Emerging Issues

Charlie Kingdollar

APRIL 2016

Follow Charlie on:

ckingdollar.com

Charlie Kingdollar

Gen Re

Emerging Issues

Cyber Attacks

Nanotechnology

Concussions

Automation / Robotics

3D Printing

Self-Driving Vehicles and Assisted Driving Innovations

Internet Communications–Personal Injury Claims

Hydraulic Fracturing

Drone Use

Food-borne Illness

BPA / BPS

Marijuana

SO MANY ISSUES, SO LITTLE TIME

Internet of Things

Food Flavorings and Coloring Litigation

GMO's

The Share Economy

Hazardous Imported Products

E-Cigarettes

Artificial Turf

C8 / PFOA

Endocrine Disrupters

Counterfeit / Imported Medicines

Legal Highs

Epigenetics

Judicial Reformation of Policy Defenses

The Future of Auto

www.google.com

The Future of Auto

Driverless Cars / Autonomous Vehicles

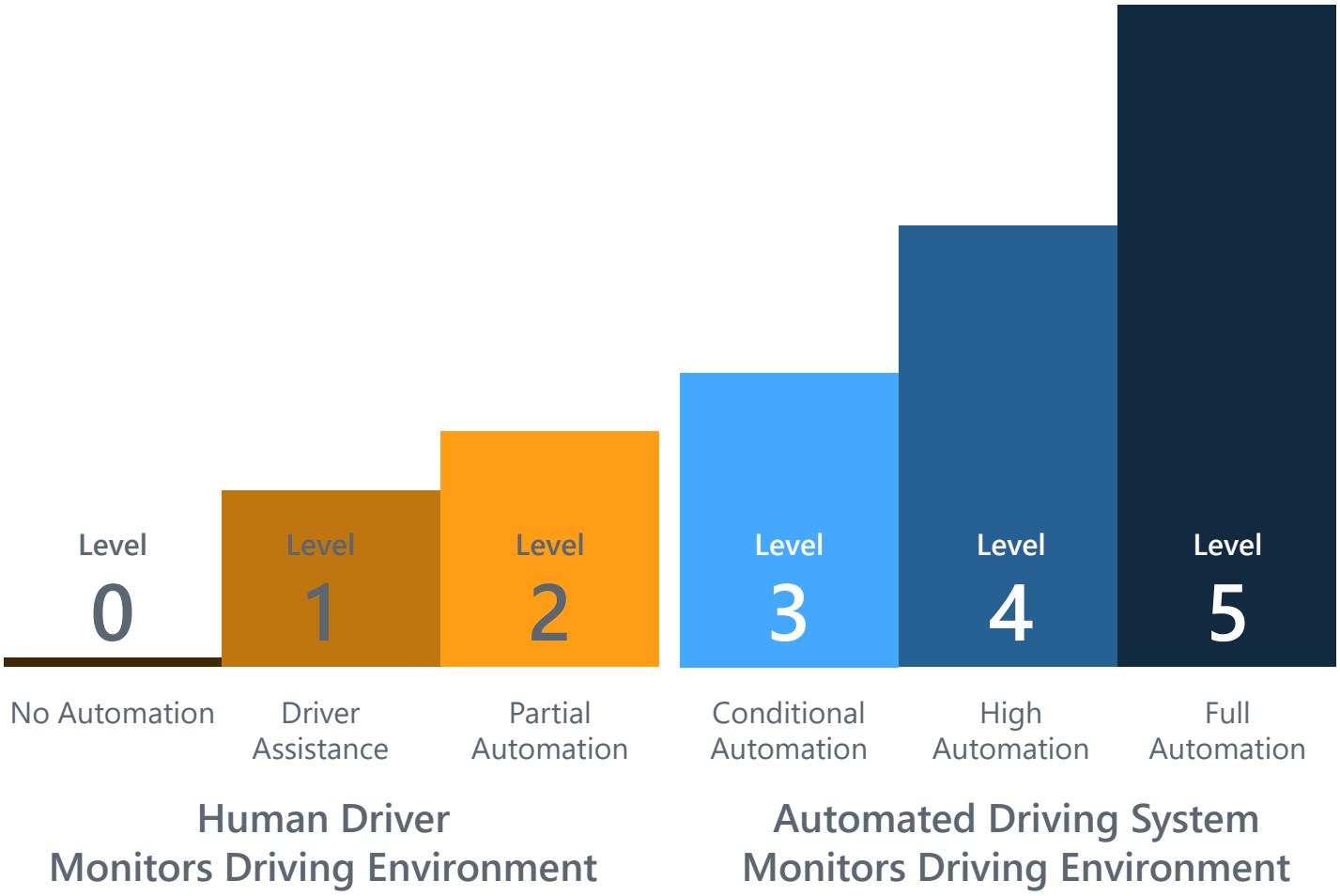
The Future of Auto

Autonomous Commercial Vehicles

Source: coolthings.com; digitaltrends.com; driverlessuber.com; techniasia.com

The Future of Auto

Automated Vehicles



Source: SAE International

The Future of Auto

Automated Vehicles

- **SAE Level 0**, the human driver does everything;
- **SAE Level 1**, an automated system on the vehicle can sometimes assist the human driver conduct some parts of the driving task;
- **SAE Level 2**, an automated system on the vehicle can actually conduct some parts of the driving task, while the human continues to monitor the driving environment and performs the rest of the driving task;
- **SAE Level 3**, an automated system can both actually conduct some parts of the driving task and monitor the driving environment in some instances, but the human driver must be ready to take back control when the automated system requests;
- **SAE Level 4**, an automated system can conduct the driving task and monitor the driving environment, and the human need not take back control, but the automated system can operate only in certain environments and under certain conditions; and
- **SAE Level 5**, the automated system can perform all driving tasks, under all conditions that a human driver could perform them.

The Future of Auto

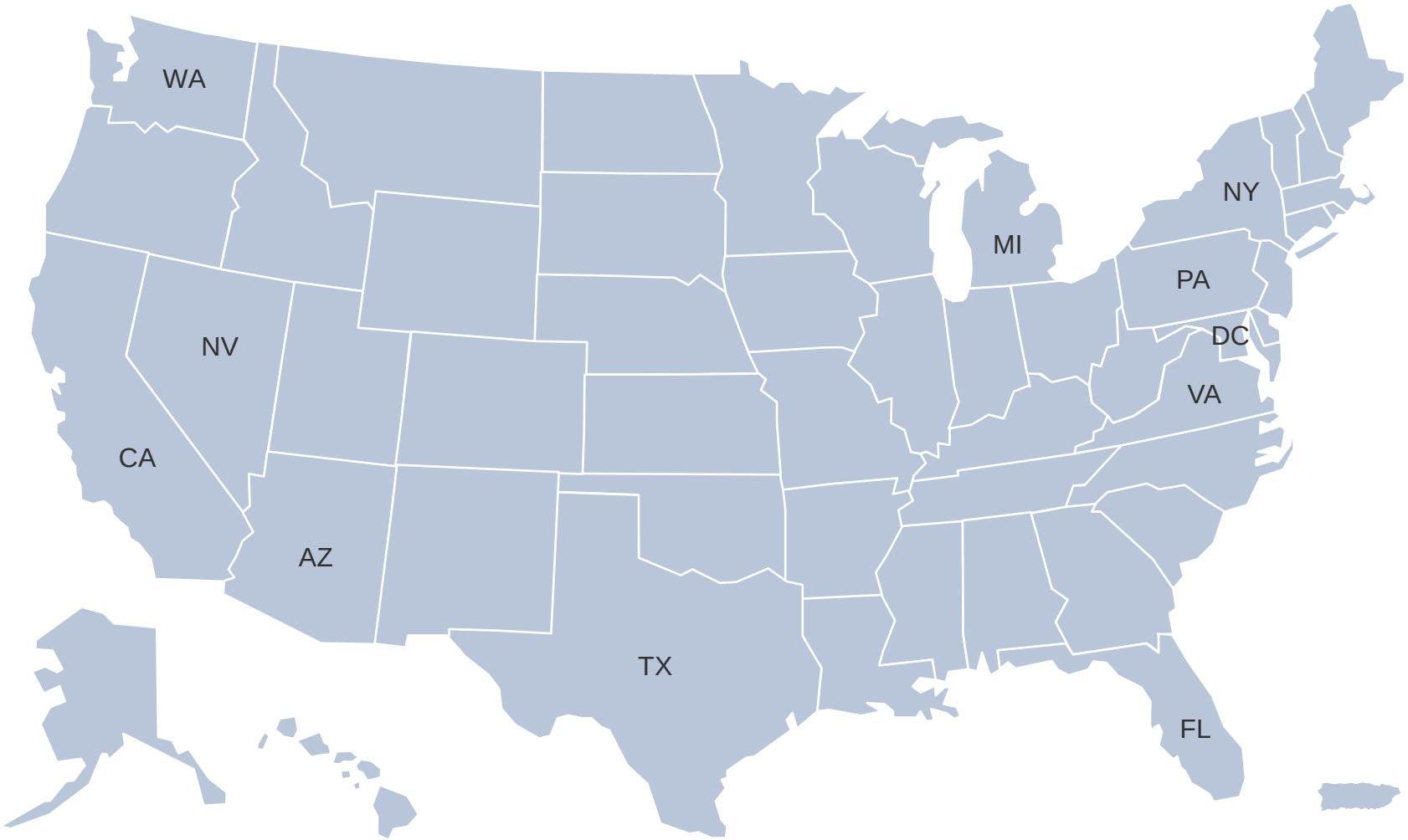
Driverless Vehicles

MAKERS TAKING THREE APPROACHES

1. Incremental approach
   Favored by traditional auto manufacturers
2. Ground up to fully autonomous
   Favored by non-standard manufacturers – Google, Apple
3. Secondary market accessories
   Turn newer models into driverless vehicles currently very limited to certain models
   - Delphi (Audi, VW)
   - Start up company Otto announces that small owner-operators and larger commercial truckers will begin using Otto's after market self-driving system by end of 2016 – purchased by Uber (8/16)
   - Cambridge, MA based nuTonomy is converting existing cars made by Mitsubishi and Renault into autonomous vehicles and plans to introduce driverless taxis in Singapore in 2018
   - AImotive – (Toyota, Volvo)
   - University of Oxford Spin Off, Oxbotica, develops software to turn regular cars into driverless vehicles – to be tested in 2 UK cities

The Future of Auto

States Gearing Up for Driverless Cars



The Future of Auto

Driverless Vehicles—Teaming Up to Speed Development

- 2014 – BMW teams up with Chinese tech Baidu on driverless cars
- 2015 – Uber teams with Carnegie Mellon University on driverless cars
  – Uber teams with University of Arizona on driverless cars
  – GM announces it will be a leading maker of driverless cars
  – Ford teams with Google on driverless cars
  – Ford testing autonomous cars in California in 2016
- 2016 – GM teams with Lyft to create driverless cars
  – Ford, Toyota, VW, Nvidia, Samsung, Qualcomm and Panasonic team up with University of California, Berkley to fund AI for use in autos
  – Google, Ford, Uber, Volvo, Lyft form lobbying group re: driverless safety requirements and getting cars to market
  – BMW teams with Intel and Mobileye
  – Volvo teams with Uber to develop fully automated cars
- 2017 – Intel buys Mobileye
  – Ford invests $1B in Argo AI
  – Uber and Daimler partner

The Future of Auto

Driverless Vehicles

- Tesla, Mercedes, BMW and Volvo already have models that allow some hands off or self-driving
- Ford and Nissan have self-driving prototypes
- May 2014: Volvo began testing 100 driverless cars on public roads in Sweden
- Google Driverless Car
  - April 2014: announced driverless car is mastering more complex city driving
  - January 2016: driven over 2.3 million miles – 18 minor accidents – all but one caused by other human drivers
- GM's driverless Cherry Bolts have driven from 10,000 miles in California in 2016 alone
- Chinese auto maker Chongqing Changan Automobile Company
  - Driverless car completes 1,200 mile trip in 4/16

The Future of Auto

Driverless Vehicles

- Tesla Motors
  - Upgraded Model S and Model X enabling autonomous driving on highways – Summer 2015
  - Upgrades occurred over the web
  - 2016 – Tesla auto pilot has accumulated 130 million miles
  - May 2016 – Tesla autopilot's first fatality
  - August 2016 – Tesla car in autopilot mode gets into a minor accident in China

Some believe these accidents will slow down the drive towards fully automated vehicles

According to the head of the NHTSA, "no one incident will derail the Department of Transportation and NHSTA from its mission to improve safety on the roads"

The Future of Auto

Driverless Vehicles – prior to the Tesla fatality

California DMV Officially Propose Autonomous Vehicles Regulations

New Regulations

- Would allow deployment for public use as opposed to just for testing
- No longer require a driver behind the wheel
- Allow deployment of vehicles without steering wheel manual makes or other devices that would allow humans to take control
- Makes and developers would have to obtain a permit and must meet liability insurance requirements

The Future of Auto

Driverless Vehicles – prior to the Tesla fatality

- To Market:
  - Tesla will be selling fully autonomous cars by 2018. Tesla already offering model X and S owners a 1-month free trial of its autopilot driverless feature.
  - Google, now Waymo, also to be selling to the public by 2018
  - Apple will be selling fully autonomous cars by 2019
  - Ford, Toyota, Alibaba, Baidu and Renault-Nissan shooting for 2020
  - Nissan to have 10 models with autonomous driving by 2020
  - Chinese auto maker LeEco to have models available by 2020
  - BMW – fully autonomous cars available by 2021

The Future of Auto

Driverless Vehicles – prior to the Tesla fatality

- January 2016 – GM CEO: "I believe the auto industry will change more in the next 5 to 10 years than it has in the last 50."
- March 2016 – Fortune: "self-driving car technology is improving so quickly that experts believe that it will be mainstream in five years (by 2021)"
- IHS Automotive predicted in January 2014 that self-driving cars with driver controls (i.e., steering wheels and gas and brake pedals), would be widely available around 2025
- Deloitte: Transformation of vehicles to disrupt industries beginning in 5–15 years
- Boston consulting Group: 25% of new car sales could be fully autonomous models by 2035

The Future of Auto

No Slow Down On Driverless Cars Since Tesla Fatality

- Ford testing autonomous cars in California in 2016
- Jaguar Land Rover to begin testing driverless cars in the UK in 2016
- Nissan debuts ProPILOT auto drive system in Japan
- Nissan testing autonomous cars in London in 2017
- Audi to launch self-driving car in 2018 to handle up to 80% of driving situations
- GM announces it will use Lyft to launch its first self-driving car. Executive chief engineer of anonymous tech at GM states "…this is all coming much faster than people anticipate…"
- GM to build and launch thousands of driverless Chevy Bolts in 2018

The Future of Auto

No Slow Down On Driverless Cars Since Tesla Fatality

- Mercedes-Benz launched its self-driving full-sized bus just completed a 12-mile trip
- UK firm FiveAI gets millions in funding to develop an artificial intelligence system capable of driving a car
- Highways around Columbus, OH will begin testing driverless platooning tractor trailers starting in 2016
- Uber announces driverless rise share will nit Pittsburgh in September 2016

According to the head of the NHTSA, "no one incident will derail the Department of Transportation and NHSTA from its mission to improve safety on the roads"

The Future of Auto

One view of potential timeline…

- 5 years – fully autonomous vehicles
- 10 years afterwards for a federal mandate
- 15 years after that for 90% fleet turnover

– Brian Sullivan
Auto Insurance Report
October 17, 2016

The Future of Auto

When discussing *a potential death blow looming for the auto insurance industry...*

That extreme scenario is 20 years away.

But there's no way anyone can tell me that we're going to have more accidents in 10 years than we have today.

If I told you that the auto insurance industry would be cut in half in 20 years, that doesn't feel crazy – we're talking about almost $100 billion in premium disappearing.

– Brian Sullivan
Carrier Management
January 25, 2016

The Future of Auto

Driverless Vehicles

- Roadblocks
  - Technological
  - Poor roads
  - Regulatory
    - Feds v. states
    - 3/16: 23 states have proposed 55 different laws related to autonomous vehicles
  - Acceptance
  - Liability ?
- U.S. Department of Transportation:
  - Committed $4B over next 10 years to speed driverless cars to the market
  - Expected to establish “best practices” guidelines for self-driving cars within six months; and
  - May waive certain safety rules to help speed driverless cars to market

The Future of Auto

Driverless Cars Predicted to Reduce Frequency and Severity

- 2016 – over 40,200 deaths in car accidents and 2.44M injuries
- NHTSA: in 2015 – 35,092 fatalities and 2.34M injuries

The Future of Auto

Driverless Cars Predicted to Reduce Frequency and Severity

- Eno Center for Transportation
  - If 90% of vehicles were autonomous:
    - 4.2 million accidents would be avoided
    - 21,700 lives saved
  - If 10% of vehicles were autonomous:
    - 211,000 fewer accidents
    - 1,100 lives saved
- Insurance thought Leadership: “A 25% reduction in auto-accident-induced fatalities would save more lives than curing leukemia; a 75% reduction would save more lives than eliminating suicide.”

The Future of Auto

Driverless Cars Predicted to Reduce Vehicle Ownership

- University of Michigan's Transportation Research Institute
  - Driverless cars with an unoccupied "return home" feature could reduce vehicle ownership by 43%
- Google – driverless cars can reduce the number of cars by 90%
- Barclays Plc – driverless cars could reduce vehicle ownership by 40% by 2025
- University of Texas – combine Uber with driverless cards and 90% of vehicles unnecessary
- KPMG – predicts a reduction in vehicle ownership could be as high as 99%
- ABI Research: 400 million people will rely on robitic car sharing by 2030

The Future of Auto

Driverless Vehicles—Reducing Industry Auto Premium

- KPMG – autonomous vehicles may bring about the most significant change to the automobile insurance industry since its inception – will eliminate 90% of collisions
- KPMG – 10/15 – "while a 50% reduction in premium may not be realistic in the near term, a major correction in premiums must eventually follow the fall in losses"
- Celent – driverless cars could reduce auto premium by between 30%–60% in 5–10 years

The Future of Auto

Driverless Vehicles—Liability

PARADIGM SHIFT!

- Google, Mercedes-Benz and Volvo assume all liability for accidents caused by their driverless cars
- NHTSA – encouraging auto makers to assume liability for accidents caused by their driverless cars
- Some are pushing for a law granting immunity to self-driving car makers and component part manufacturers
- Michigan – December 2016 – passes law holding makers liable for accidents when automated driving system is at fault

The Future of Auto

Driverless Vehicles—Liability *(continued)*

PARADIGM SHIFT!

- Tesla – selling car insurance with the purchase of the car in Asia – currently using an insurance company
- Root Insurance – offering discounts for self-driving cars

The Future of Auto

Assisted Driving Innovations

- Of course: all these innovations render vehicles more vulnerable to hackers
- 2016: U.S. government is warning that manufacturers of driverless car technology need to prioritize cybersecurity standards or risk coming under attack from cybercriminals and hackers

The Future of Auto

Driverless Vehicles

COMMERCIAL VEHICLES

- Currently some 3.4 million truck drivers
  - Another 10 million that hold commercial drivers' licenses
- Truck driving is the most common job in 29 states including: CA, TX, OH, IL, NC, PA and IA

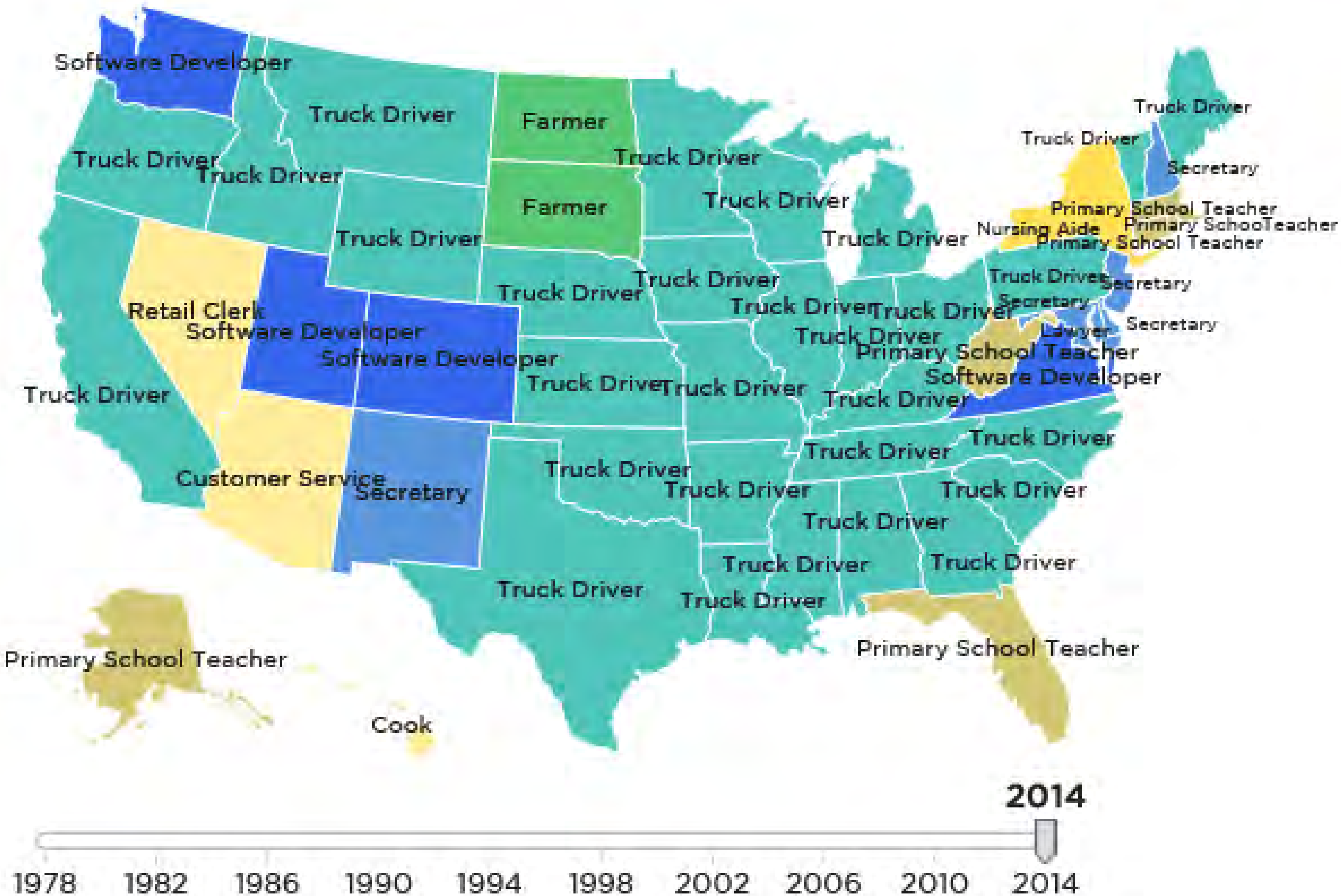
Why driverless trucks?

"there's no industry on Earth that wouldn't jump at the chance to cut 34% of its operating costs through automation"

"the drive to reduce costs and increase efficiency will quickly outpace concerns about any possible consequences"

– digitaltrends.com – Jeff Zwschmeide

The Most Common Job In Every State



Source: NPR

The Future of Auto

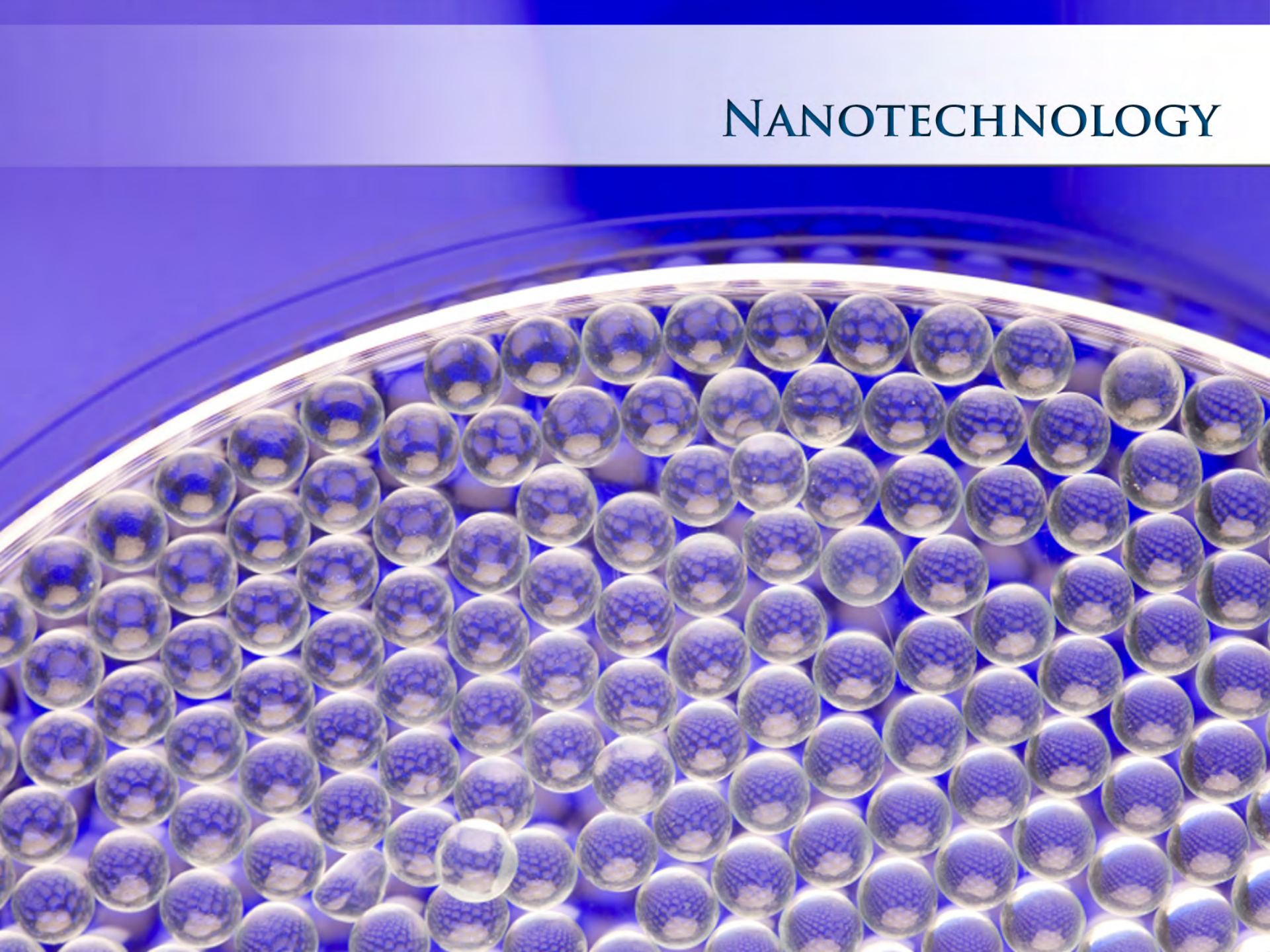
www.digitaltrends.com

The Future of Auto — Chinese Ehang

Source: Ehang

TODAY

Nanotechnology



Nanotechnology

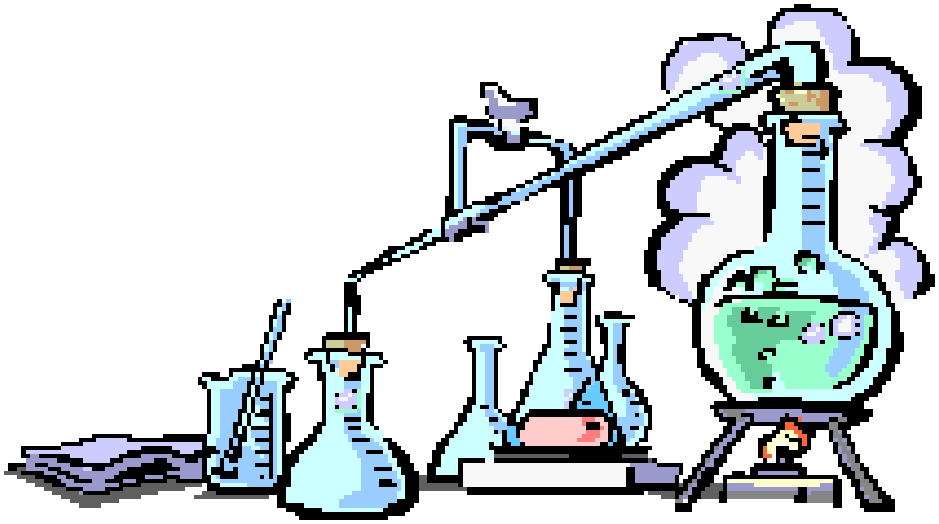
It's a Small World After All

- Split human hair 80,000 times to reach a width of 1 nm
- Red blood corpuscle is 7,000 nm
- Viruses = 20 nm to 300 nm
- 10 hydrogen molecules fit into one nanometer
- Over one million particles 1 nm in size would fit into the dot of this "i"

Nanotechnology

The Next Industrial Revolution

- Reduction of existing materials
  - Properties of materials change when brought to nanoscale
    - Color
    - Conductivity
    - Reactivity
    - Electrical
    - Magnetic
    - Toxicity
- Creation of new materials



Nanotechnology

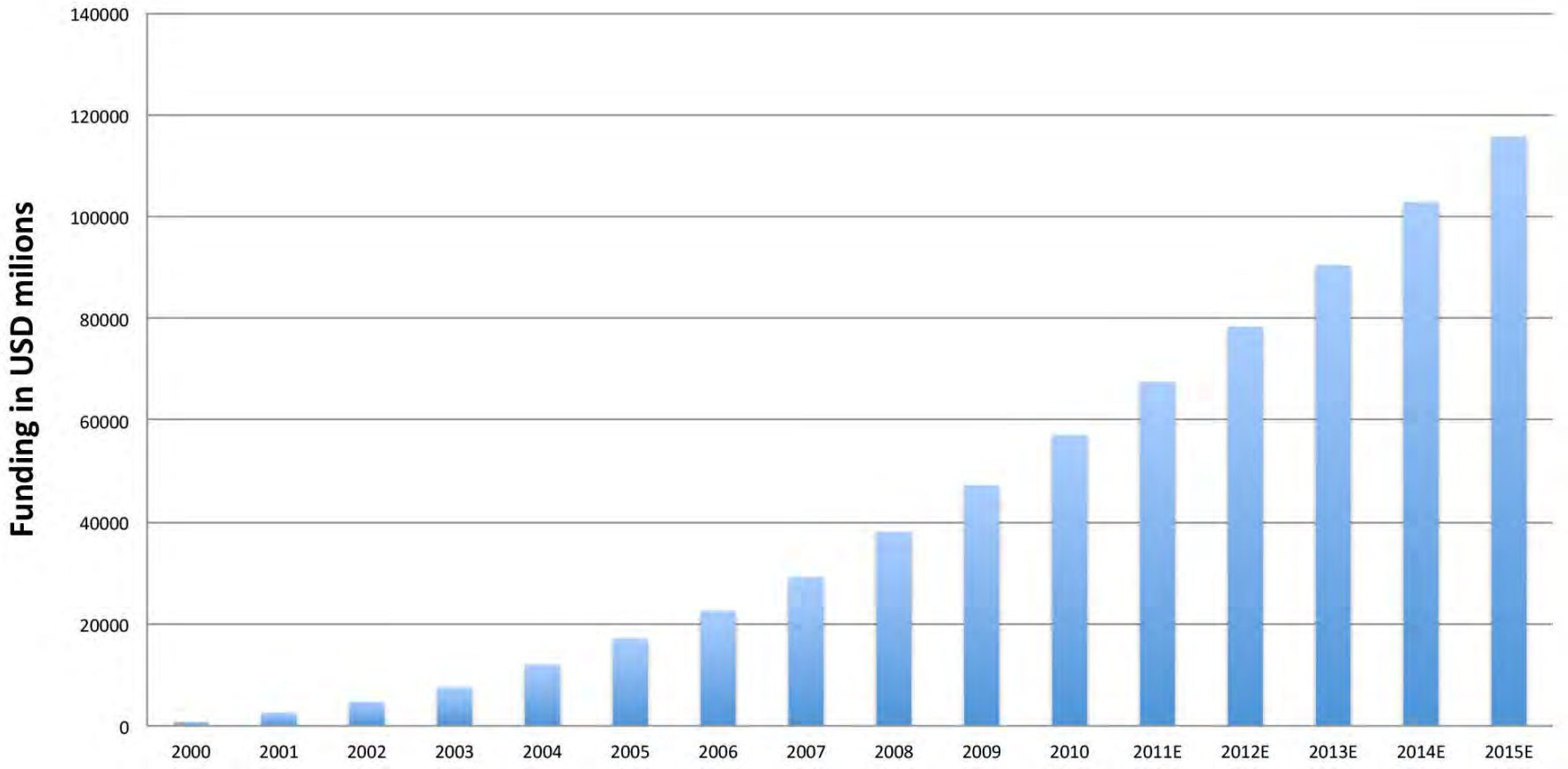
Governmental Spending

Product Development vs. Toxicity / Environmental Safety

- Since 2001
  - U.S. Nanotechnology industry has grown 16%–33% annually
- 2001–2016
  - U.S. government: $23 billion mostly for product development
  - Less than 10% spent on environment, health and safety
- 2016
  - $1.5 billion for nanotechnology development by U.S. government
  - U.S. government 2017 est. $1.4 billion

Nanotechnology

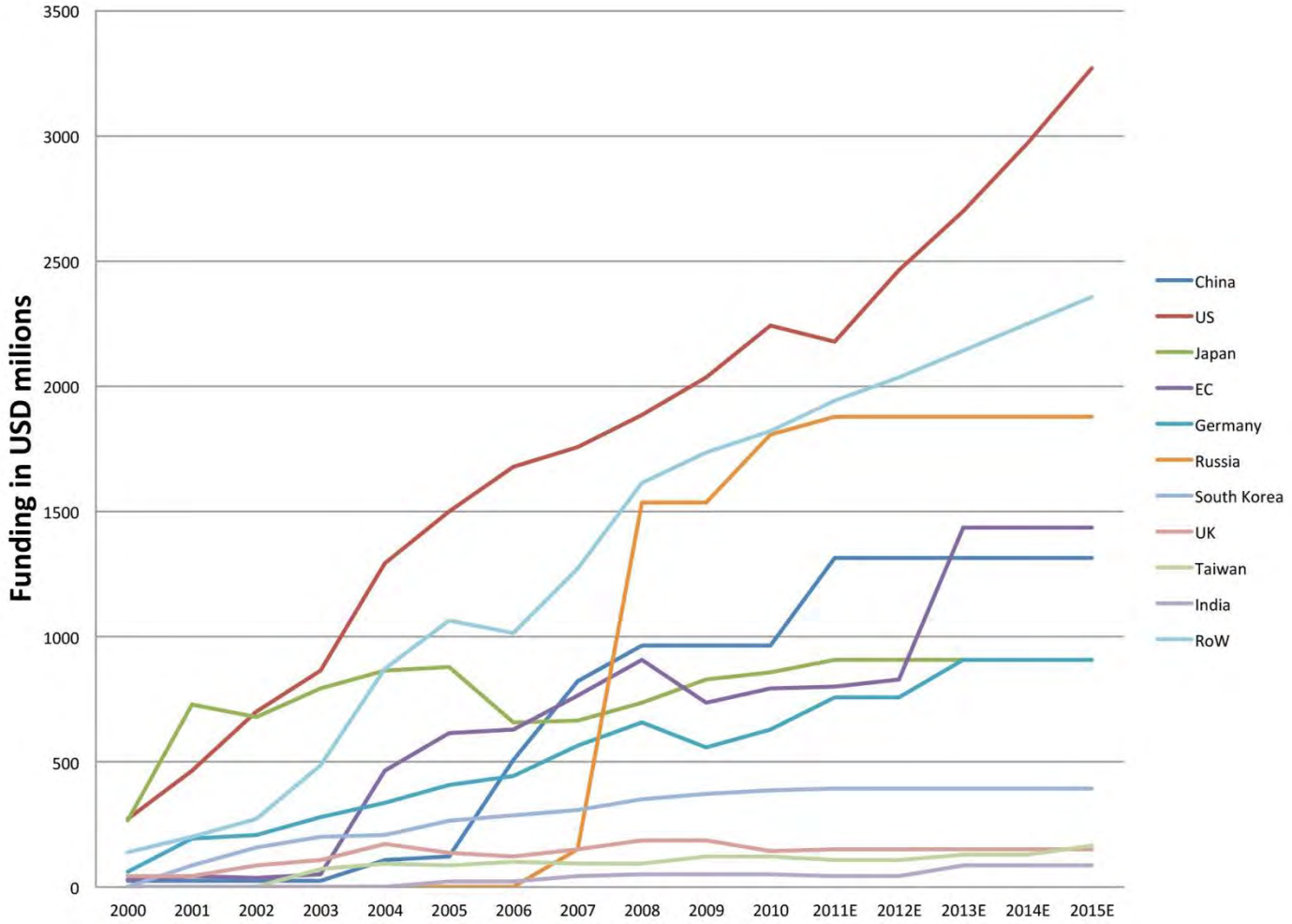
Total Global Nanotechnology Funding



Source: Cientifica Ltd 2011.

Nanotechnology

Nanotechnology Funding by Country



Source: Cientifica Ltd 2011.

Nanotechnology

What We Don't Know

Regulations

- Can nanomaterials fit into existing regulatory schemes?
  - EPA early voluntary data request
  - NIOSH: 4/13 – issues RELs for occupational exposure to carbon nanotubes and nanofibers
  - EPA: 3/15 – proposed new rule – makers and processors must report:
    - Identity of nanomaterial
    - Quantities produced
    - Methods of manufacture
    - Exposure and environmental release info
    - Health and safety data
- In the U.S. currently, no requirements for:
  - Labeling
  - Special toxicity assessments

Nanotechnology

The Possibilities

- Drug delivery
- Improved diagnostics
- Tumor killers / cancer cell hunters
- Much smaller, more powerful batteries
- Materials >100x stronger plus 8x lighter than steel
- Superconducting materials
- Smaller, faster computers with more storage
- Minute solar cells
- Super-efficient, hydrogen-based fuel cells
- Augmentation of living organisms

Nanotechnology

Nanotechnology

Exposures Already Here

- The Next Industrial Revolution
  - How many different nanomaterials?
  - Some nanotechnology companies began operations around 1990
  - In 2016 there were over 1,900 companies conducting R&D, manufacturing and/or product sales
  - Some 1,100 of these businesses have fewer than 500 employees
  - Many are small firms with 25 employees or less
  - Incorporated into thousands of consumer products on the market
  - NIOSH spokesperson: 180,000 nanotechnology workers in 2009
  - 2016 est. 500k–1M
  - Millions of other workers in secondary industries exposed on a regular basis
  - In 2016, U.S. nano market to grow at a 15.1% CAGR

Source: International Council on Nanotechnology, October 2006

Nanotechnology

Exposures Already Here

- 2006 Survey of Nano Manufacturers
  - 66% of firms and universities not conducting toxicity tests
  - 61% not monitoring air to determine occupational exposure
  - Many use “conventional,” protective equipment

Nanotechnology

Exposures Already Here

- NIOSH — July 2010 Study of Occupational Exposures in Labs Handling Nanomaterials
  - Studied airborne releases of nanomaterials in labs during routine handling and processing
  - Airborne nano particle concentrations increased when materials were weighed, transferred to beakers and sonicated
  - Findings contradict belief that exposures are minimized when working with nanomaterials in liquid suspensions

Nanotechnology

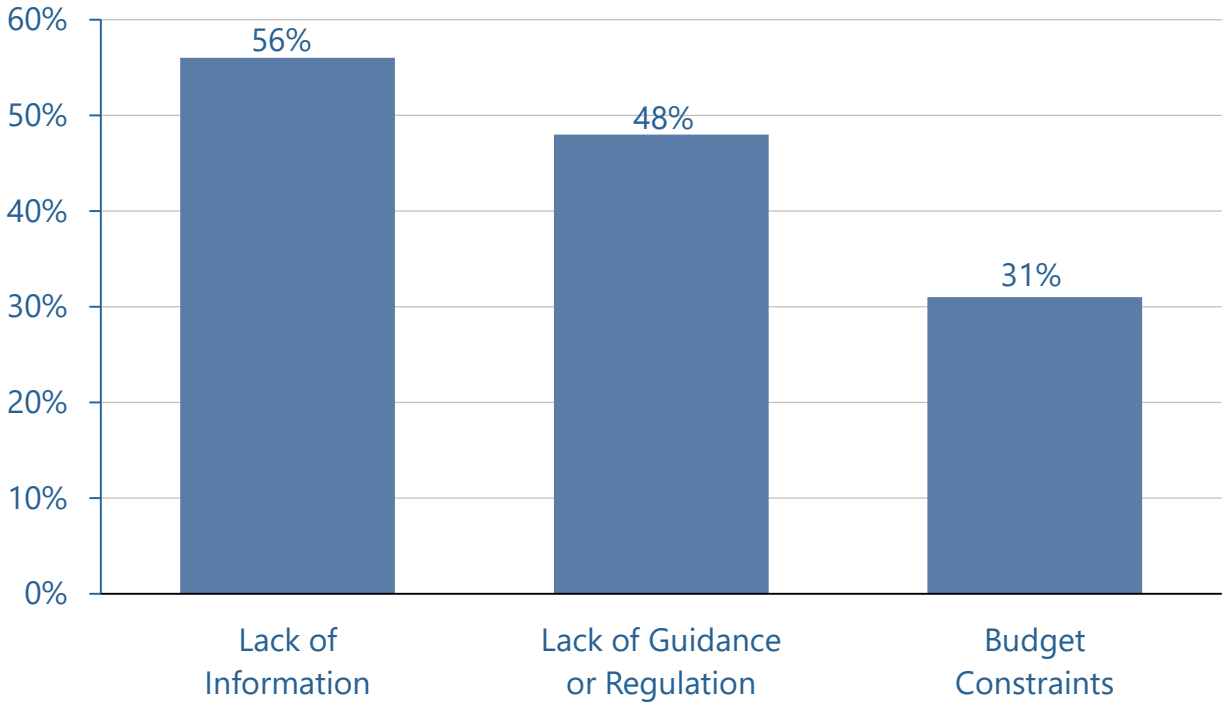
Exposures Already Here

- New Survey by University of California —Santa Barbara announced at the end of 2012
  - 74 nanotechnology firms
  - 45 in U.S.
  - 65% had less than 50 employees
  - Used/manufactured 15 different NMs
- Only 46% had nano-specific EHS programs
- 13% had no EHS program
- 62% did not monitor occupational exposures
- Less than 50% required workers to wear PPE
- 30% use vacuuming and sweeping to clean NMs (against recommendation by NIOSH)
- 63% had no specific NM waste program

Nanotechnology

New Survey by University of California—Santa Barbara

- US Nanotech companies
  - Impediments to having an nano EH&S program?



Engeman et al 2012 under review.

Nanotechnology

U.S. NIOSH – 2013

- Control methods to ensure appropriate industrial hygiene exposure controls in decreasing order of preference base on effectiveness:
  - Elimination
  - Substitution
  - Engineering controls
  - Warnings
  - Administrative controls
  - Personal protective hear

U.S. EPA's Nanoscale Materials Steward Program – Interim Report

- 90% of likely commercially available nanoscale materials are not reported by companies at all
- Companies are not inclined to voluntarily test their nanomaterials for toxicity

Nanotechnology

Exposures Already Here

- U.S. revenue = Over $500 billion from nano-enabled products in 2016 – a 6 fold increase since 2009
- Products including:
  - Skin Creams and Cosmetics
  - Sun Block and Suntan Lotions
  - Personal Care Products
  - Joint and Muscle Pain Relief Creams
  - Paint and Coatings
  - Plastic Wrap / Food Containers
  - Lubricants
  - Automobiles and Aircraft Parts
  - Fabrics
  - Computer Chips
  - Electronics
  - Bedding

Nanotechnology

Exposures Already Here

- Other Products Containing Nanomaterials
  - Medicine Capsules
  - Sports Equipment
  - Wound Dressings
  - Deodorants
  - Toothpastes
  - Shampoos
  - Car wax
  - Air Sanitizers / Purifiers
  - Joint and Muscle Pain Relief Creams
  - Wet Wipes
  - Cleansers
  - Imported Animal Feed
  - Imported Veterinary Medicine





Nanotechnology

Exposures Already Here

- Building Materials
  - Concrete
  - Insulation
  - Glass coatings
  - Flame retardants
  - Countertop coatings
  - Polyurethane wood finishing
- Ag Products
  - Pesticides
  - Fertilizer

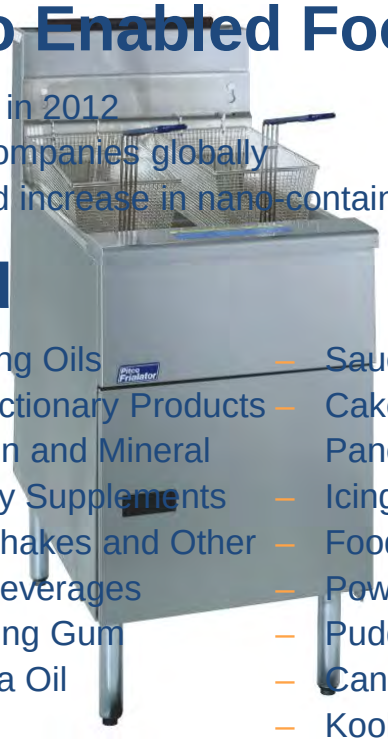
Nanotechnology

Nanotechnology

Exposures Already Here

Nano Enabled Food Industry

- $5.8B in 2012
- 400 companies globally
- 10 fold increase in nano-containing foods since 2008



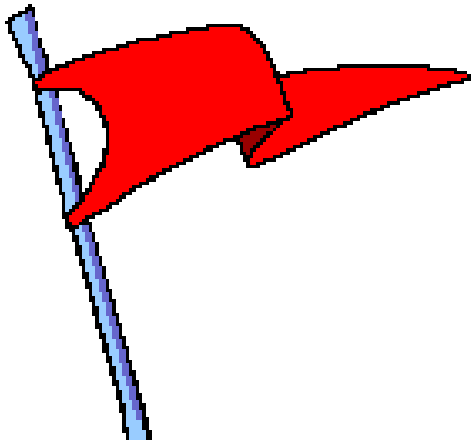
Food

- Cooking Oils
- Confectionary Products
- Vitamin and Mineral Dietary Supplements
- Diet Shakes and Other Diet Beverages
- Chewing Gum
- Canola Oil
- Tea
- Ice Cream
- Cheeses
- Salad Dressing
- Mayonnaise
- Sauces
- Cake, Muffin and Pancake Mixes
- Icing / Frosting
- Food Additives
- Powdered Donuts
- Pudding
- Candy
- Koolaid
- Marshmallows
- Coffee Creamers
- Poptarts
- Syrup
- Whipped Cream
- Mints
- Yogurt
- Cinnamon
- Cereal
- Chocolate
- Minute Rice
- Cookies
- Alfredo Sauce
- Milk
- Baby Formula

Nanotechnology

First Studies

- Progressive dysfunction and cell death of human brain cells
- Gathered and remained in the liver and spleen
- Nano titanium dioxide damaged neurons
- Four different nanomaterials caused proteins to misfold
- Damage DNA and may increase risk of cancer
- Some pass through the skin / distributed throughout the body
- Decreased function in cells exposed to nanosilver
- Promote blood-clotting
- Penetrate deep into lungs — causing death
- Inhaled can pass into brain through blood / brain barrier
- Caused death by suffocation
- Increase in brain damage
- Increase in genetic and cellular damage
- Kill human liver and skin cells
- By-products harmed aquatic life



Nanotechnology

In Vitro Study *(Petri Dish)* Suggests

- 2/08 First EPA Study of a Nanomaterial
  - Nano-sized titanium dioxide widely used in sun blocks suggests damage to brain cells
  - Found cellular apoptosis after 6 hours of exposure

Nanotechnology

Post-2008 Studies of Carbon Nanotubes

2008

February
Japan's National Institute of Health Sciences
- Can mimic asbestos

May
University of Edinburgh (UK) and U.S. Project on Emerging Nanotechnologies
- Exposure caused development of lesions and precancerous masses similar to those that precede mesothelioma

December
University of Dayton (U.S.)
- Accumulate in cells resulting in cell death
- Increased cell mutations by two times

2009

January
Institute of Occupational Medicine, Edinburgh
- Carbon nanotubes and nanowires have same characteristics as asbestos; likely to have similar pathalogy

March
University of Dayton
- Surpresses immune response of human lung cells

July
University of Dayton
- Surpresses immune response in lungs

2010

April
NIOSH
- Inhalation causes inflammation of the brain

2011

January
Sweden Lulea University of Technology
- Increased risk of lung cancer

July
U.S. FDA
- Caused clots in the blood that obstruct flow

June
University of Edinburg, UK
- Same effects as asbestos

August
Indiana University – Purdue University
- Exposure to even low levels penetrated kidney cells

2012

March
Ingested
- Alters normal blood vessel function

2013

March
Potent cancer promoter

November
Inhalation causes a stronger inflammatory response than asbestos

2015

January
Damage to lungs more severe than asbestos

January
Chronic exposure promotes cancer in lung cells

Nanotechnology

Additional Studies

- Quantum dots toxic to cells under certain conditions
- Nanorods and nanowires may also cause asbestos-like effects
- Accumulate and damage kidney cells
- Dissolve in cell membrane, pass into cells, reform and damage cells
- Four Nanoparticles when inhaled cause cancer
- Inhaled Nanoparticles can cause chronic or acute illness
- Injected quantum dots damaged kidneys
- Airborne nanoparticles can be more hazardous than their larger scale counterparts
- Buckyballs have high potential of accumulating in tissue
- Diesel nanoparticles get trapped in lungs — inhibit fluid that facilitates breathing

Nanotechnology

Additional Studies

- Inhaled nanoparticles of titanium dioxide may pass through the blood-brain barrier and damage neurons
- Gold nanparticles increases nitric oxide production which can result in cell death
- Nano zinc oxide — direct contact with colon cells caused death of cells
- Quantum dots made from cadmium and selenium released toxins into soil
- Nickel nanoparticles contribute to lung cancer
- Zinc oxide nanoparticles damaged DNA; may cause cancer
- Magnetic core nanomaterials caused DNA damage and accumulated in the liver
- Inhaled cerium oxide nanoparticles used as a diesel fuel additive travel from lungs to liver and damage liver
- Nanoplatelets stay airborne — penetrate deeply into lungs
- Silver and titanium dioxide nanoparticles damaged testicular cells and DNA

Nanotechnology

Additional Studies

Nano Titanium Dioxide

- Nano titanium dioxide when ingested damaged or destroyed DNA and chromosomes
- Nano titanium dioxide caused damage to the heart muscle
- Nano titanium dioxide caused eczema
- WHO: International Agency for Cancer Research declares nano titanium dioxide a “possible carcinogen”
- NIOSH: Data supports finding nanoscale titanium dioxide as an “occupational carcinogen”
- Exposure caused holes to form in parts of the brain and killed nerve cells in the brain

Nanotechnology

Additional Studies

Nano Titanium Dioxide *(continued)*

- In the bloodstream promotes disregulation of the blood brain barrier and build-up in liver and spleen
- Ingested food grade titanium dioxide nanoparticles is directly absorbed into the bloodstream
- Ingested Nanospheres alters normal blood vessel function
- Nano titanium dioxide highly toxic to amniotic fluid cells
- Titanium dioxide particles migrate from the lungs to the heart promoting arrhythmias

Nanotechnology

Additional Studies

- Graphene nanoparticles can pierce cell membranes
- Children's lungs more susceptible to nano materials
- Graphene nanodiscs can accumulate in lungs and cause damage
- Plastic nanoparticles are transported through the aquatic food chain — effects fish metabolism and behavior
- Poorly soluble nano-sized nickel particles cause lung cancer in humans
- Cerium oxide and zinc oxide nanoparticles — take up and distributed throughout edible plant tissue. Plant growth and yield diminished
- Metal oxide nanoparticles damage cells at low concentrations
- Inhaled silicon dioxide nanoparticles can damage the heart
- Silica nanoparticles caused lung injury
- Nanoscale carbon black particles interfere with lung function

Nanotechnology

Additional Studies

- Ingested silver nanoparticles damaged kidneys and caused hearing loss
- Nanoparticles could disrupt immune cell function
- Inhaled nanomaterials negatively impact gestational development
- Exposure to nanomaterials damaged the lungs — copper and zinc oxide
- Exposure to nano silver and nano zinc oxide significantly damage DNA
- Nanodiamonds allow large amounts of metal ions to accumulate in cells resulting in cytotoxicity
- Inhaled silver nanoparticles gather in the brain: trigger an immune response liked with injury
- Inhalation of nanosilica likely to cause multiple organ toxicity
- Silver nanoparticles induced cytotoxicity in human liver cells

Nanotechnology

2013 Multi Lab Study on the Toxicity of Carbon Nanotubes and Nano-Sized Titanium Dioxide

- 8 labs across the country examine the inhalation exposure of Carbon Nanotubes & Nano-Sized Titanium Dioxide
- All conclude that inhalation of these materials damage the lungs
- Inhalation produced inflammation and inflammatory lesions in the lower portions of the lung

Nanotechnology

Health & Safety Studies Since January 2016

- 2/17 - Ability of the small intestine to absorb nutrients & act as a barrier to pathogens is “significantly decreased” after chronic exposure to ingested titanium dioxide nanoparticles, a common food additive – Binghamton Univ., US
- 1/17 – Exposure to nanoparticles of titanium dioxide, often used in toothpaste, sunscreen and food products, cause precancerous growths in the intestine or colon – National Institute for Agricultural Research, France
- 1/17 – Nanoparticle exposure can awaken dormant viruses in the lings – Hemlholtz Zentrum, Germany
- 10/16 – Inhalation of carbon nanotubes will interfere with the immune system when entering the bloodstream – Institut de Biologie Structurale and Minatec, France
- 9/16 – Inhaled metal nanoparticles gather in human brains – linked to Alzheimer's – Lancaster Univ., UK
- 5/16 – Inhalation of nanosilica and polyacrylate nanosilica is likely to cause multiple organ toxicity – Occupational Disease and Toxicology Department, Beijing Chao-Yang Hospital, Capital Medical University, China

Nanotechnology

Health & Safety Studies Since January 2016 *(continued)*

- 8/16 – Laser printers release potentially hazardous nanomaterials into the air when printing which may cause significant cytotoxicity, membrane integrity damage lung inflammation and other injuries – Harvard T.H. Chan School of Public Health, US
- 5/16 – Titanium dioxide nanoparticles, used in food, cosmetics, sunscreen & other products can have subtle effects on the activity of genes – adds to concerns about long-term exposure – Georgia Institute of Technology, US
- 3/16 – Exposure to high levels of zinc oxide nanoparticles caused severe DNA damage in bone marrow cells and inhibited DNA repair mechanism – KIIT Univ. India
- 3/16 – Metal oxide nanoparticles found to be toxic to human small airway epithelial cells – NIOSH, US
- 3/16 – Silver nanoparticles induced cytotoxicity in human liver cells – U.S. Food and Drug Administration, US
- 1/16 – Inhaled aluminum oxide nanoparticles cause damage to the respiratory system – School of Public Health, Southeast Univ., China

Nanotechnology

Hypothetical Sizing Exercise

- If: Currently 5,000 Nanomaterials
  - If 99% are benign = 50 new toxic substances
  - If 97% are benign = 150 new toxic substances

- Potential impact on P/C insurance industry? Occupational and consumer exposure.

Nanotechnology

First U.S. Illness – 2014

- Occupational exposure
- Nanonickel particles
- Scientific lab
- Measuring out 1–2 grams (0.035–0.070 ounces)
- Respiratory ailments/metal sensitivity

First reported illness – China 2004

- Seven women occupationally exposed for between 5–13 months
- Suffered permanent lung damage
- 2 deaths

Emerging Issues

- Cyber Attacks
- Nanotechnology
- Concussions
- 3D Printing
- Self-Driving Vehicles and Assisted Driving Innovations
- Internet Communications – Personal Injury Claims
- Hydraulic Fracturing
- Drone Use
- Food-borne Illness
- BPA
- Food Flavorings and Coloring Litigation
- Internet of Things
- GMO's
- The Share Economy
- Hazardous Imported Products
- E-Cigarettes
- Artificial Turf
- C8 / PFOA
- Endocrine Disrupters
- Counterfeit/Imported Medicines
- Legal Highs
- Epigenetics
- Judicial Reformation of Policy Defenses

Follow Charlie on:

ckingdollar.com

Charlie Kingdollar