The technical challenge: Reduce wet and dry friction.

The technical solutions: Wax, surfactants, fluorocarbons.

- PFOA (Perfluorooctanoic acid)
- Sodium dodecyl sulfate
- Paraffin
- Cycloparaffin
Academic

• Chemists are evaluated in terms of their publications and grants.

• They are interested in new chemistry, and making things that have never been made before.

Industrial

• Chemists are evaluated based on new patents for the company.

• They are interested in cost, efficiency and new intellectual property.

Future

• Chemists will still be evaluated based on publication, intellectual property, etc.

• They consider impacts on human health and the environment.
The article reports that some workers and skiers are exposed to PFCs from ski wax. Some ways of controlling exposure, such as adequate ventilation and protective equipment, are mentioned.

A central environmental health problem is that of “containment.” Once a chemical is produced and distributed for use, it becomes virtually impossible to control the ultimate environmental fate of that substance. It is a fallacy to count on limiting exposure at this stage.

- Personal protective equipment and engineering controls cannot be taken for granted, and are not always provided or implemented.
- Even if primary users (e.g. workers) are protected from exposure, how is the rest of the biosphere protected against eventual exposure? Does adequate ventilation protect the atmosphere?
- The potential for uncontrollable human and environmental exposure to chemicals such as PFCs is amplified by persistence, bioaccumulation, and long-range transport.
The standard environmental health-driven question in a case like this is “Is it safe to use PFCs in ski wax?” This produces a series of detailed investigations into health effects and exposure scenarios in an attempt to quantify the associated risk.

Asking the question this way bounds the analysis and reduces its relevance. Instead:

1. Account for the effects of *aggregate exposures*—resulting from multiple sources of exposure to the same chemical.

2. Account for the effects of *mixed exposures*—many chemicals affect the same physiological processes, and people are simultaneously exposed to hundreds of chemicals.

3. Ask “Is it necessary?” not “How much harm is acceptable?”
1. This case illustrates how the legal system presumes economic activity will benefit society, even if there is some collateral damage.

2. Government can regulate PFC-ski wax, but only if it shows there is a risk of harm caused AND that the risks outweigh the benefits.

3. Plaintiffs can sue for damages, but the burdens are even heavier than the government’s; that is why the federal environmental laws were adopted!

4. This system leads to vested economic interests that can resist regulation and litigation, and seems to create an economy vs. environment conflict.

5. Under REACH, the burden of proof for PFC-ski wax may be placed on industry to show benefits outweigh costs.

6. Paul Anastas, one of the fathers of green chemistry and now working at EPA, believes voluntary measures and R&D are the best way to promote GC.
**A lawyer’s view of Ski Wax (Prof. Alastair Iles)**

**Litigation**

Can consumers sue companies for harm resulting from using ski wax?

Major obstacles to legal liability:
- Proving causation
- Showing actual harm for plaintiffs

Result: manufacturers lack the legal and regulatory incentive to produce safer products.

**Policy-making**

Can policy-makers act on the risks that ski wax poses?

Major obstacles to intervention:
- EPA isn’t paying attention and isn’t conducting scientific assessments of the risks
- Manufacturers have no obligation to test their substances
- There is no requirement to disclose ingredients in products
- EPA struggles to require manufacturers to change or withdraw the product unless they voluntarily do so.
Businesses are going to look at this as a business problem
They will want to know if it is a real threat to their bottom lines
Are they likely to be sued? Will this lead to regulation?
Do customers care? – these products are high performance waxes
Are there alternatives that work as well – or not?
They will need to decide what to do – R&D for new product? withdraw from market? Fight? Wait and See?
If the precursor chemical that is especially toxic is in everything - even pizza boxes – chemical producers may feel it is necessary to fight – debunk research, lobby Congress, EPA, the public