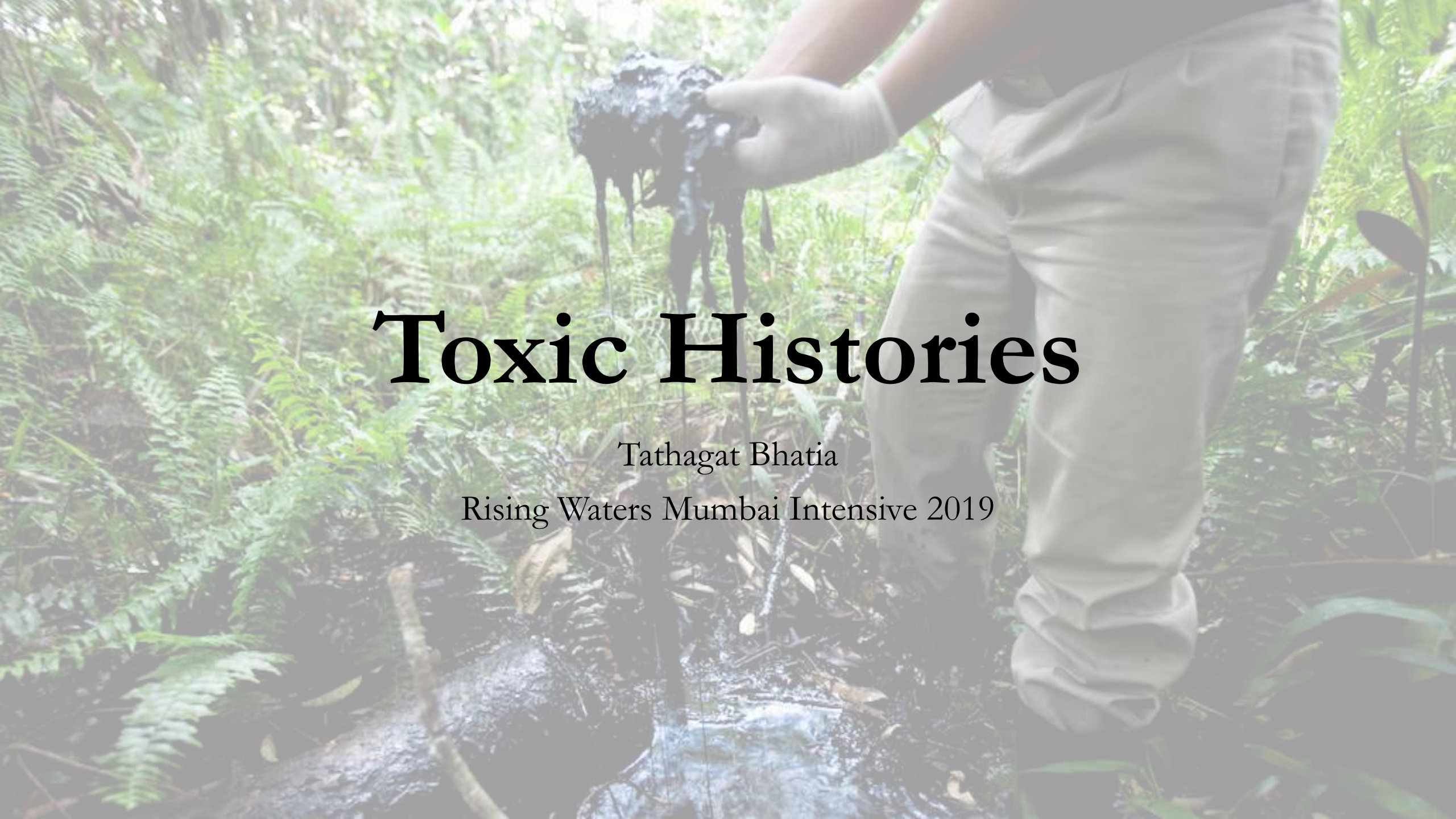


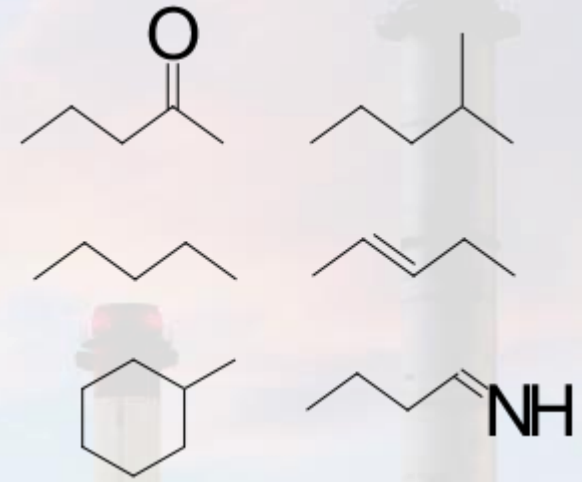
Toxic Histories

Tathagat Bhatia

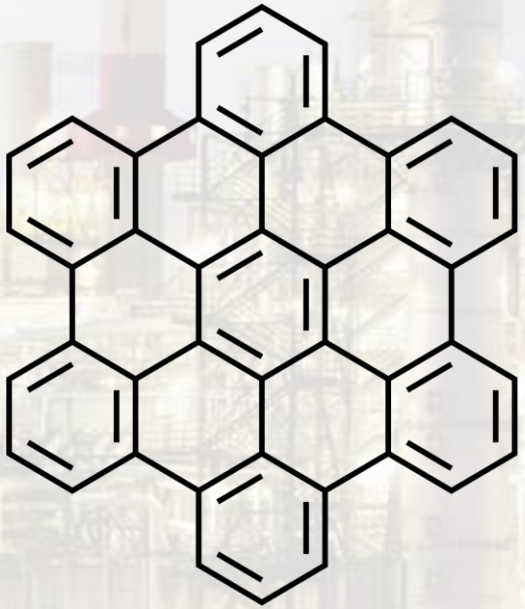
Rising Waters Mumbai Intensive 2019

Background

- Total Petroleum Hydrocarbons (TPH)
  - Umbrella term for hydrocarbons in crude oil
  - 1000s of compounds, less than 30 studied and analyzed



- Polycyclic Aromatic Hydrocarbons (PAH)
  - Many rings, fused
  - Either light-volatile or heavy-inert



Methodology

- Trace important events in classifying TPH and PAH as a toxic substance
- Finding analogs to compare Mumbai and Philadelphia
- Trisection of toxicity
  - Government/law
  - Corporations
  - Science

Difficulty in TPH measurement

- Different methods yield different values of TPH levels
- Some carcinogenic chemicals are volatile and do not remain in the environment for long
- Not all chemicals in TPH are equally harmful
  - "TPH concentration data cannot be used to quantitatively estimate human health risk"
  - Post 1993 states moved from establishing limits on TPH to focusing on risk to human health

The term "total petroleum hydrocarbons" (TPH) is generally used to describe the measurable amount of petroleum-based hydrocarbons in the environment; and thus the TPH information obtained depends on the analytical method used. One of the difficulties with TPH analysis is that the scope of the methods varies greatly. Some methods are nonspecific while others provide results for hydrocarbons in a boiling point range. Interpretation of analytical results requires an understanding of how the determination was made.

ATSDR 1999

Regulatory framework

Mumbai

- **Central Pollution Control Board** (CPCB) advises state boards, helps in setting standards for water quality and measuring practices
- **Maharashtra Pollution Control Board** (MPCB) works at the state level, sets standards and publishes reports
- **Water (Prevention and Control of Pollution) Act** of 1974, amended in 1988
- **NEERI**, **NIO** (offshore refining) and **Bureau of Standards** work with CPCB and MPCB to test waters and update standards

Philadelphia

- **Environment Protection Agency** (EPA) enforces federal regulations, including water quality standards on a state level
- **Philadelphia Water Department** (PWD) provides potable water to Philadelphians, which includes treating wastewater (most cities have these)
- **Clean Water Act** of its 1972 form strives to protect the integrity of American waters
- **Bureau of Laboratory Services** division has water quality testing facilities (not all cities have these)

TPH in India

- No restrictions on TPH levels by CPCB but limits imposed on benzo(a)-pyrene (PAH) and benzene
- Elevated TPH levels in upper Assam near oil fields, Amba Estuary and "around automobile workshops"
- Currently no "federal regulatory guidelines" in place for bioremediation

[1][1. Petroleum Oil Refinery:

Parameter 1	Standard 2
	Quantum limit in Kg/l 1,000 tonne of crude processed
1. Oil & Grease	2.0
2. BOD $_{3\ days,\ 27^{\circ}C}$	6.0
3. COD	50
4. Suspended Solids	8.0
5. Phenols	0.14
6. Sulphides	0.2
7. CN	0.08
8. Ammonia as N	6.0
9. TKN	16
10. P	1.2
11. Cr (Hexavalent)	0.04
12. Cr(Total)	0.8
13. Pb	0.04
14. Hg	0.004
15. Zn	2.0
16. Ni	0.4
17. Cu	0.4
18. V	0.8
19. Benzene	0.04
20. Benzo (a) – Pyrene	0.08

CPCB's standards

TPH in the US

- TPH has never been regulated at a federal level
- 1970s: States took the lead, with very different standards (10 to 10,000 ppm) and EPA made PAHs a "priority pollutant"
- In 1993 TPHCWG is set up to reconcile the disparity. Calls state standards "sometimes arbitrary" and finds little harm in PAHs. Says:
  - Disregard TPH levels and focus on risk to health
  - Most TPH chemicals are inert/volatile so not as dangerous as portrayed
  - Group into fractions
- Unlike TPHCWG reports, many scientists find PAHs (inert and volatile) harmful, with a spike in congenital spinal/cardiac defects in at-risk areas

Has the federal government made recommendations to protect human health?

There are no regulations or advisories specific to TPH. The following are recommendations for some of the TPH fractions and compounds:

The EPA requires that spills or accidental releases into the environment of 10 pounds or more of benzene be reported to the EPA.

The Occupational Safety and Health Administration has set an exposure limit of 500 parts of petroleum distillates per million parts of air (500 ppm) for an 8-hour workday, 40-hour workweek.

ATSDR's website

TPH in the US

- Based on TPHCWG reports, US policy shifted from investigating TPH to investigating subsets or "fractions" of chemicals in crude oil
- The Working Group has also standardized processes that "produce inability to apprehend the harmful effects" of PAHs
- The reports of TPHCWG cite only industry-scientists
- Interests become clearer knowing it was formed soon after the *Exxon Valdez* spill of 1989

Some findings

- Toxicity does not emerge entirely from scientific research; it has social underpinnings

- In case of TPH, indeterminacy in science has been manufactured and exploited by oil companies to jeopardize its toxic status
  - Moving from levels and caps to risks
  - Dividing TPH into benign and less benign fractions/groupings
  - Standardizing processes in TPH testing that produce uncertainty

> This production of truth claims serves to hide the controversy around petroleum hydrocarbons and the partiality of the industry's own claims. At one level, industry-related scientists must depict the state of scientific knowledge in constrained and limited terms in order to magnify corporate certainty; that is, they misrepresent by selectively ignoring, even censoring out, other science—those alternative chemical stories that don't suit industry interests. Not one of the industry-sponsored or -associated studies I examined cited research outside its bubbled industry-science realm. But more profoundly, and insidiously, the laboratory techniques and protocol that industry scientists have standardized produce the inability to apprehend the harmful effects of three-ringed PAHs. That is, their experiments—with the requisite tests and equations—cannot register a consequential value. The life-debilitating capacity of heavy PAHs is made imperceptible; and imperceptibility is inevitable because it is actively produced as such.

Suzana Sawyer in *Law, Science and Indeterminacy*

Key Problems

- Lack of data about TPH regulation in India
  - At times, counter-factual to study why regulation did not happen
- Understanding toxicity through remediation
  - Reversing our approach from studying polluted areas to remediated areas
  - What is clean? What is clean enough? Who decides?