

# AIHA Environmental Scan



February 23, 2014



# AIHA Environmental Scan

## Introduction

In October 2013, AIHA asked Foresight Alliance to undertake a systematic environmental scan focused on five broad research categories, in order to identify potential changes affecting industrial hygiene that could support a new content development strategy. The following document is a topline view of the key trends and issues from this research for each of the five broad categories of research:

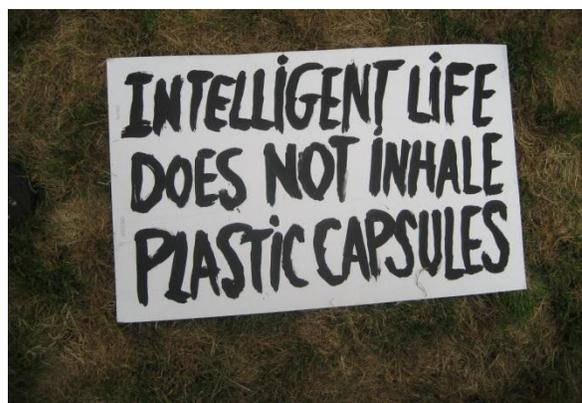
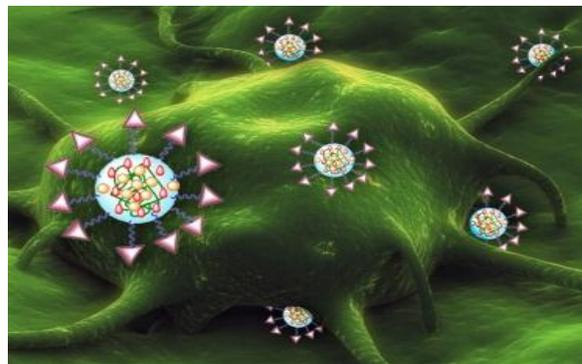
- Technology and Innovation
- Global Change & Markets
- Changing Society & Workplace
- Policy & Regulation
- Knowledge, Education & Research.

The AIHA Board of Directors plans to invest in new research, education programming and resources in areas where AIHA can better equip our members in protecting worker health. A Content Portfolio Management Team will recommend priority areas for these investments. Your responses to these areas of change will help inform the team's recommendations.

*This is a confidential document for AIHA internal use only.*

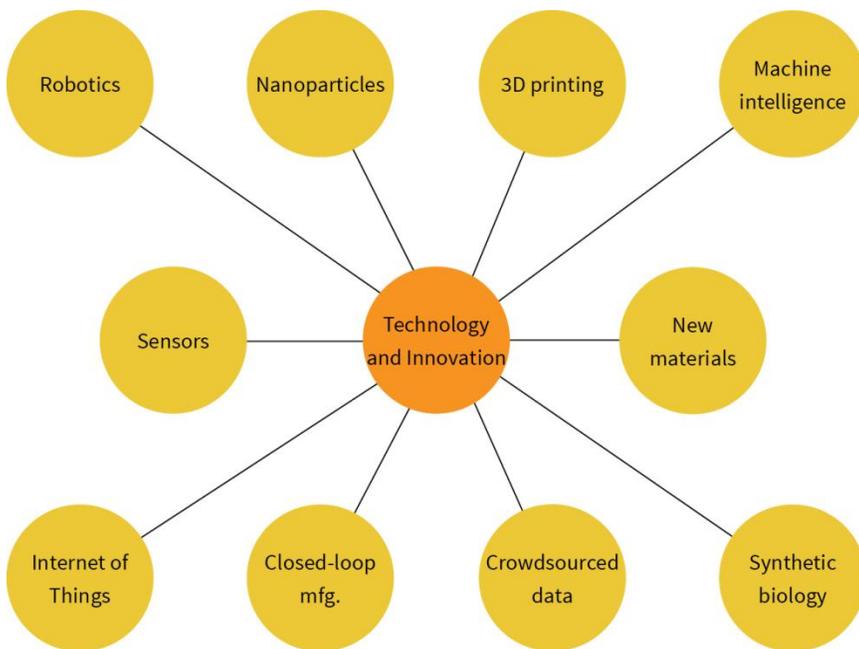
*If you are participating in the Leadership Workshop, this instrument will be your worksheet and reference for our exercise.*

*If you are an AIHA leader sharing this instrument with your scientific or technical committee, task force or work group or your local section, please forward any feedback you collect to Vicky Yobp, managing director, professional community, at [VYOBP@aiha.org](mailto:VYOBP@aiha.org).*





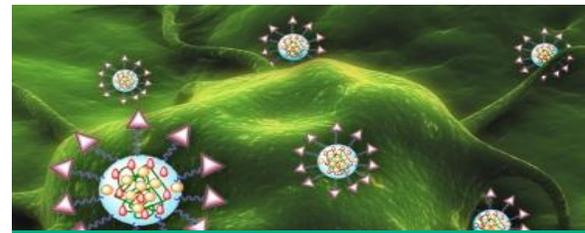
# Technology & Innovation



Protecting workers' health and safety in an environment of rapid technology innovation is extremely challenging and will require new approaches on many fronts. Fortunately, the new technology may also offer solutions.

New hazards may arise from new materials (such as nanomaterials, graphene, or programmable matter) or from new processes (such as 3D printing, robotics, contextual computing, or fracking.) Risks may also come from whole new industries, including the green economy (where closed-loop manufacturing and remanufacturing are growing), or biotechnology (including biomanufacturing, synthetic biology, and small-scale biotech).

New tools to protect worker health and safety include sensors, which are increasingly ubiquitous (including deployment to consumers), increasingly intimate (on-body and in-body), and increasingly networked. Machine learning and expert systems applied to burgeoning, sometimes crowdsourced, data streams will offer new ways to detect and analyze health issues; digital epidemiology is one example. Genomics at the personal and population levels will offer new insights into worker risk, and here toxicogenomics is one emerging discipline.



## Key Scan Hits for Category

**3D printing.** 3D printing is moving beyond prototyping to direct parts fabrication.

**Closed-loop manufacturing.** Resource insecurity is driving more manufacturers to explore closed-loop manufacturing.

**Small-scale biotech.** Biotechnology is occurring in small enterprises and even in the "garage."

**Cognitive applications.** IBM's Watson expert system is being offered as a web application.

**Crowdsourced exposure data.** Noise exposure data, for example, can be gathered using mobile phones as sensors.

**Internet of Things.** There are already more devices than people connected to the Internet.

**On-body sensors.** Prototype passive, wireless graphene nanosensors can be affixed to biological tissues.

**Personalized genetics and health.** Knowledge about genetic predispositions will allow personalized worker protection.

**Automation addiction.** Overdependence on tech could pose new risks in manufacturing, aviation, and other fields.

**Graphene.** The wonder-material graphene has been found to pose human health risks.

Image:web.MIT.edu



# Global Change & Markets



Industrial hygiene issues are becoming globalized. Companies are assuming IH responsibilities from one end of their supply chains to the other. Threats are reaching across borders too, embodied in trade, and in forms such as climate change and pandemics.

How IH issues are defined will in part be set globally. Europe continues to be a leader in approaches to health and safety issues. New global standards are being developed. Down the road, emerging markets will begin to have power to influence global standards and trade rules relevant to IH.

For now, emerging markets will be playing catch-up. In many developing countries, work health and safety regulation and monitoring are rudimentary at best. Even in large emerging markets such as China and India, IH capabilities lag the massive increases in manufacturing and trade that have occurred in the last couple of decades. As a result, most of the growth in the field will likely be occurring outside the developed world in the medium-term future.



## Key Scan Hits for Category

**Weak regulation in emerging markets.** Generally weak regulatory structures in many emerging markets include flimsy workplace safety regulation.

**New ISO standards.** New international standards for occupational health and safety are likely to influence national policies.

**EU regulation of chemical safety.** Europe may be upgrading how information about chemical safety is handled.

**Imported dangers.** Products imported from emerging markets may endanger American workers as the volume of such products grows.

**Rising risk aversion?** Rise of global wealth may be increasing aversion to risk in many places.

**Certified global worker safety.** Global worker safety is a growing part of corporate social responsibility.

**Workplace and climate change.** Climate change could increasingly impact the workplace, and vice versa.

**Risk and rapid development.** The speed of change in many emerging markets may cause workplace risks to appear suddenly.

**Emerging-market firms going global.** Firms from developing countries are increasingly going global.



# Changing Society & Workplace



From telecommuting to Total Worker Health, societal and workplace trends are transforming industrial hygiene’s operating environment, sometimes in radical ways.

STEM-related jobs are growing three times faster than non-STEM, and by 2018 the US will face a significant shortfall in STEM manufacturing workers. Women and Hispanic STEM grads are being courted to fill the gap, and the IH profession can benefit by reaching out to this growing pool of new talent.

At the other end of the age spectrum, Americans are working ever later into their golden years. This could bring rising rates of work-related injuries and fatalities. Employers will need IH to help make worksites friendlier to older workers—especially to prevent falls, heat stress, and hazardous exposures.

Prevention, in fact, is a society-wide trend that will alter sectors from manufacturing to healthcare. Addressing risk at the design level will be increasingly promoted via holistic approaches like Total Worker Health and closed-loop manufacturing resource planning.

Finally, workplaces are decentralizing. The number of people who work at home is rising, exposing employers to new liability risks. And job-hopping continues to grow—challenging IH to track exposure-related health risks across a lifetime of diverse job experiences and locations.

## Key Scan Hits for Category

**Job-hopping on the rise.** US workers are changing jobs more often, challenging IH to track exposures across worksites.

**Home-based worksites bring new risks.** Employers may bear liability for harms suffered by employees working from home.

**Closed-loop manufacturing gains traction.** Resource insecurity is driving interest in closed-loop manufacturing resource planning (CLMRP).

**Toxicogenomics.** The focus on toxins is moving from direct health threats to how toxins impact the human genome.

**US shortfall in STEM manufacturing workers.** The US has more manufacturing STEM jobs than STEM grads.

**Google funds minorities in STEM.** Google has given \$5m to fund AP STEM classes for minority high-school students.

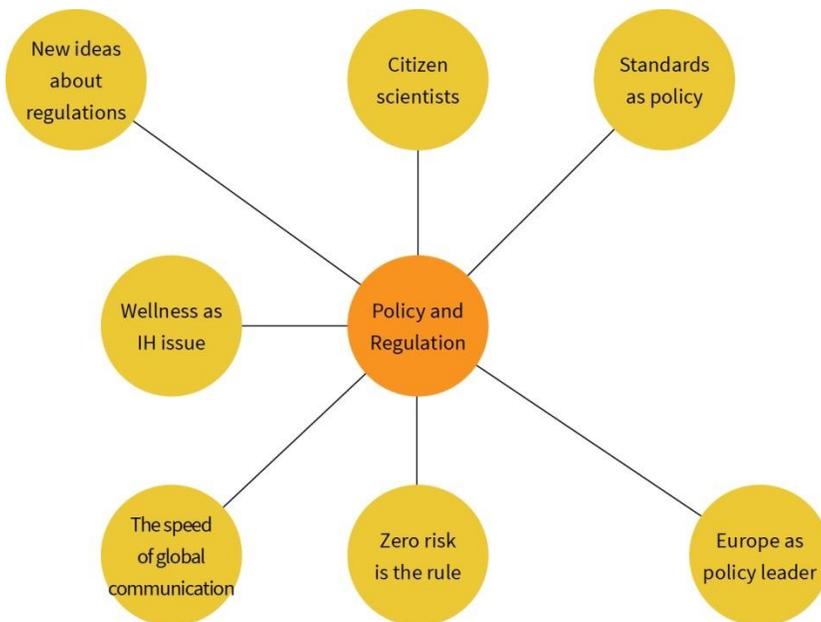
**Total Worker Health gains buy-in.** NIOSH’s concept is rapidly gaining awareness and buy-in among agencies and employers.

**Number of older workers rising.** By 2020, workers over 55 will comprise more than 25% of the US labor force.

**Older workers at higher risk—but better at decision-making.** Older workers are more vulnerable to work-related fatalities, but they can solve problems as well or better than younger colleagues.



# Policy & Regulation



Public policy is seeing a move away from traditional processes, organizations, and thinking to systems that are more responsive, flexible, and resilient.

With the rise of Internet-based (single) issue campaigns, public policy and regulations are beginning to be driven by individuals with a compelling story/voice and the ability to attract followers—taking leverage away from traditional policy/issue gateways such as NGOs. While NGOs will not go away as drivers of policy change, their influence will give way to other kinds of advocates. This affects the trajectory of emerging IH issues.

Scientific authority, too, is losing ground. The validity and legitimacy of published studies are being questioned, as replicability is often found wanting. This erosion of faith in traditional scientific research could further fuel citizen science initiatives. All of this could shift how threats and risks are discovered and evaluated.



## Key Scan Hits for Category

**Cleaner inputs for safer outputs.** Manufacturing and production safety is beginning to shift to use of cleaner, safer inputs at the start of the process, rather than mitigation of output and by-product hazards.

**Closed-loop manufacturing gains traction.** Resource insecurity is driving more manufacturers to explore closed-loop manufacturing resource planning (CLMRP, aka circular resource use) as a way to reduce their reliance on scarce resources, reduce energy use, and cut costs.

**Governments explore closed-loop manufacturing.** A wholesale shift to closed-loop manufacturing could deliver more than £10 billion in new profits to UK manufacturers.

**No safe levels?** Environmental activists are moving from a stance of acceptable risk to the idea that no risk is acceptable.

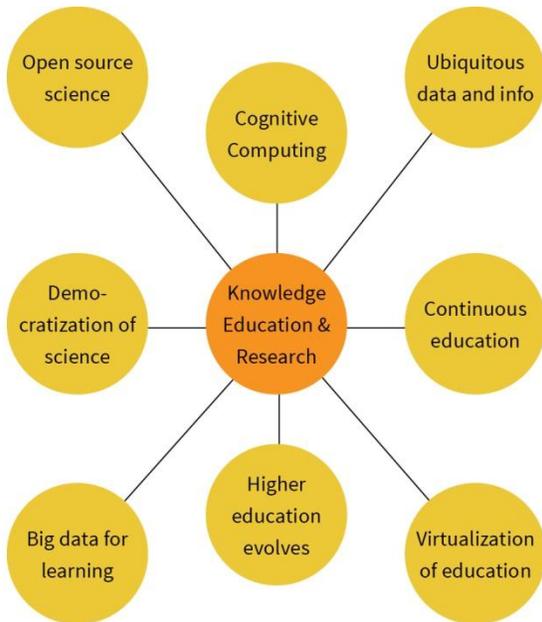
**Citizen science—policy activists.** With the Internet, concerned consumers can connect directly with the public.

**Citizen science—detectives.** Environmental policy could be driven by consumers with new tools that make it easier for them to act as environmental monitors.

**Wellness as an occupational health issue.** More companies are taking direct steps, including incentives and penalties, to encourage healthier lifestyle choices among their employees.



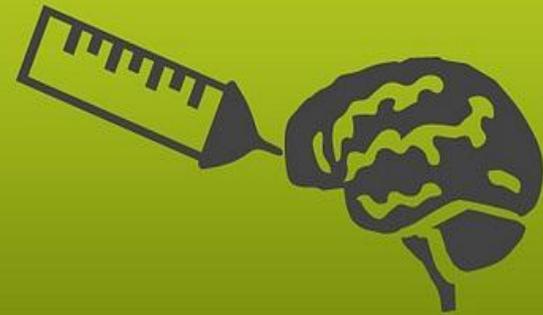
# Knowledge, Education, and Research



The knowledge age is posing new challenges—and opportunities—for industrial hygienists. While information has never been easier to access, the flattening of information hierarchies is requiring many traditional gatekeepers of knowledge to rethink their roles, as well as generating new tools to manage knowledge and facilitate learning.

Online and computer-facilitated instruction are rising to compete with traditional colleges and universities. Scientists face greater scrutiny of their findings, including by the public, which is gaining access to science journals and research posted on the Internet. New players—including digital systems—are challenging the preeminence of legacy institutions and professions.

Meanwhile, new tools are emerging to assist both learners and educators. Learning analytics can generate in-depth data on students' knowledge acquisition, and new online and virtual tools are enabling digitization and virtualization of online instruction. Industrial hygienists will increasingly receive instruction using these new approaches, and the IH profession will see a growing reliance on computer-assisted analysis, expert systems, and a rapidly evolving suite of information management tools and decision support analytical systems.



analytics is the application of “big data” to measuring learning processes and student outcomes.

**Transactional memory.** Tools like Google are becoming part of people's transactional memory, with memory tasks offloaded to systems around them.

**Cognitive collaboration.** Cognitive collaboration is the process of collaboration between human experts and computer expert systems.

**MOOCs for professional training.** Massively open online courses (MOOCs) are being aimed at professional development.

**Augmented reality.** AR systems can overlay various types of data on displays to give a real-time view of factory subsystems.

**Standardized benchmarking.** Postgraduate exams like the Collegiate Learning Assessment Plus give students a way to show employers an objective measure of their abilities.

**How and whom do you trust?** A crisis in verifying findings may create a need for new systems of trust in research.

**Machine learning.** Improved algorithms and the expanding Internet of Things are allowing machines to learn from each other.