



The Evolution of Industrial Hygiene

A Long Strange Trip Historically for Industrial Hygiene to Total Worker Exposure

Presented By:

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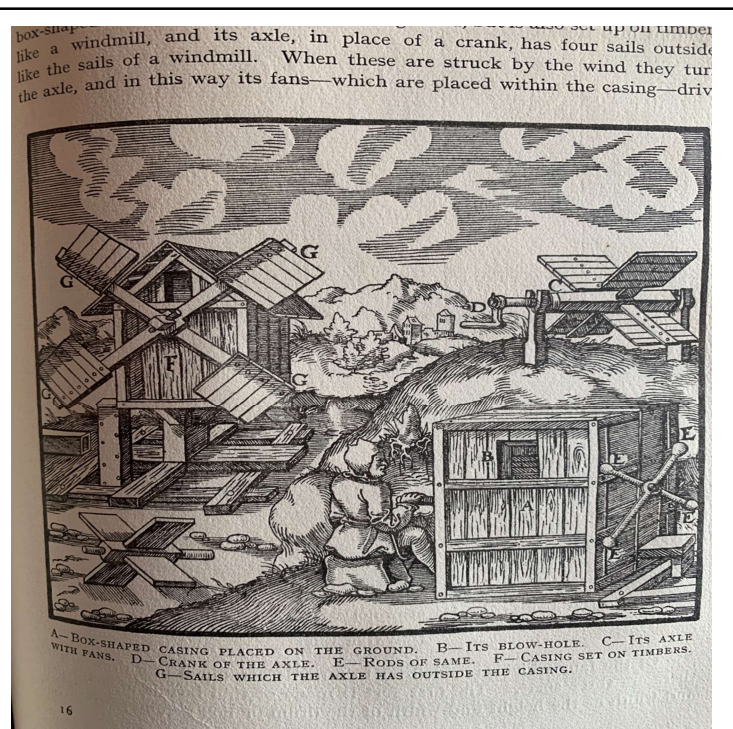
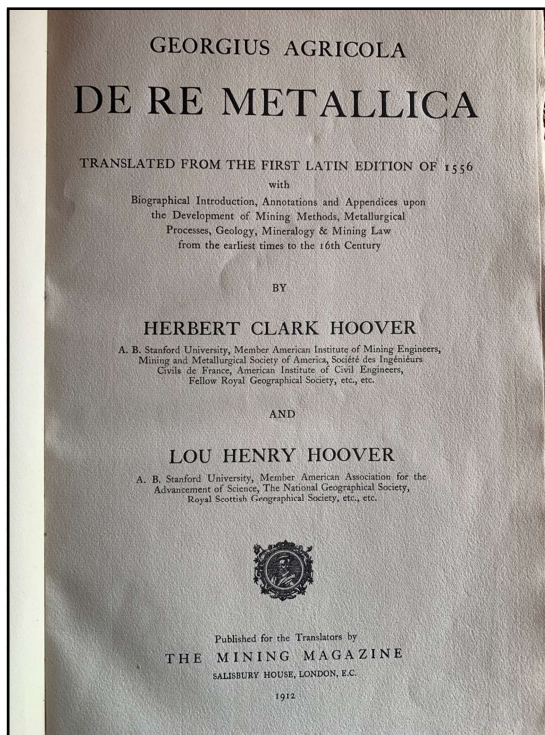


This Presentation is Adapted From:

- **Chapter in 2019 7th Edition of Patty's Industrial Hygiene and Toxicology:** *"The Evolution Of Occupational And Industrial Hygiene As A Profession"* by Barbara Dawson, Kyle Dotson, L. Faye Grimsley, Tom Grumbles, Zack Mansdorf, Jennifer Sahmel and Noel Tresider. Team leader Christine Lorenzo.
- **Revision of the previous 6th Edition (2010) chapter Rationale for Industrial/Occupational Hygiene Practice,** by Robert L. Harris, Lewis J. Cralley, Lester V. Cralley and Vernon E. Rose.
- **Also 6th Edition (2010) chapter IH: Retrospect and Prospect – Hippocrates to Nanotechnology,** by John A. Pendergrass. Historical Review of IH. In Vol. 5. IH – The Future. ACGIH. 1983. Protecting the Health of Workers: The ACGIH. 1990. Dr. Jacqueline Karnell Corn.

Beginnings in Public Health. Where to Start? Pre-US. No much before 1900s.

- **4th century BC**, Hippocrates recognizes Lead toxicity.
- **100 AD**, Pliny the Elder, Roman. Recognized Zinc, Sulphur. A bladder mask.
- **200 AD**, Galen, Greek physician, recognized acid mist risk to copper miners.
- **1473** Ulrich Ellenborg hygiene pamphlet, CO, Hg, Pb, Nitric Acid, (gold miners).
- **1538**, Paracelsus. Swiss. "it is the dose that makes a substance a poison."
- **1556** Agricola, Georgius. De Re Metallica. 1556. A scientific history of mining. Translation by Herbert Hoover and his wife, Lou Hoover, 1st Ed 1912.
- **1705** Ramazzini. Treatise, Diseases of Tradesmen. "*Of what trade are you?*"
- **1778** Percivall Pott: Occupational scrotal cancer from Soot in chimney sweeps.
- **1847**. Beginning of the "Hygiene Era" Semmelweis. Hungarian. *Warned MDs to wash hands (docs took it personally and didn't for decades more).*



Industrial Hygiene Mostly Sanitation

by MDs/Engineers 1900-1930

- **1902.** Oliver, Thomas. Dangerous Trades: The Historical, Social, and Legal Aspects of Industrial Occupations as Affecting Health. 1st "IH" text.
 - **1914.** Amer. Public Hlth Assoc IH Section. USPHS office of IH, Sanitation.
 - **1919.** Journal of Industrial Hygiene in the US.
 - **1916-22.** Palmer, Smyth, Greenburg. Methods to measure dust.
 - **1923.** Cancer < top 5 cause of death. Pneumonia, Flu, Tuberculosis mostly.
 - **1925.** Hamilton, Alice. Industrial Poisons in the United States.
 - **1927.** Harvard Schools of Pub Health/Eng Program "industrial sanitation."
- Knowledge of hazards and industrial disease risks, before 1930 (other than Alice Hamilton) were "convoluted and unclear." (Greenberg 1994).*

Emerging Industrial Hygiene, US, 1930s

- **1935.** Social Security Act of 1935 and the Walsh–Healy Act of 1936. Stimulated new IH programs in industry, foundations, educational institutions, insurance carriers, labor unions, and government.
 - **1938.** 1st yr Cancer #2 (#1 Heart disease). All infections #1. Life Exp, 64.
 - **1938.** Dreessen. 1938. "A Study of Asbestosis in the Asbestos Textile Industry". One of first studies funded by new Social Security funds.
 - **1938.** Michigan IH Society. 160 members. (auto industry birthed IH)
 - **1938.** Nat/Amer. Conf. of Governmental Industrial Hygienists. <100.
 - **1939.** American Industrial Hygiene Association. 160 members.
- Warren Cook estimated 300 industrial hygienists in the US in 1939.*

Carey McCord, MD. Chrysler. Oct. 1937.



It was all about
the Curves



Industrial Hygiene, US, 1940s

- **1942.** NCGIH publishes list of Maximum Acceptable Concentrations.
- **1943.** USPHS. *Manual of IH and Medical Service in War Industries.*
- **1943.** Alice Hamilton's book *On the Dangerous Trades.*
- **1944.** Penicillin mass produced (Finally not so much about biologic risk)
- **1946.** ACGIH publishes list of Maximum Allowable Concentrations.
- **1948.** ACGIH Threshold Limit Values, 144 materials.
- **1948.** 1st edition Patty's Industrial Hygiene and Toxicology.
- **1949.** Trasko in *Public Health Reports*: 45 IH agencies in 38 states.

World War II was a major force in the development of the industrial hygiene profession as noted by Teleky 1948 in History of Factory and Mine Hygiene (Foreword by Alice Hamilton).

“Real” Industrial Hygiene, US, 1950s

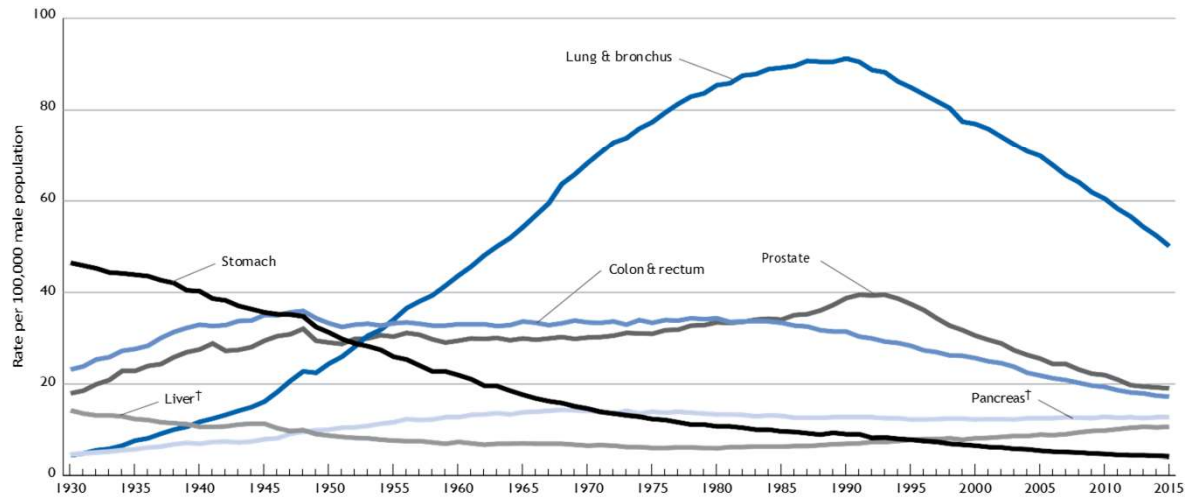
- Growing concern about public/occ health due to increasing rates of cancer in the US.
- 1953. Doll epidemiology shows cigarettes the major cause of lung cancer. But other contributors abounded.
- AIHA tech committees (air pollution, analytical chemistry, noise, and radiation). 1951. Walsh Healey Public Contracts Act includes Safety and Health Standards with list of 29 ACGIH TLVs.
- 1958. AIHA published Hygienic Guides for 56 substances with documented rationale for each.

1950s IH includes air pollution and other community/environmental affairs, health physics.



The Influence of Cancer Rates on IH

Figure 1. Trends in Age-adjusted Cancer Death Rates* by Site, Males, US, 1930-2015



Professional Industrial Hygiene, US, 1960s

- **1960.** American Board of Industrial Hygiene (ABIH). First 13 CIHs. 483 grandfathered by 1962. First CIH exams 1963.
- **1960.** Sherwood and Greenhalgh build first practical battery powered personal sampling pump.
- **1962.** Rachel Carson. *Silent Spring*. Ignited the environmental movement with limits on DDT pesticide.
- **Air Contaminants** - Particulate or gas and vapors as dusts, fumes, mists, aerosols, and fibers. **Biological** - bacteria, viruses, fungi causing acute and chronic infections. **Chemical** - Solids, liquids, gases, mists, dusts, fumes, and vapors. **Physical** - Ionizing and nonionizing electromagnetic radiation, noise, vibration, illumination, and temperature. **Ergonomic** - lifting, holding, pushing, walking, and reaching.

More sampling of workplace exposures than ever before. Lab analytical techniques standardized. Many toxicological, epidemiological studies by government, industry, universities, and foundations provided better data for basis of exposure standards and IH improvements. In 1969, IH was still a small profession with 647 CIHs certified by the ABIH.



OSHA Industrial Hygiene, US, 1970s

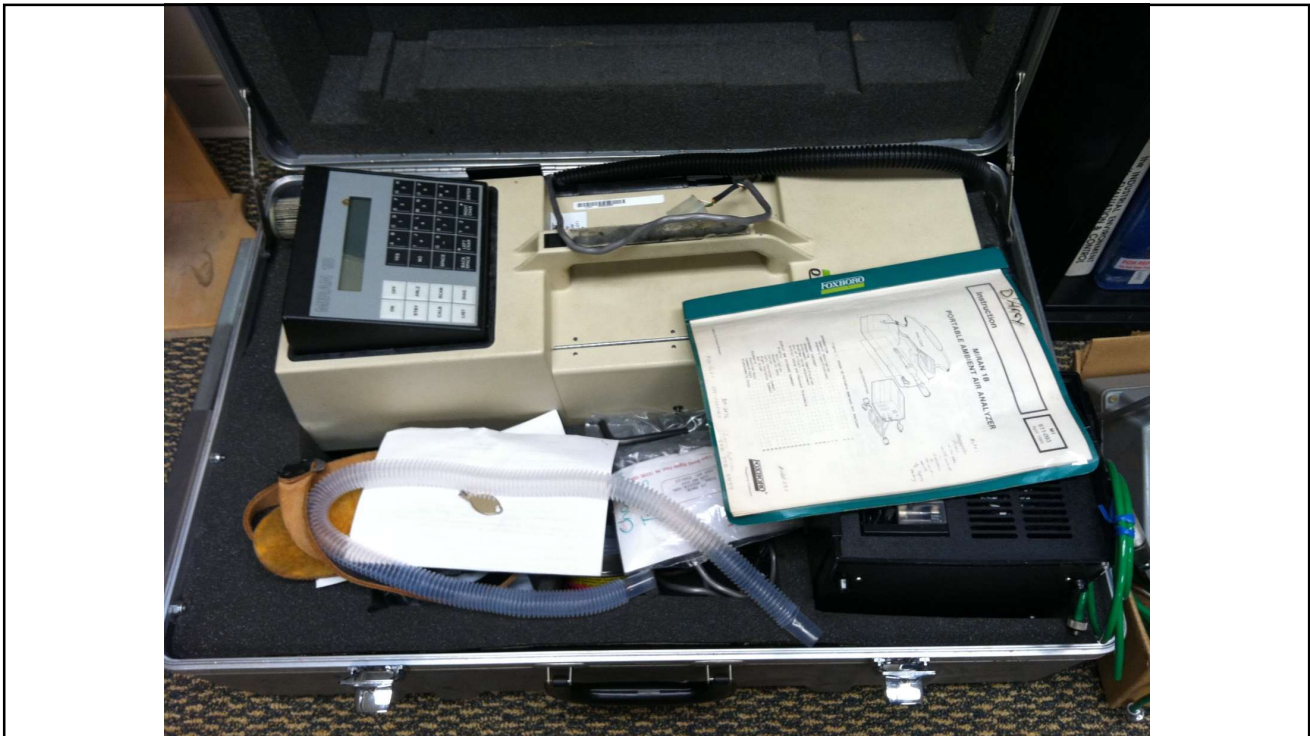
- **1970.** Passage of the Occupational Safety and Health Act creates OSHA. One time adoption of TLVs.
- **1970.** Passage of the National Environmental Policy Act creates EPA.
- **1970.** National Cancer Act of 1971. Starts “war on cancer.”
- **1974.** AIHA established its laboratory accreditation program.
- **1977.** NIOSH “yellow book” defines modern industrial hygiene exposure assessment.

While still a small profession, the 1970s saw the doubling of the number of CIHs from 647 at the end of the 1960s to 1750 by the end of the 1970s.

EPA/OSHA/Liability Driven Industrial Hygiene, US, 1980s

- **1980.** Comprehensive Enviro Response, Comp and Liability Act of 1980 (CERCLA). “Superfund.” Real Estate Env. Site Assessments become the norm.
- **1979-1990.** EPA Orange, Blue, Purple, Green books define a decade of asbestos removal from US buildings.
- **1986.** OSHA Hazard Communication Standard. MSDSs for everything.
- **1984-88.** Canada/US. Responsible Care. Chemical industry pledges EHS.
- **1989** – OSHA S&H Prog Mgmt Guidelines. Precursor to EHS Mgmt Systems.
- The majority of industrial hygiene samples collected historically likely occurred in the 1980s. Great increase of risk assessments based upon data.

While still a relatively small profession, 1980s again saw the doubling of number of CIHs from 1750 at end of the 1970s to 4581 by the end of the 1980s.



Management Industrial Hygiene, 1990s

- Personal Computers at Work. AIHA forms Computer Applications Committee.
- Increasing employment of IH managers but with leaner staffs.
- **1996** OHSAS 18001. EHS based on ISO 9000 (1987) Quality Mgmt Systems.
- Increase in dual certified CIHs/CSPs.
- Behavior Based Safety increases PPE use.
- More IHs as consultants. Tort litigation becomes a major function.

In the 1990s, the profession almost doubled again with the number of CIHs rising from 4581 at the end of the 1980s to 7966 by the end of the 1990s.

“More” Industrial Hygiene, The 2000s

- **2001.** IHS assess fallout of 9/11 and cleanup.
- **2002.** Control Banding began in pharmaceutical industry but adopted more widely and internationally after UK HSE published Control of Substances Hazardous to Health (COSHH).
- **2000-2004.** “Toxic Mold” and Indoor Air Quality. Nosocomial.
- **2005.** CA Meth Lab Cleanup requires CIHs.
- **2006.** REACH Regulations by European Commission. Increasing Product Stewardship activities involving US IHS, phase-in 2007-2018.
- **2006.** AIHA membership peaks at 11,055.

Exposure/Risk Assessments increasingly sophisticated and routine for control of occupational/environmental health hazards in the US.

Industrial Hygiene Profession “Spinoffs”

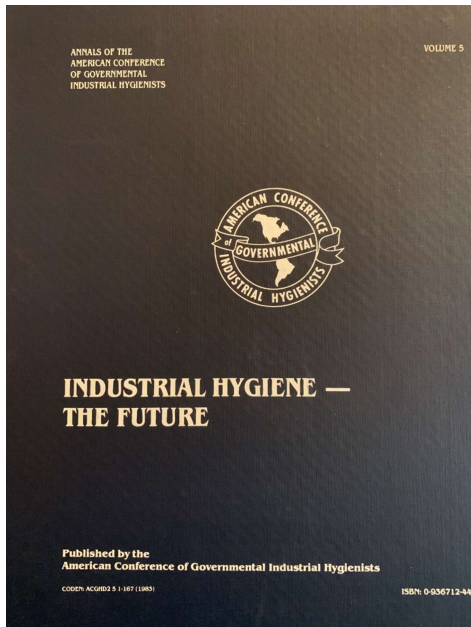
- **1955-56** Health Physics Society
- **1980** Society for Risk Analysis
- **1980s** Asbestos Consultants
- **Mid-1980s-1992** Human Factors/Board Certification in Professional Ergonomics
- **Late-1980s-1990s** State Radon Certifications
- **2000s** Mold Assessment Licensure by State
- **2008** EPA Lead Paint Certifications
- **2012** Product Stewardship

Industrial Hygiene, The 2010s

“Where we are now”

- Increased inclusion of off-the-job risk factors; smoking, alcohol consumption, drug use, hobby activities. DNA individual risk factors.
- Nano risk.
- Sensor detection technology.
- Increasing scope spanning Environmental, Health, Safety, Security, Sustainability.
- Legalization of cannabis/marijuana in Canada/USA.
- Recognition of much more traditional IH to do internationally.

As of 2017, 11,475 people have been certified by the American Board of Industrial Hygiene, with over 6800 in active practice. BOHS as of 2018, has over 1800 members in 57 countries.



“What's past is prologue”

1. William Shakespeare. *The Tempest*. Act 2. About 1610.
2. Douglas H.K. Lee and Irving J. Selikoff, *Asbestos and Disease*. Page 311. 1978.

Enough about the History.

Now about the Future...

*Sarcos Robotics Guardian XO Max
Full-body, battery-powered Exoskeleton
Shipping next year, in 2020.*

*Thanks!
Kyle B. Dotson, CIH*

