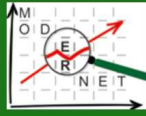


Modernet Meeting 2023



in Milan 12-13 October

Occupational hazards and risk management in academic research: an emerging working population with unusual scenario.

Federico Maria Rubino

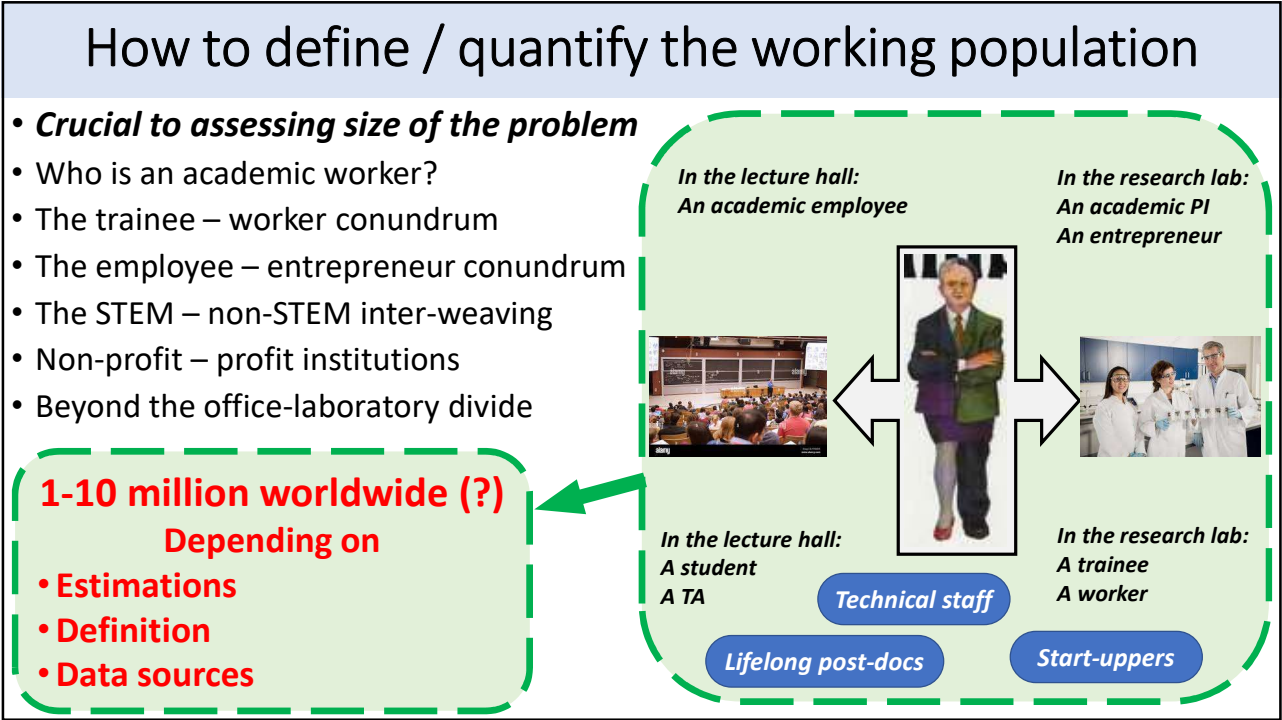
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The «*Endless Frontier*» and its expanding workforce

SCIENCE
the endless frontier
75th Anniversary Edition
VANNEVAR BUSH 25 July 1945

OPPENHEIMER
A FILM BY CHRISTOPHER NOLAN
7 21 23
THE WORLD FOREVER CHANGES

- Not only short-term education
- Government-sponsored research in academia
- The «Golden Era» of most disciplines
- Corporate-sponsored research in academia – *spinoffs* - *startups*



Chemical risk assessment models for chemical plants

Optimized for

- Highly repetitive tasks
- Huge-large amounts of materials
- A limited number of chemicals at time
- Chemicals with sufficiently well characterized properties
- Limited concurrent activities (plant - lab – office)

Totally inadequate for

- Non-repetitive tasks
- Tiny amounts of materials
- Several different chemicals at time
- Chemicals with poorly characterized properties
- Multiple activities concurrent (lab – office – lecture room)

Chemical death of an academic toxicologist

HOME > NEWS > ALL NEWS > MERCURY POISONING KILLS LAB CHEMIST

NEWS | CHEMISTRY

Mercury Poisoning Kills Lab Chemist

11 JUN 1997 • BY SCIENCE NEWS STAFF

SHARE:



In a tragic end to a story that began last summer, an internationally known research chemist at Dartmouth College, Karen Wetterhahn, died on Sunday of poisoning from a few drops of a potent neurotoxin she spilled on her lab glove 10 months ago. She was 48.



Karen Wetterhahn (1948-1997)

CONNECT >

A few deadly precedents in the research lab

- The original discoverers of the substance, in the 1870s: 2 lab technicians died
- A Czech PhD student died after synthesizing a 6-gram amount (1974)

- Unwilling misbehavior
- Partial information ...
- ... Deemed sufficient

Accidental injection of methylene chloride

ACS
central
science

This is not a joke!

EDITORIAL

Safety First: A Recent Case of a Dichloromethane Injection Injury

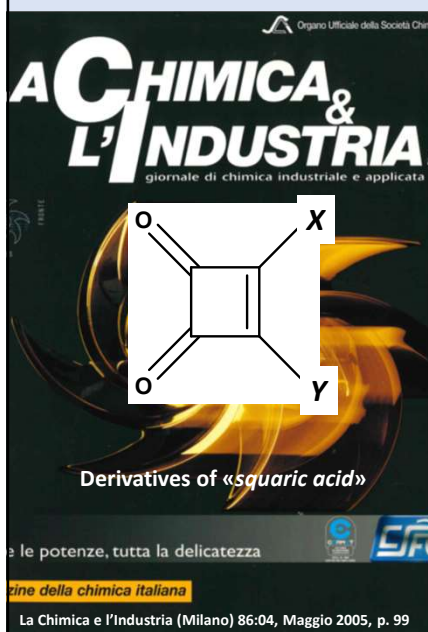
Cite This: ACS Cent. Sci. 2020, 6, 83–86

Read Online



- An accidental 100-microL (two drops) injection of CH_2Cl_2 occurred while transferring the solvent with a sharp-tip syringe
- Only sheer luck – availability of a hand surgeon within short time – saved the guitarist and chemistry PhD student from having his finger amputated

Unprecedented chemicals – unprecedented hazards



- 2005: an academic research chemist in Italy
- Synthesized unprecedented chemical compounds
 - For gaining fundamental knowledge
 - In very small amounts (< millimole, 100 milligrams)
 - To use for spectroscopy studies
- Handled for the few minutes to transfer from vessel to measurement cell
- After one routine measurement, he complained of respiratory impairment
- Diagnostics highlighted extensive lung fibrosis, likely from past cumulative events
- The man alerted his peers in a letter in a national professional fanzine

... or not?

Special Contributions

International Journal of Occupational and Environmental Health
Volume 13, 2007 - Issue 1: The International Construction Industry

Popcorn-worker Lung Caused by Corporate and Regulatory Negligence: An Avoidable Tragedy

David Egilman, Caroline Mailloux & Claire Valentin

Pages 85-98 | Published online: 20 Nov 2013

O=C1C=CC(=O)C1

Squaric acid derivs.

A «unique» chemical curiosity

Prepared once, in milligrams

The New England Journal of Medicine

N Engl J Med . 2002 Aug 1;347(5):330-8 doi: 10.1056/NEJMoa020300.

CLINICAL BRONCHIOLITIS OBLITERANS IN WORKERS AT A MICROWAVE-POPCORN PLANT

KATHLEEN KREISS, M.D., AHMED GOMAA, M.D., Sc.D., GREG KULLMAN, Ph.D., KATHLEEN FEDAN, B.S.,
EDUARDO J. SIMOES, M.D., M.Sc., M.P.H., AND PAUL L. ENRIGHT, M.D.

CC(=O)C(C)=O

Biacetyl 2,3-butandione

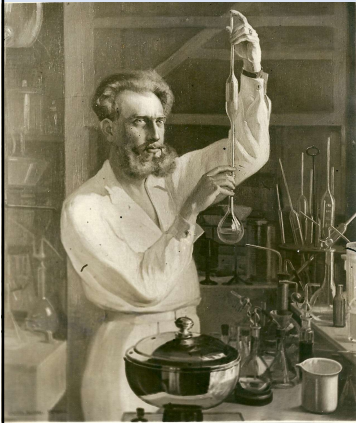
The synthetic fragrance of butter

Thousands of tons a year

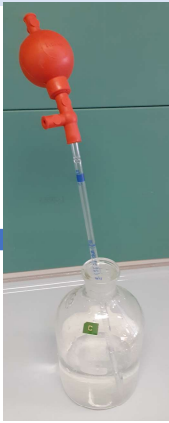
How to forecast health hazard?

- Structural similarity?
- Analogies in reactivity?

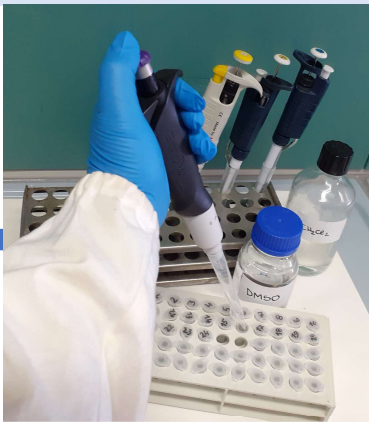
I'm NOT a stitcher, I'm a SCIENTIST!



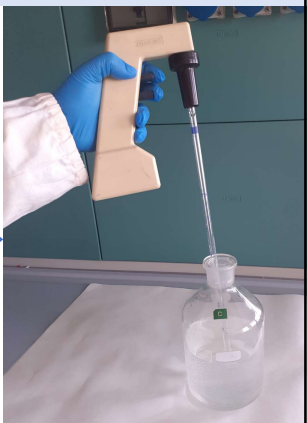
1932
Few samples
Manual pipetting
Aspiration by mouth
No lab coat
Safety is skill & care



Avoid aspiration by mouth
Use the rubber ball!



The «Gilson» system
Many samples
Enhanced accuracy and precision
Large and small liquid volumes
Operator protection
Repetitive movement strain



Motorized aspiration – delivery
Heavier device
Possibility to hang for reduced workload on arm and shoulder

Genuine concern in the academic professional world



Thinking long term for lab safety

Research safety programs should address not only immediate hazards, but daily laboratory activities that could cause adverse effects down the road.

Jun 09, 2023 SARAH ANDERSON, PHD



Chemical Research in Toxicology

pubs.acs.org/rt

Review

What to Expect When Expecting in Lab: A Review of Unique Risks and Resources for Pregnant Researchers in the Chemical Laboratory

Mary Kate M. Lane, Mahlet Gurdew, Emma C. Deary, Cherish N. Coleman, Melissa M. Ahrens-Viquez, Hanno C. Erythropel, Julie B. Zimmerman, and Paul T. Anastas*

Cite This: Chem. Res. Toxicol. 2022, 35, 163–188

Read Online

ACS CHEMICAL HEALTH & SAFETY

pubs.acs.org/acschas

Article

Primer on Area Electrical Classification for Research Laboratories

Richard P. Palluzzi*

Cite This: ACS Chem. Health Saf. 2023, 30, 279–286

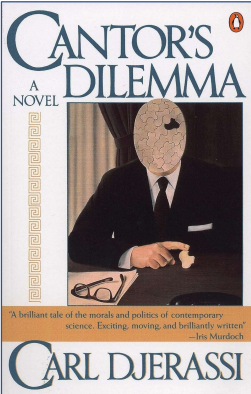
Read Online

Same job
Different employer - Different entitlement
to protection as worker

The hidden cloud of psycho-social stress

The untackled issue

- Instability
- Competition
- Vertical pressure
- Peer pressure
- Tribal culture
- Discrimination
- Personal harassment



1923 - 2015

Not alone in suffering

- The showbiz
- Competitive sport



Jobs disguised into vocations

←All characterized by being→

Vocations disguised into jobs

Conclusions, if any (?)

- **Narrow / wide definition of the working population**
- **Numbers are anyway increasing worldwide**
- **Plurality of roles - relationships**
- **STEM – non-STEM differences**
- **Material – immaterial hazards**
- **Perception of hazard / damage**
- **Necessity for rational approach to issues**

Occupational hazards and risk management in academic research: an emerging working population with unusual scenario.

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Department of Health Sciences, Università degli Studi di Milano, v. A. di Rudinì 8, Milano (Italy)

Since Vannevar Bush's "Endless Frontier" 1948 report, academic research has greatly expanded its goals, well beyond training next-generation scholars and professionals. Long-term governmental and private funding, especially in the most developed nations, increased the number of academic workforces and of long-term, non-tenure track research professionals in academic and no-profit research institutions (Higher Education Institutions, HEI), especially, but not only in the STEM. An emerging working population with an unusual occupational scenario thus emerged in the late XX and early XXI century, spreading from traditionally advanced Countries to an increasingly large number of quickly developing ones. Academic workforce often overlaps with non-academic, especially in the STEM sector, which includes high-end healthcare and technological spinoffs.

A new specific occupational scenario thus emerged, and makes the academic research workforce a specific population for which tailored protection of basic workers' rights needs research-based evidence.

Research in the STEM often involves work at knowledge frontiers, where materials, methods, equipment, are by definition not tested for safety, including new, previously unknown molecules, living organisms and techniques. Flexible occupational relationships have developed well beyond the traditional short-term mentorship. An increasingly large proportion of the academic research workforce is female in their life-determining passages that involve relationship, family building, childbearing. Academic institutions attract an ethnically and otherwise diverse young workforce that does not coincide with the traditional migrant working population.

Awareness of entitlement to workers' health protection may be limited especially for younger academic research workforce, due to specific characteristics of job relationships, such as fixed-term, fixed-project hiring, lack of protection in contracts, vertical and peer pressure. Top-ranked scholarly journals, such as the behemoths *Science* and *Nature*, often address specific issues in editorials and policy discussions, such as protection from physical and psychological harassment, demeaning, discrimination on non-professional grounds.

Thus, the academic research workforce is twice "new and emerging".

First, this population of workers has been little considered or has been grouped, for risk assessment, in broader, poorly discriminating categories and job titles. Since the numbers are steadily increasing, it is worthwhile to address them better as a separate workforce from others that perform analogous tasks in different environments, such as in the corresponding industrial companies that necessarily adopt stringent safety and health management measures.

Second, workers face specific risks that have not been addressed before, due to the novelty of the agents and of the scenarios. Traditional approaches to hazard assessment for new entities may fail due to the novelty of the involved materials and are not generally performed, basing on the assumption that very low amounts are produced and handled by a small number of trained and well-protected operators. Occupational hazards that can be efficiently tackled in different working compartments, such as physical, sensorial, mental and psychological stress from repetitive actions that need sustained and meticulous attention, cannot benefit from automation due to the reduced size of workload.

Research in this field is thus needed to rationally address response to a phenomenon for which steady increase is expected in the forthcoming years.

MODERNET 2023

7