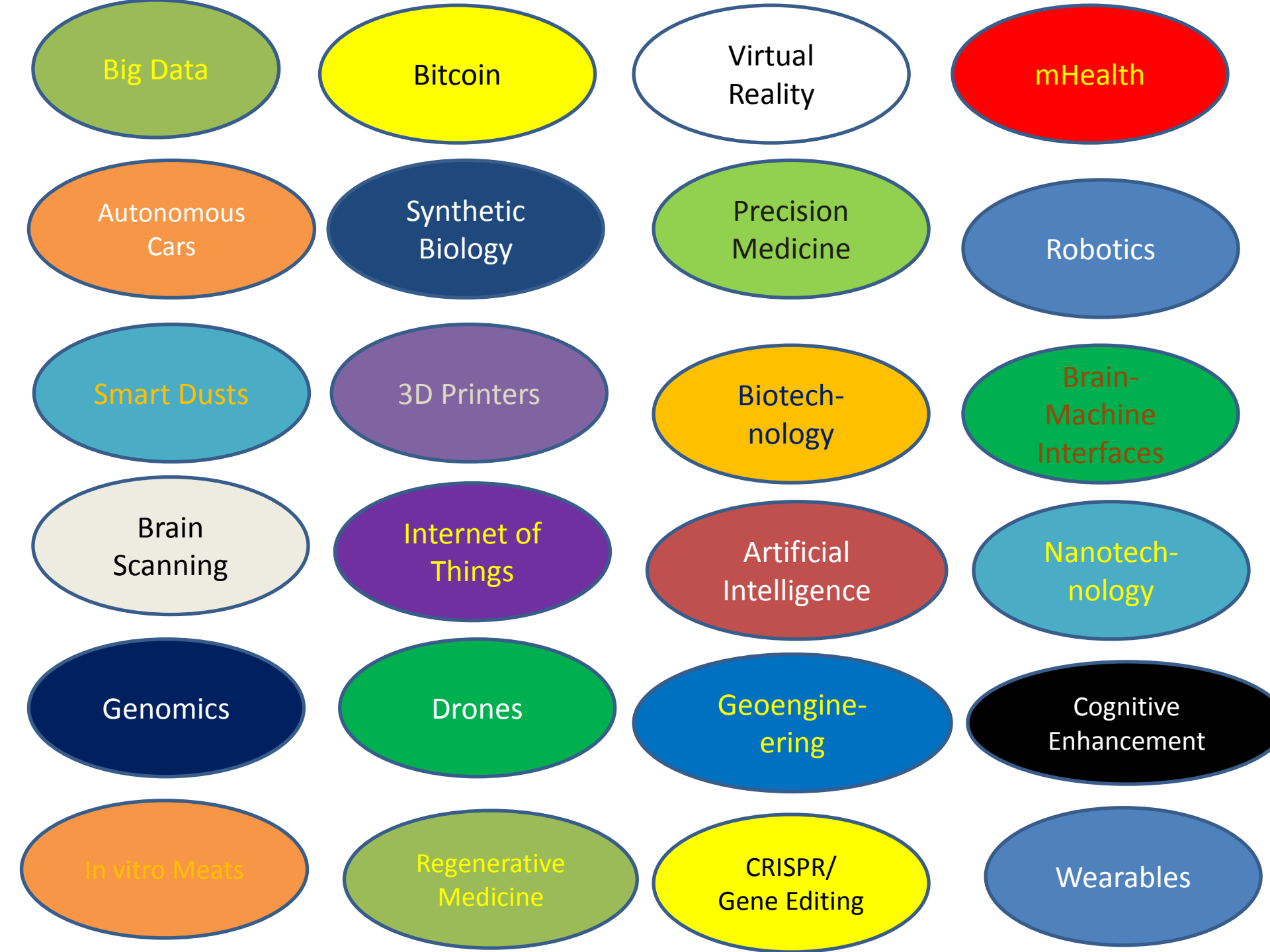


Computing and Communication Technologies

Neurobiology and Cognitive Sciences

- **technologies with radical, pervasive and enduring impact**

Source: adapted from George Poste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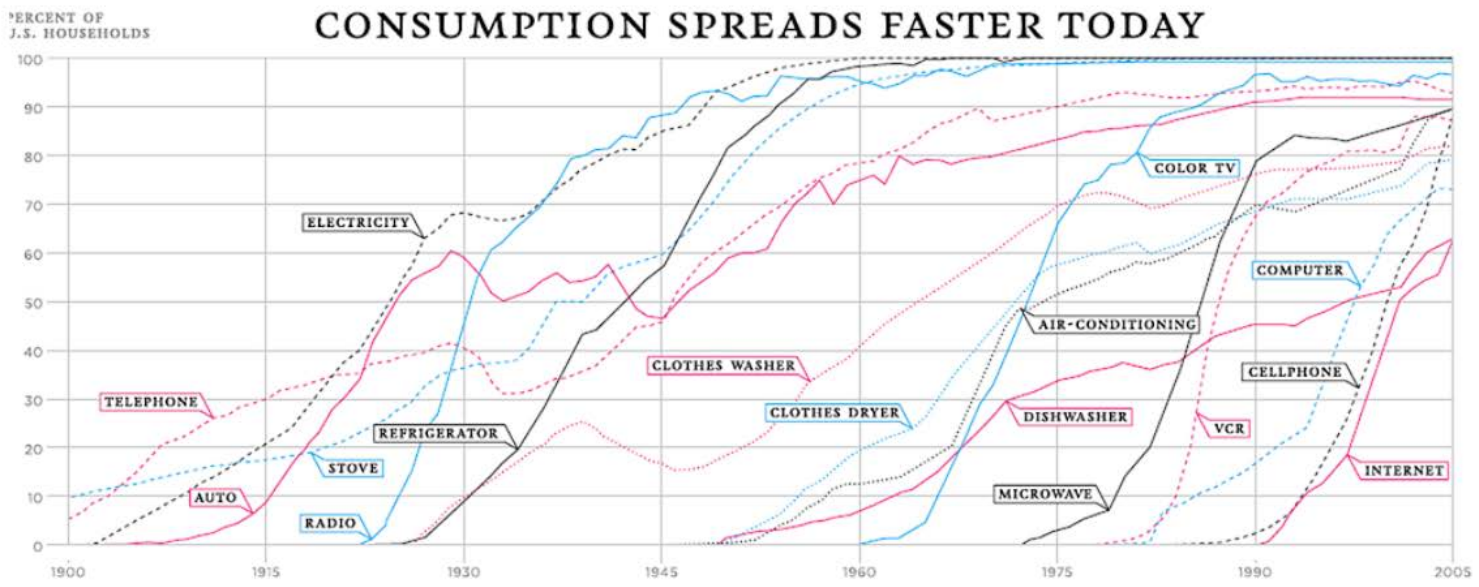
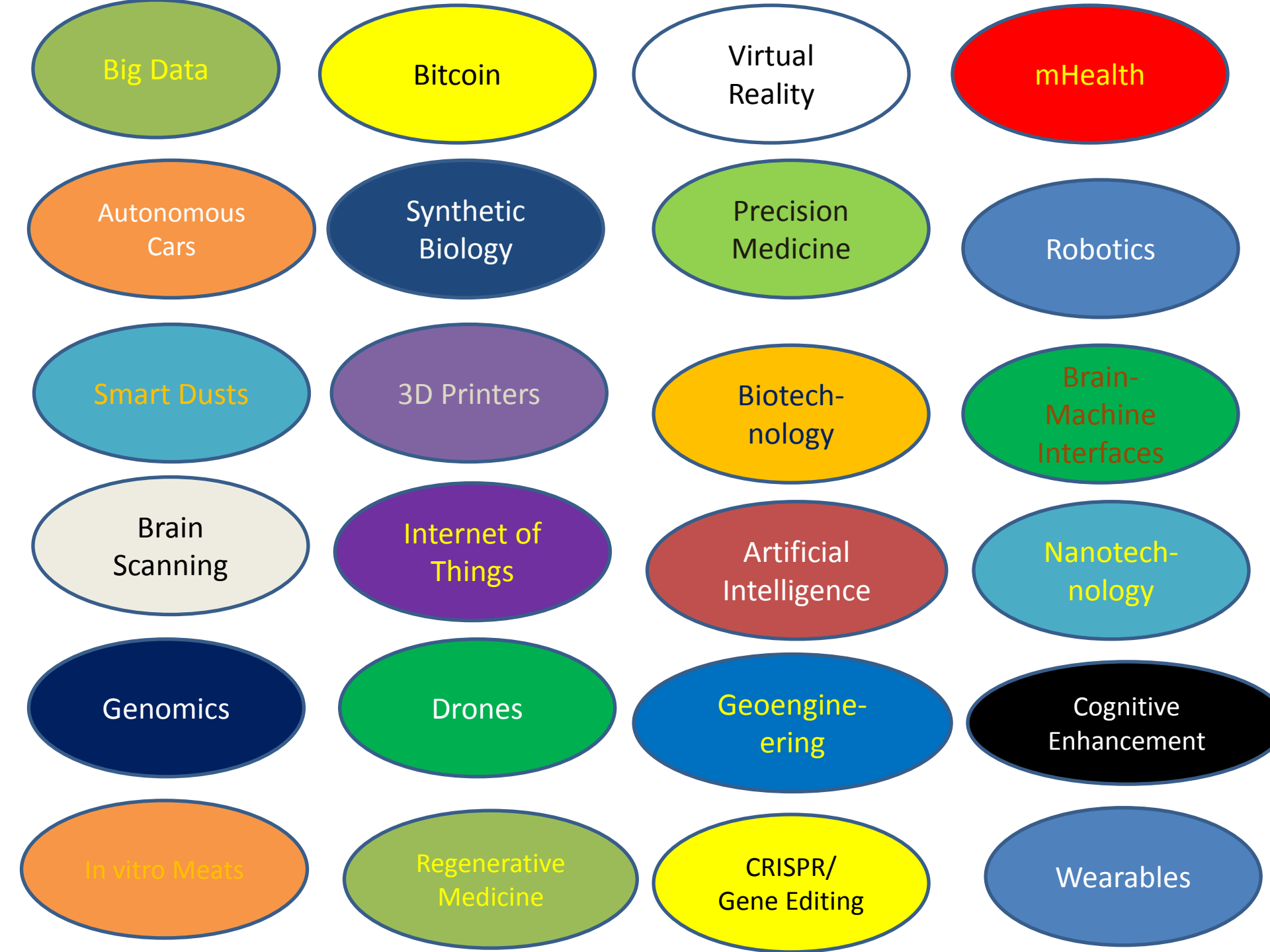
Regenerative Medicine
CRISPR/ Gene Editing
Wearables

Technology Adoption Rates Acceleration



Source: *Charlie Catlett, Argonne Nat'l Laboratory*

life.augmented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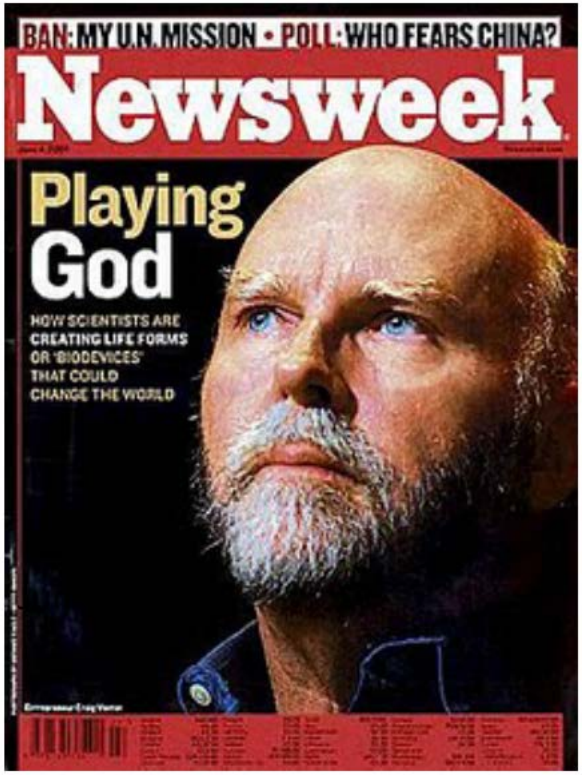

(19) **United States**
(12) **Patent Application Publication**
Glass et al.

(54) **MINIMAL BACTERIAL GENOME**

(75) Inventors: **John I. Glass**, Germantown, MD (US); **Hamilton O. Smith**, Reisterstown, MD (US); **Clyde A. Hutchison III**, Rockville, MD (US); **Nina Y. Alperovich**, Germantown, MD (US); **Nacyra Assad-Garcia**, Rockville, MD (US)

Correspondence Address:
VENABLE LLP
P.O. BOX 34385
WASHINGTON, DC 20043-9998 (US)

(73) Assignee: **J. Craig Venter Institute, Inc.**, Rockville, MD

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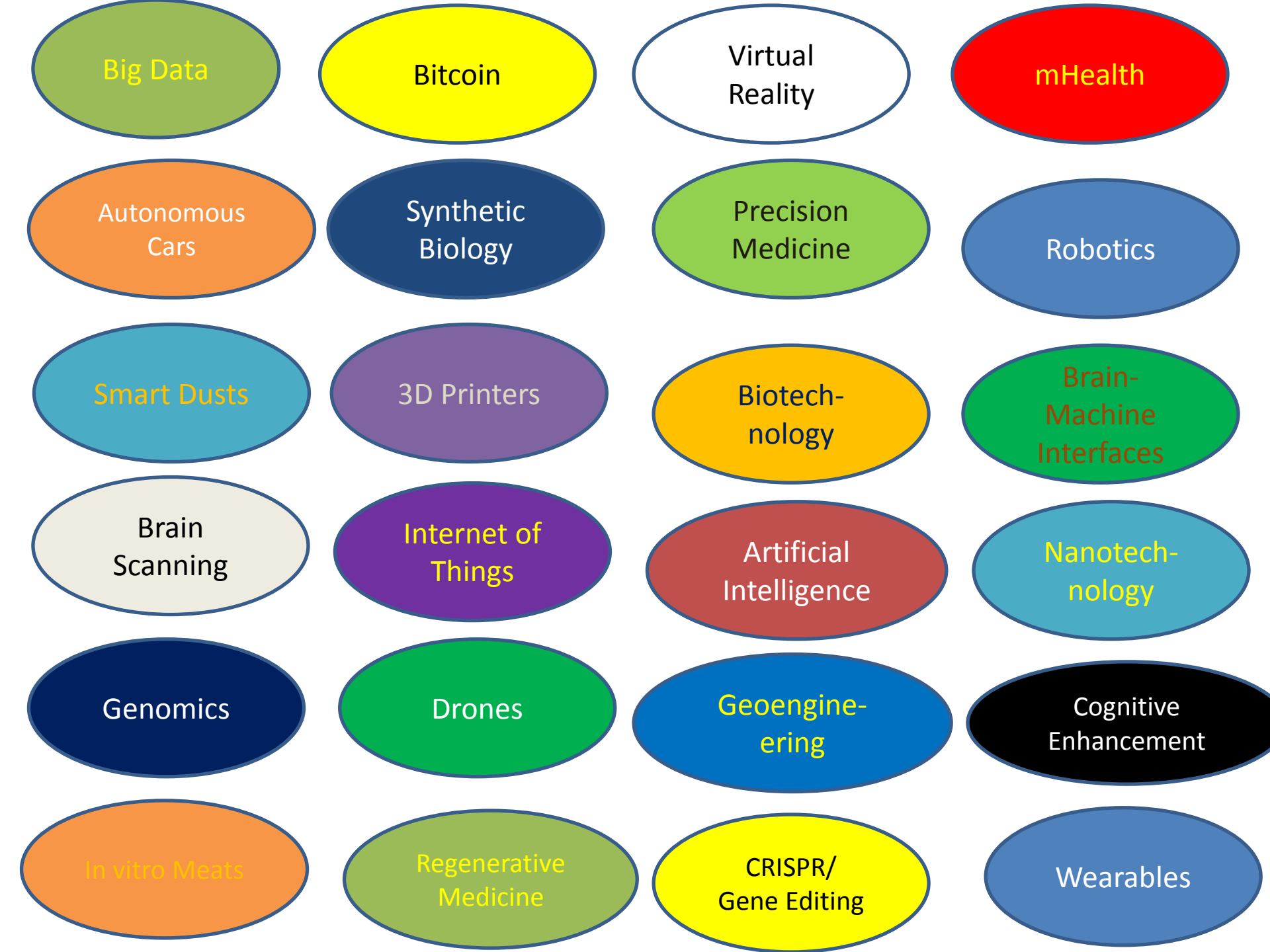
SYNTHETIC BIOLOGY

Attempt to Patent Artificial Organism Draws a Protest

An activist group's concern about maverick genome sequencer J. Craig Venter's intention to patent an entirely synthetic free-living organism has thrown a spotlight on the emerging intellectual-property landscape in this hot new field. The protesters claim that Venter

In a press release, the ETC Group, a technology watchdog in Ottawa, Canada, called Venter's "monopoly claims … the start of a high-stakes commercial race to synthesize and privatize synthetic life forms." ETC calls for the U.S. and international patent offices to

he says; his team is working on sever
species. "We haven't given any thought to" t
licensing conditions, but in any case, the
would not impede work in academic labs, sa
Venter, adding, "This is a problem that v
hope will have hundreds of solutions."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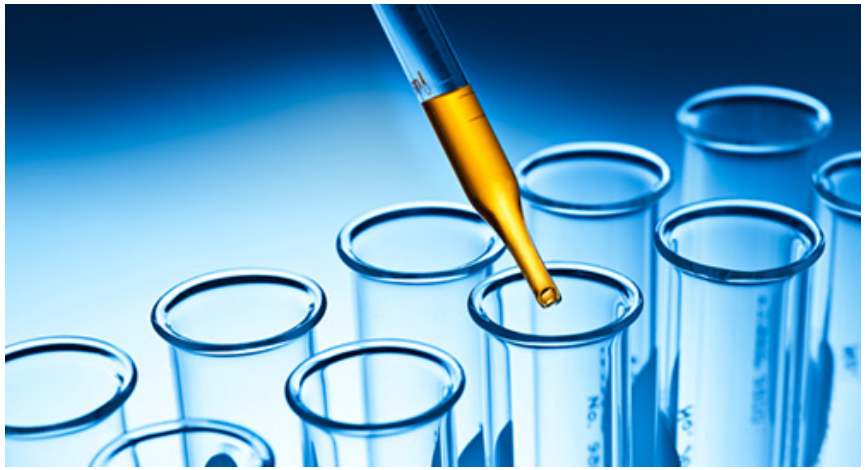
Syllabus

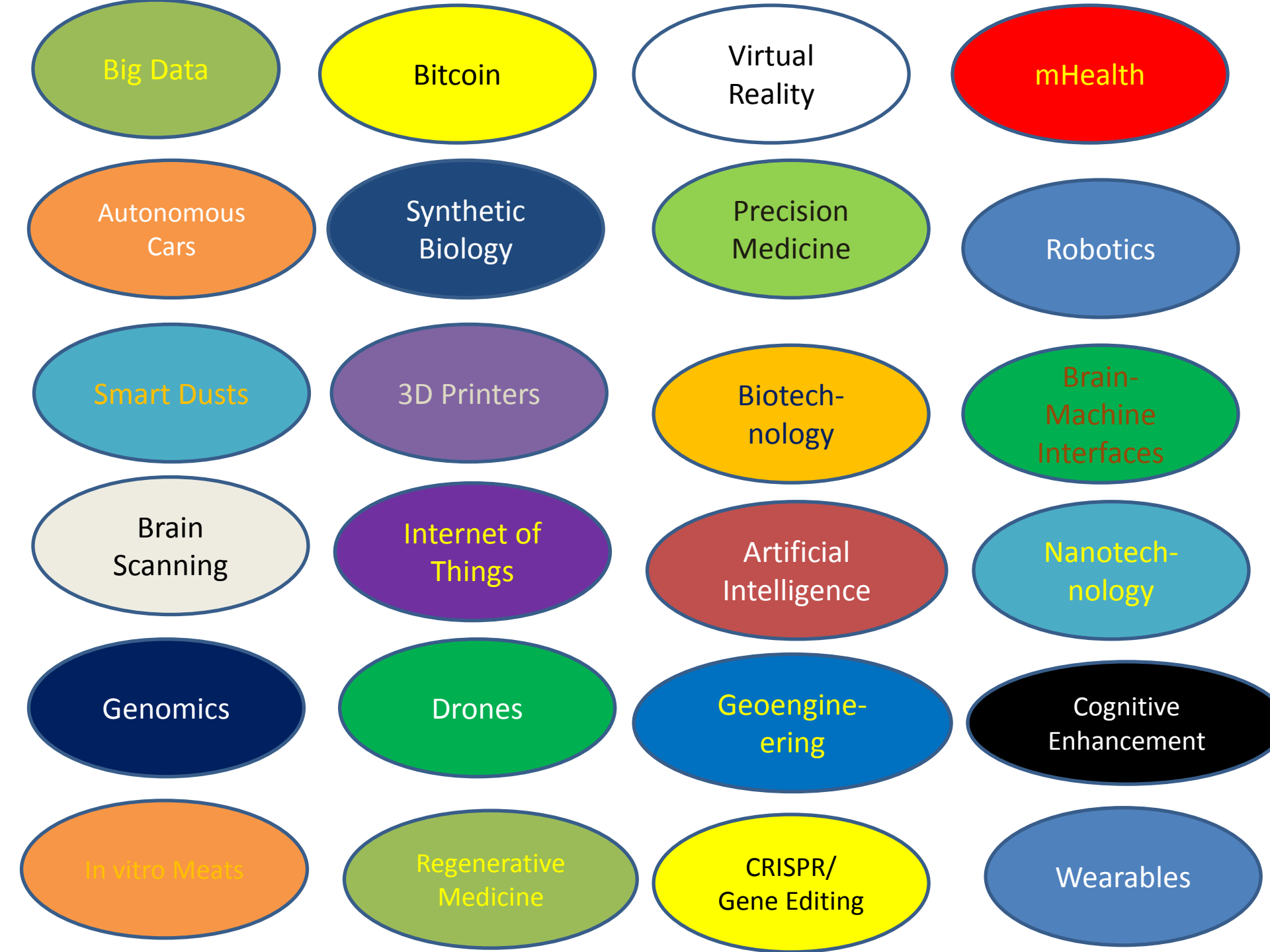
NOTE: Where it is feasible, a syllabus (headnote) will be released, as is being done in connection with this case, at the time the opinion is issued. The syllabus constitutes no part of the opinion of the Court but has been prepared by the Reporter of Decisions for the convenience of the reader. See *United States* v. *Detroit Timber & Lumber Co.*, 200 U. S. 321, 337.

SUPREME COURT OF THE UNITED STATES

Syllabus

MAYO COLLABORATIVE SERVICES, DBA MAYO MEDICAL LABORATORIES, ET AL. *v.* PROMETHEUS LABORATORIES, INC.

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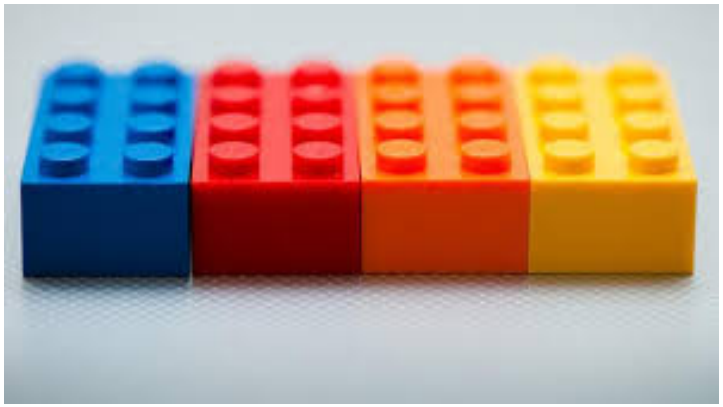
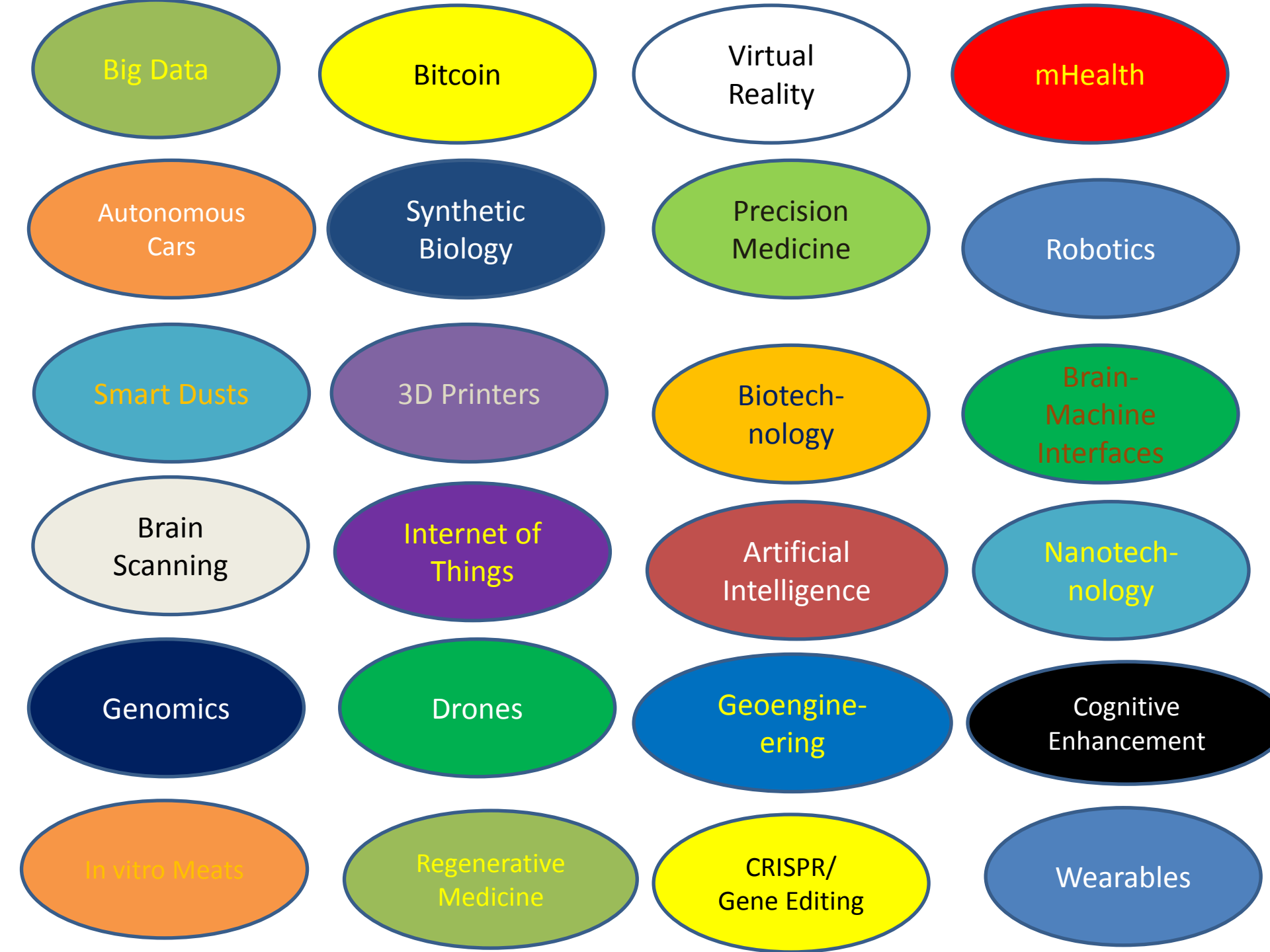
IP
PIRACY
&
3D Printing


The Economist
Europe loses the mobile-phone war
Africa's new wealth
Japan's tea party
How to switch off the internet
The shoe-thrower's index
FEBRUARY 12TH-18TH 2011
Economist.com
Print me a Stradivarius
The manufacturing technology that will change the world
This violin was made using an EOS laser-sintering 3D printer (and it plays beautifully)

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SUPREME COURT OF THE UNITED STATES

Syllabus

BOWMAN *v.* MONSANTO CO. ET AL.

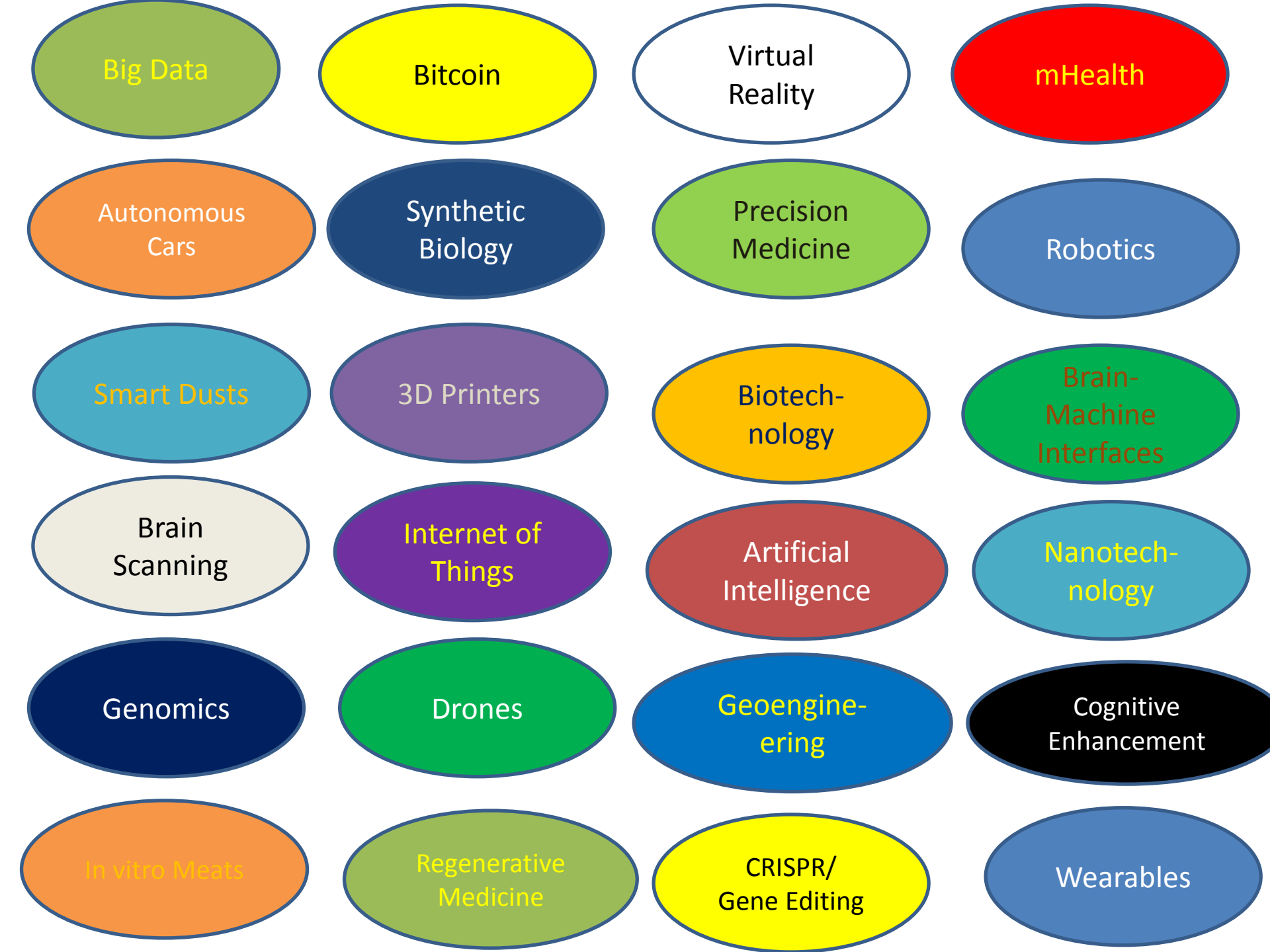
CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

No. 11–796. Argued February 19, 2013—Decided May 13, 2013

MIT Technology Review

As Patents Expire, Farmers Plant Generic GMOs

August 3, 2015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COMMENTARY

Trends in nanotechnology patents

HSINCHUN CHEN[1], MIHAIL C. ROCO[2], XIN LI[1] AND YILING LIN[1]

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e-mail: hchen@eller.arizona.edu; mroco@nsf.gov; xlli@eller.arizona.edu; yilin@eller.arizona.edu

An analysis of 30 years of data on patent publications from the US Patent and Trademark Office, the European Patent Office and the Japan Patent Office confirms the dominance of companies and selected academic institutions from the US, Europe and Japan in the commercialization of nanotechnology.

The papers that reported the invention of the scanning tunnelling microscope in 1981 and the atomic force microscope in 1986 have been credited in part with 'opening the doors to the nanoworld'[1], and the fact that these papers have been cited thousands of times by other researchers is a testament to the impact that these two instruments have had in the field of nanoscale science and technology. There were also significant advances in other areas such as molecular self-assembly and nanomechanics around the same time, and these fragmented areas were brought together by the increased availability of techniques to control and restructure matter at the nanoscale at the end of 1990s. Today, more than 60 countries have national programmes in nanotechnology[2] and hundreds of nanotechnology-based products are commercially available[3]. In addition to scientific papers and commercial products, however, there is another way to gauge the rate of progress in nanotechnology over the past few decades — patents.

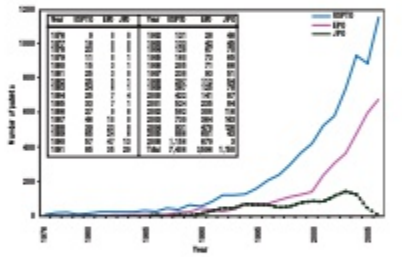


Figure 1 Number of nanotechnology patents published by the USPTO, EPO and JPO according to publication date. The drop in the number of USPTO patents in 2002 is due to the USPTO enforcing a stricter definition of nanotechnology. The decline in the number of JPO patents for 2005 and 2006 is due to the delay between the publication and granting of patents at the JPO.

Various authors have made significant efforts to identify[4] and analyse[5] nanotechnology patents, but this can be difficult because applicants tend to file patents with their national patent office rather than with foreign patent offices[6], and because different patent offices have different policies and examination procedures[7,8]. To gain a global perspective on trends in nanotechnology patents we have analysed those granted by the United States Patent and Trademark Office (USPTO), the European Patent Office (EPO) and the Japan Patent Office (JPO). These three patent offices cover most of the world's patents in nanotechnology[9–11].

Data for this study were collected by searching for a list of nanotechnology keywords in the titles and abstracts of patents published by the USPTO, EPO and JPO between 1976 and 2006. These keywords, which were provided by domain experts[9,10], included atomic force microscope (and variations thereon), molecular electronics, nano*, quantum dot, and self assembly. We removed some noise from the data, and included only patents that had been granted in our analysis. (See Table S1 in Supplementary Information for a full list of keywords and details of the analysis).

PATENTS BY COUNTRY

We found that the USPTO had granted 7,406 nanotechnology patents during this period, which was about two times the number granted by the EPO

Innovation
AMERICA'S JOURNAL OF TECHNOLOGY COMMERCIALIZATION
Published on *Innovation America* (http://www.innovation-america.org)

Nanotech May Face Patent Problems

CLASS 977, NANOTECHNOLOGY

SECTION I - CLASS DEFINITION

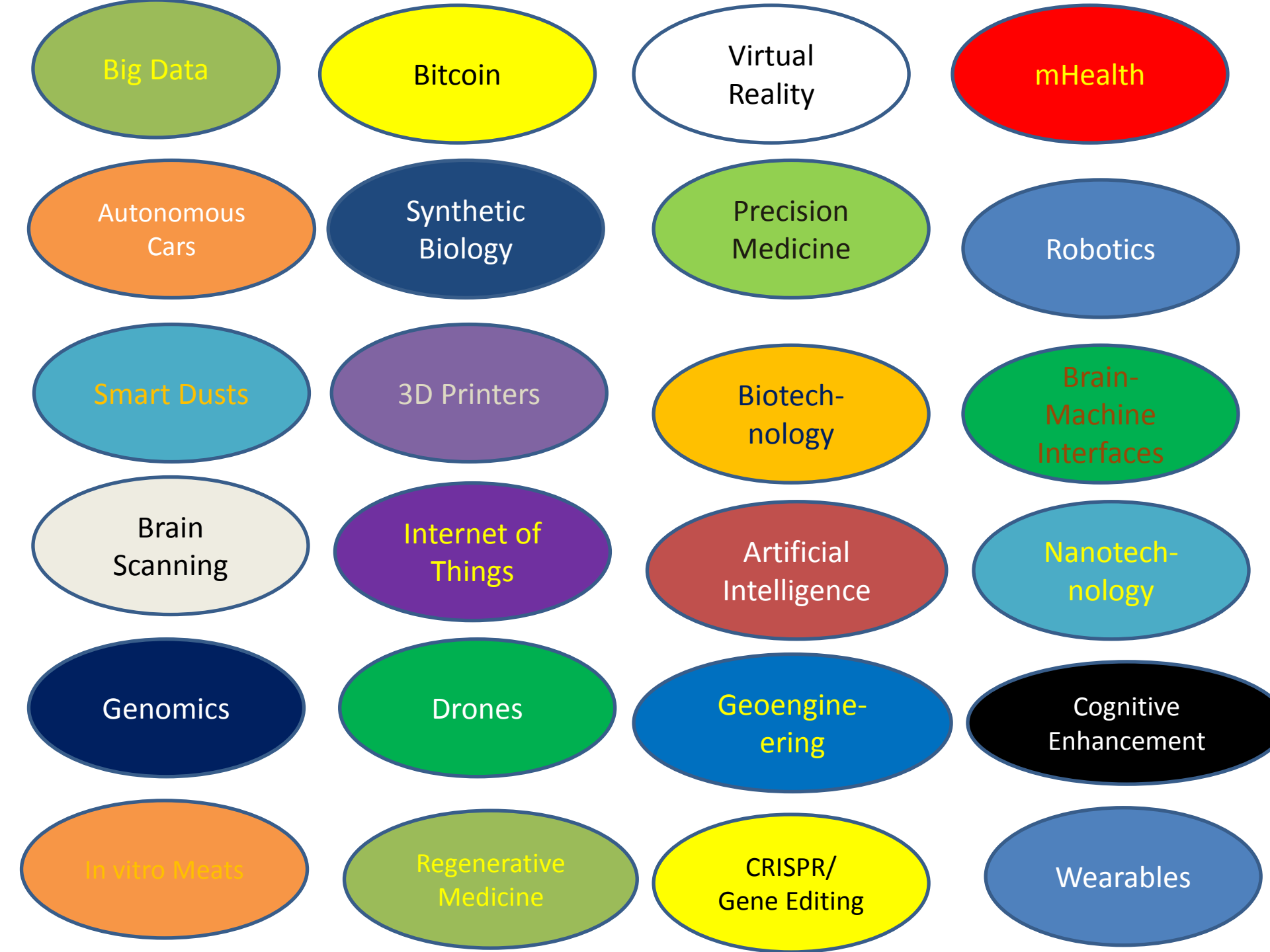
CROSS-REFERENCE ART COLLECTIONS

This Nanotechnology art collection provides for disclosures related to:

i. Nanostructure and chemical compositions of nanostructure;

ii. Device that include at least one nanostructure; which impart special properties or functions to the nanostructural assemblage related to the altering of basic chemical or physical properties attributed to the nanoscale.

(3) Note. Special properties and functionalities should be interpreted broadly, and are defined as those properties and functionalities that are significant, distinctive, nonnominal, noteworthy, or unique as a result of the nanoscale dimension. In general, differences in properties and functionalities that constitute mere differences of scale are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MIT Technology Review

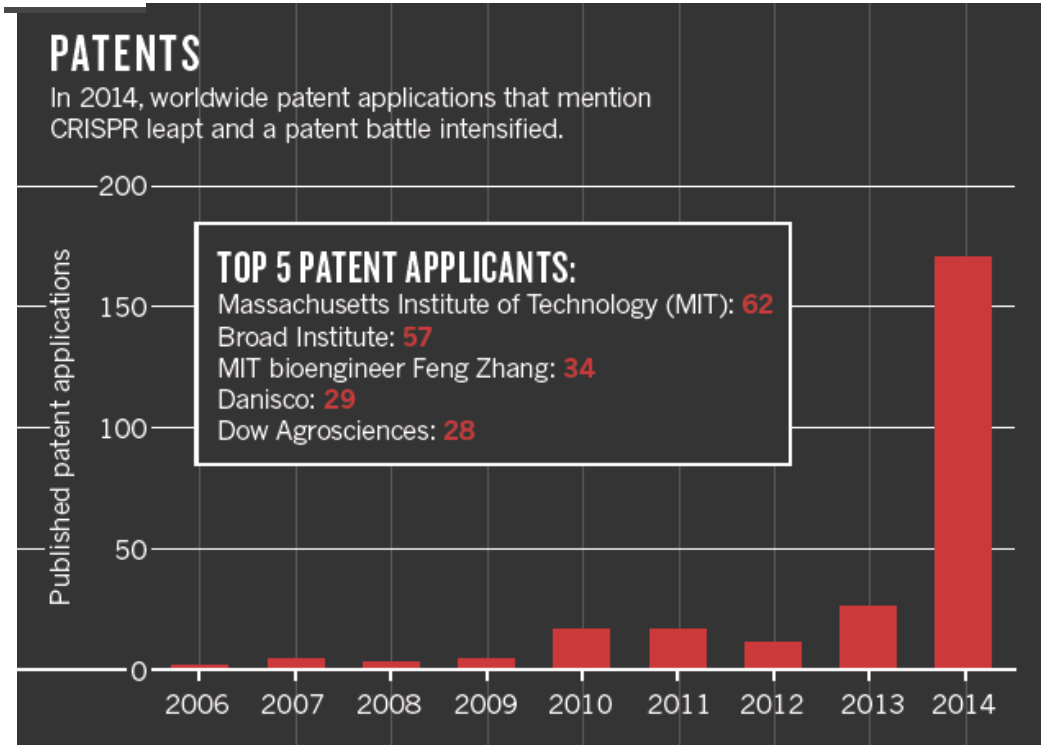
NEWS & ANALYSIS · FEATURES VIEWS MULTIMEDIA DISCUSSIONS TOPICS POPULAR: WORKING QUANTUM COMPUTER?

BIOMEDICINE NEWS 1 COMMENT

CRISPR Patent Fight Now a Winner-Take-All Match

Lab notebooks could determine who was first to invent a revolutionary gene-editing technology.

By Antonio Regalado on April 15, 2015



Too Fast for Regulation

- "If you think that any existing regulatory framework can keep pace with this rate of change, think again."
  - David Rajeski, Wilson Center

Congress: Gridlock

Executive Agencies: Ossification

Today's Unique Context

- We are in a period of unprecedented rapid technological change that will radically and repeatedly change the way we live our lives, interact with others, conduct business, and practice law
- Over the next two decades, new technologies, industries, companies, products, lawsuits, and practice areas will rapidly rise and fall
- No previous generation of policymakers, judges, lawyers, and scientists have faced such a tumultuous and rapidly changing near future
- **Implications for how we plan and conduct our professional responsibilities?**

IP Implications of Rapidly Emerging Technologies

- New technologies often raise unique IP issues
- Fundamental technology patents co-existence with commercialization
- Potential for patent thickets
- Confusion/controversy over overlapping inventions and refinements
- Questions about competency of patent offices to handle new technologies
- Most emerging technologies highly international; international IP issues more prominent

“If facts are changing, law cannot be static."

-Felix Frankfurter, The Zeitgeist and the Judiciary, Address at the Harvard Law Review Twenty-fifth Anniversary Dinner (Mar. 30, 1912).