

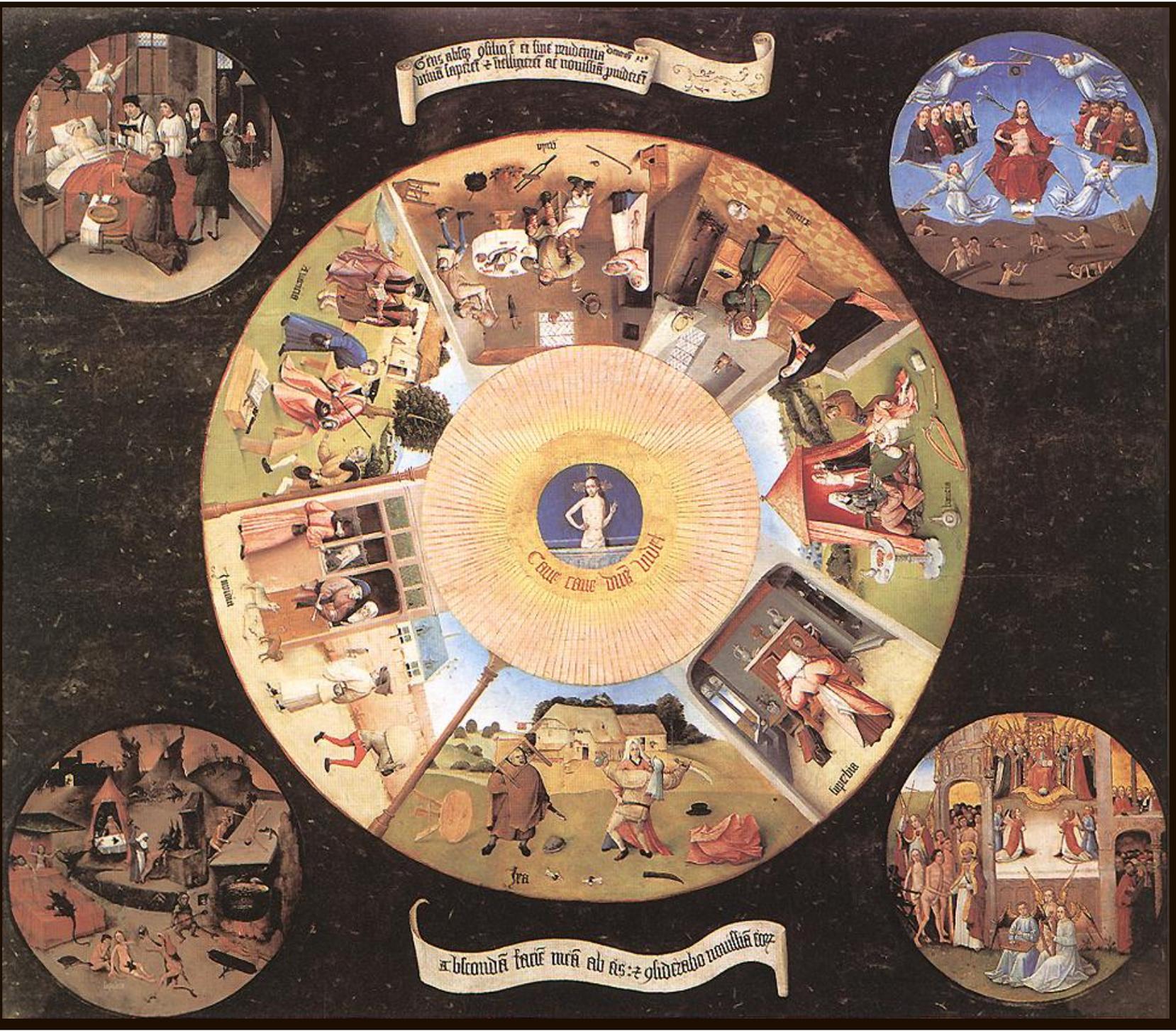
# Tracking emerging hazards:

## The seven deadly sins

... and the  
precautionary  
virtues



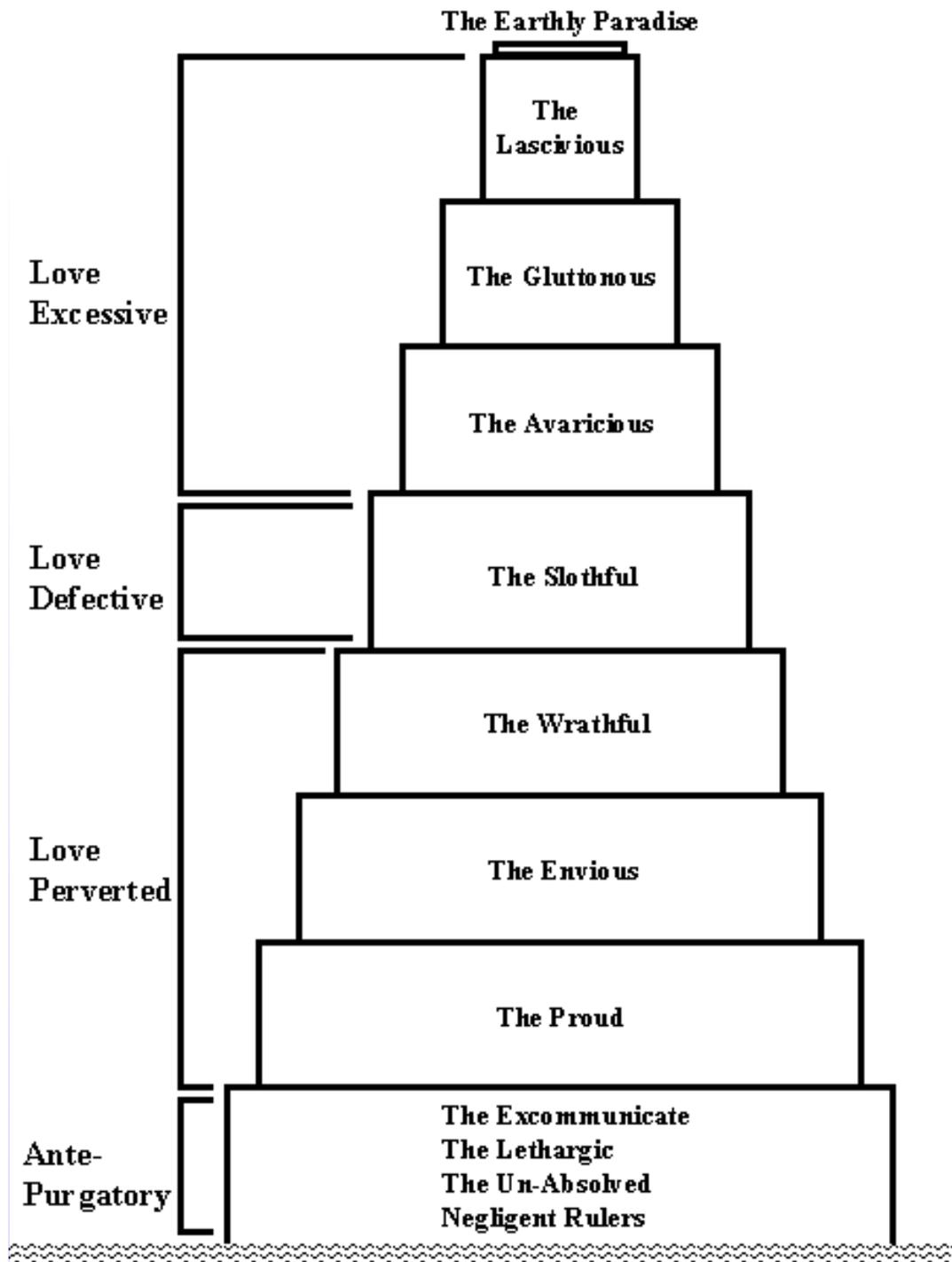
Philippe Grandjean  
University of Southern Denmark  
Harvard School of Public Health



Etis abiq; oñib; et sine prudentia  
vniū sapient et negliget ac nouitiū pudet

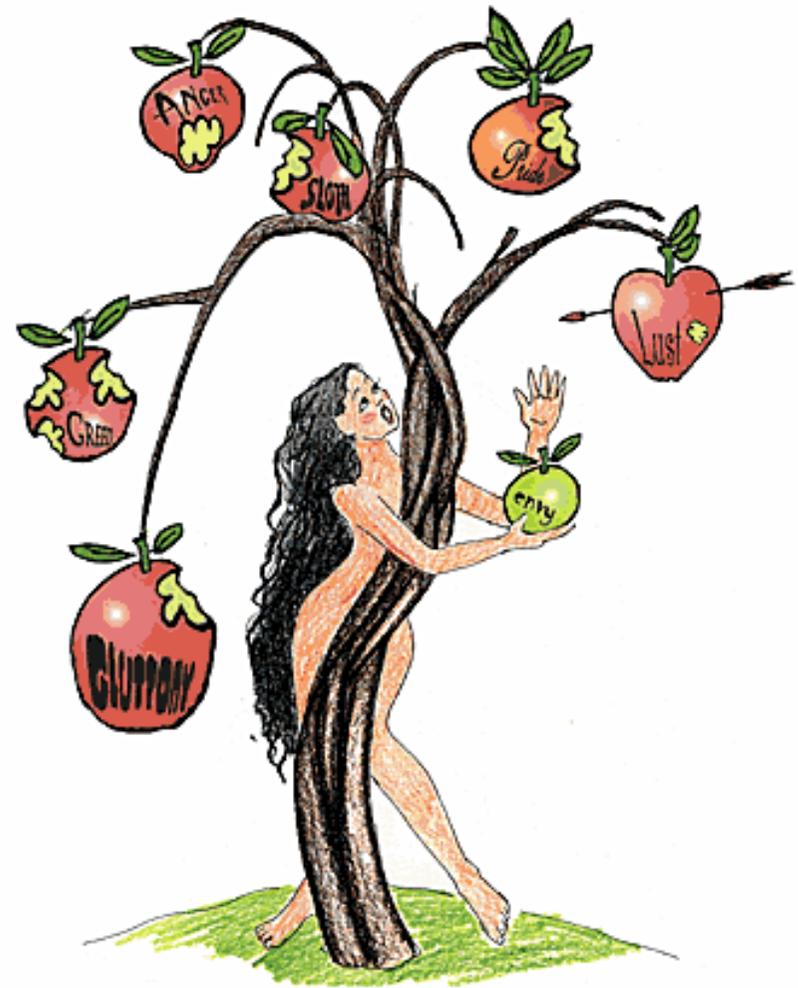
Cave cave dñe uideri

a blonda face nra ad eis: z oñdecho nouitiū coz



# Dante's Mount Purgatory

## ...and a modern version



# Superbia (pride)

Self-delusion, grandiose illusions

Paying overzealous attention and pious respect to high scientific standards  
... when judging the work of colleagues

Condescending attitude toward studies from other countries or cultures

## Constructing “Sound Science” and “Good Epidemiology”: Tobacco, Lawyers, and Public Relations Firms

The tobacco industry has attacked “junk science” to discredit the evidence that secondhand smoke—among other environmen-

| Elisa K. Ong, MD, MS, and Stanton A. Glantz, PhD

THE TERMS “SOUND SCIENCE”

AJPH 2001;91:1749-57

# Pride ignores the bias in epidemiology conclusions\*

<b>Methodological feature</b>	<b>Main direction of error</b>
<b>Low statistical power</b>	<b>False negative</b>
<b>Use of 5 % probability level</b>	<b>False negative</b>
<b>Use of 20% probability level to minimize risk of type II error</b>	<b>False negative</b>
<i>Post hoc</i> hypothesis	False positive
Pressures against false alarm	False negative
Publication bias	False positive
etc...	

Developed with David Gee, John Bailar, and Collegium Ramazzini colleagues

# Invidia (envy)

Ingratitude and failure to recognize others' achievements  
Abusing “criteria” for causality

**“All scientific work is incomplete...**

All scientific work is liable to be upset or modified by advancing knowledge. That does not confer upon us the freedom to ignore the knowledge we already have, or to postpone the action that it appears to demand at the given time.”

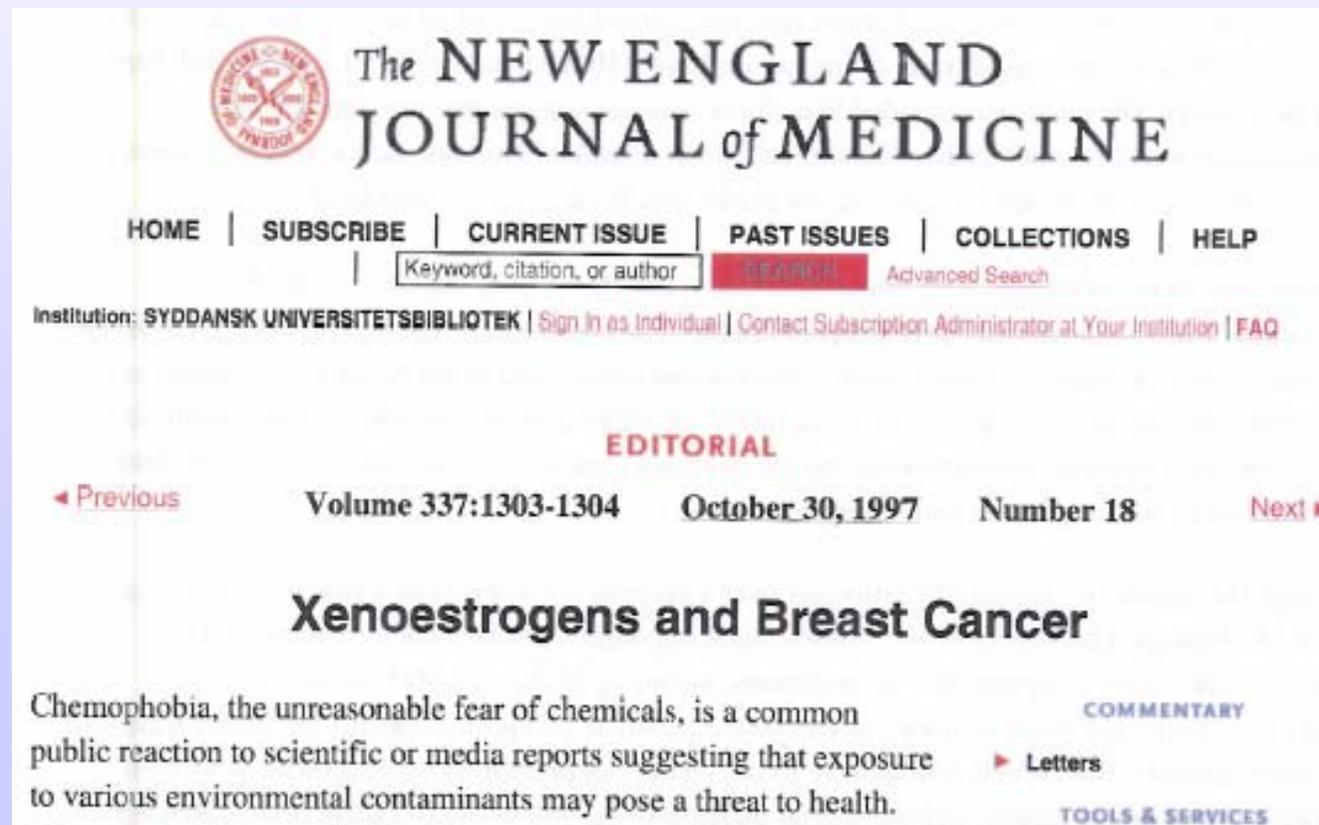
A Bradford Hill (1965)

**Envious researchers mistake the validity of their own conclusions for meticulousness in identifying presumed violations of causal “criteria”**

# Ira (Wrath)

Injury is transformed into the pleasure of vengeance

Often coupled with narrow-minded inflexibility



The screenshot shows the homepage of The New England Journal of Medicine. At the top left is the journal's logo, a red circular seal with a caduceus and the text "The NEW ENGLAND JOURNAL of MEDICINE". To the right of the logo, the journal's name is displayed in a serif font: "The NEW ENGLAND JOURNAL of MEDICINE". Below the logo and name is a navigation menu with links for "HOME", "SUBSCRIBE", "CURRENT ISSUE", "PAST ISSUES", "COLLECTIONS", and "HELP". A search bar is located below the navigation menu, containing the text "Keyword, citation, or author" and a red "SEARCH" button. To the right of the search bar is a link for "Advanced Search". Below the search bar, the institution name "SYDDANSK UNIVERSITETSBIBLIOTEK" is displayed, along with links for "Sign In as Individual", "Contact Subscription Administrator at Your Institution", and "FAQ". The main content area features the word "EDITORIAL" in red. Below this, there are navigation links: "◀ Previous", "Volume 337:1303-1304", "October 30, 1997", "Number 18", and "Next ▶". The title of the editorial, "Xenoestrogens and Breast Cancer", is displayed in a large, bold, black font. Below the title, the first sentence of the editorial is visible: "Chemophobia, the unreasonable fear of chemicals, is a common public reaction to scientific or media reports suggesting that exposure to various environmental contaminants may pose a threat to health." To the right of the first sentence, there is a link for "Letters" and a link for "COMMENTARY". At the bottom right of the page, there is a link for "TOOLS & SERVICES".

# Lust and Gluttony

Obsession with satisfaction

Inordinate appetite for credentials / publications

Desire for replication

Demand of full documentation,  
complete evidence

...paves the way for continued  
studies, more funding, inertia,  
and...

... *Greed*



# Avaritia (greed)

Inordinate desire of possessions

Prestige, academic honors, burgeoning CV act as means to achieve, wield and display personal power

## Special Contributions

American College of Occupational and Environmental Medicine (ACCOEM):

A Professional Association in Service to Industry

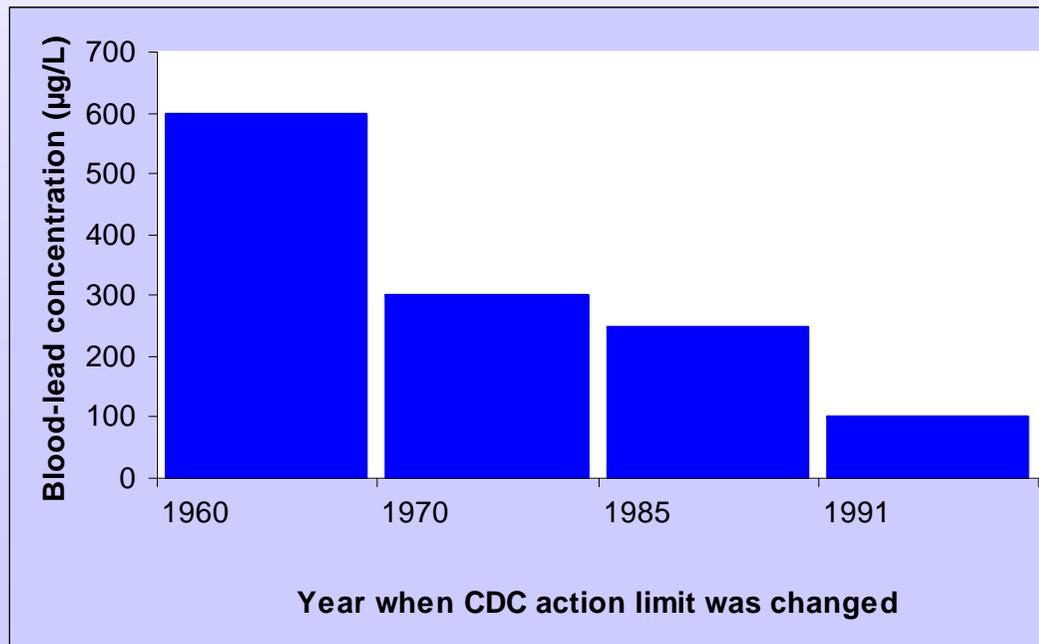
**JOSEPH LADOU, MD, DANIEL T. TEITELBAUM, MD, DAVID S. EGILMAN, MD, MPH,  
ARTHUR L. FRANK, MD, PHD, SHARON N. KRAMER, JAMES HUFF, PHD**

# Acedia (sloth)

Indifference to the welfare of others

Apathy, callousness and lack of caring

Hiding in the ivory tower



Safe level now recommended by many public-health officials

Truly safe level

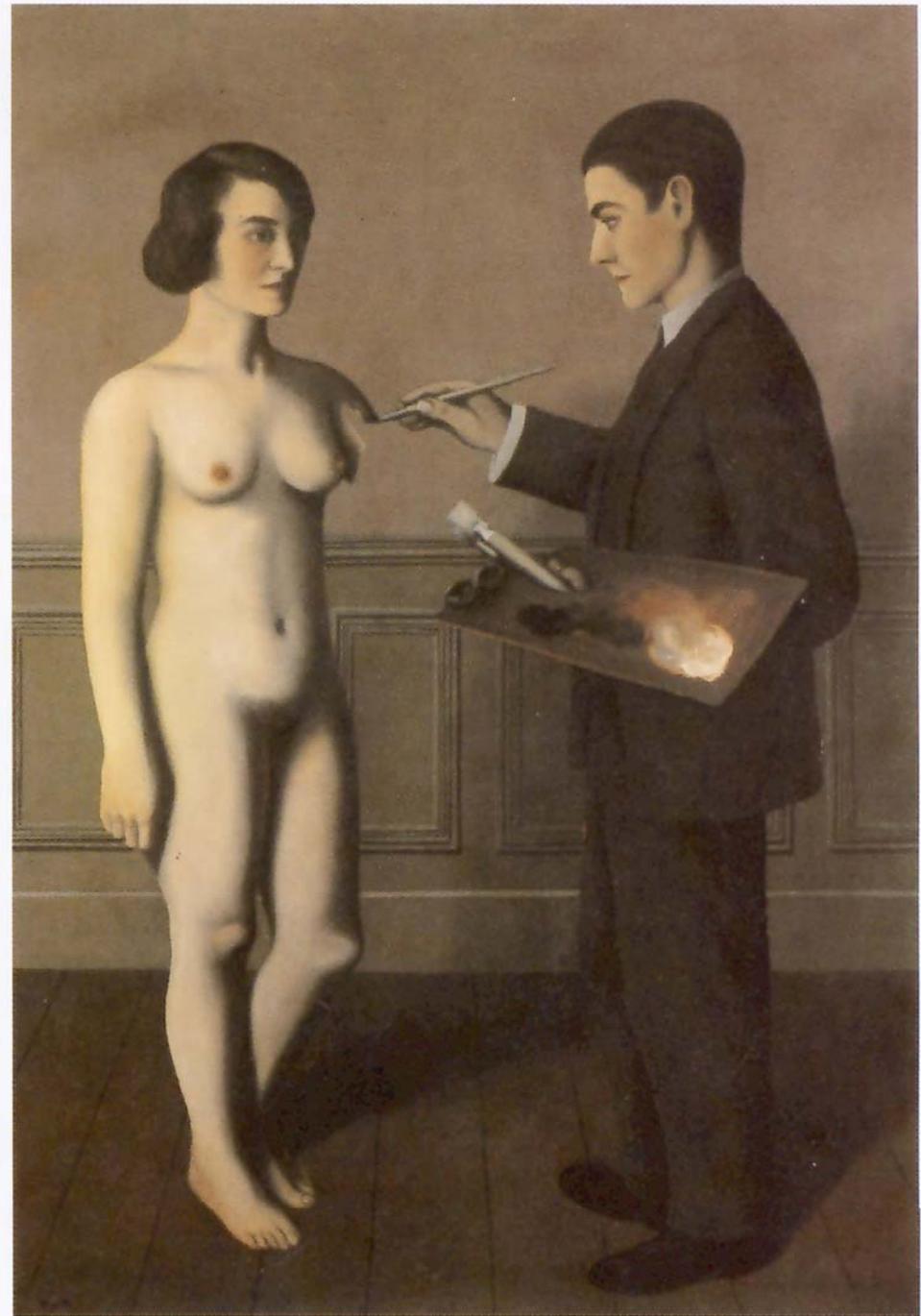
*Prudent interpretation of environmental science may be inspired by (but does not necessarily depend on) the Precautionary Principle*

The subject is capable of being decided by exact numerical investigation, but I have thought it better to publish my inquiry in its present imperfect state than to wait till I should be able to make such a complete research as I could wish, more especially as, by directing the attention of the profession to the question, it may be earlier decided.

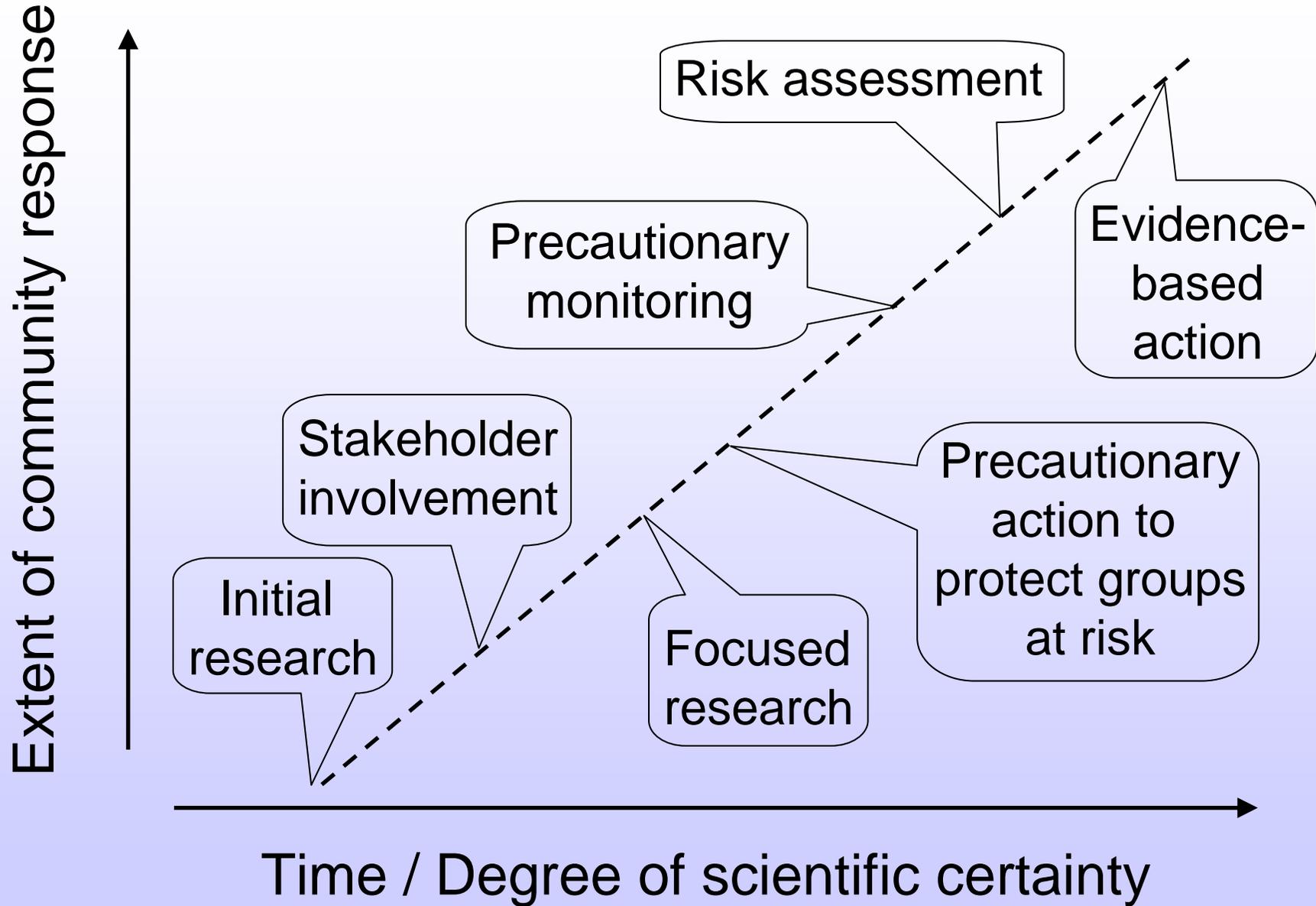
John Snow (1855)

We must recognize that a phenomenon may exist, even if we cannot see it...

What could be known, given our research opportunities and methodologies?



# Need for new science-policy interface



# Precautionary remedies for ailing environmental health science

<b>Vice</b>		<b>Precautionary virtue</b>	
Pride	<i>Preoccupation with methodology</i>	Humility	<i>Exploration of uncertainty</i>
Envy	<i>Failure to recognize achievements by others</i>	Fairness	<i>What could be known, given the evidence?</i>
Wrath	<i>Self-righteous intimidation of competitors</i>	Empathy	<i>Weighing in all relevant evidence</i>

<b>Vice</b>		<b>Precautionary virtue</b>	
Lust	<i>Desire for academic honors</i>	Restraint	<i>Balanced choice of research methods/topics</i>
Gluttony	<i>Excessive craving for publications</i>	Innovation	<i>Limiting attempts of replication</i>
Greed	<i>Benefit from vested interests</i>	Transparency	<i>Involvement of all stakeholders</i>
Sloth	<i>Callousness to injustice</i>	Compassion	<i>Public health responsibility</i>

To expunge  
their sins  
researchers  
must climb  
Mount  
Purgatory





The Precautionary lesson: We need to change the way we plan, conduct, report, and use science