

Fire investigation as an interface of forensic science and fire safety

Olivier Delémont

Ecole des sciences criminelles, University of Lausanne

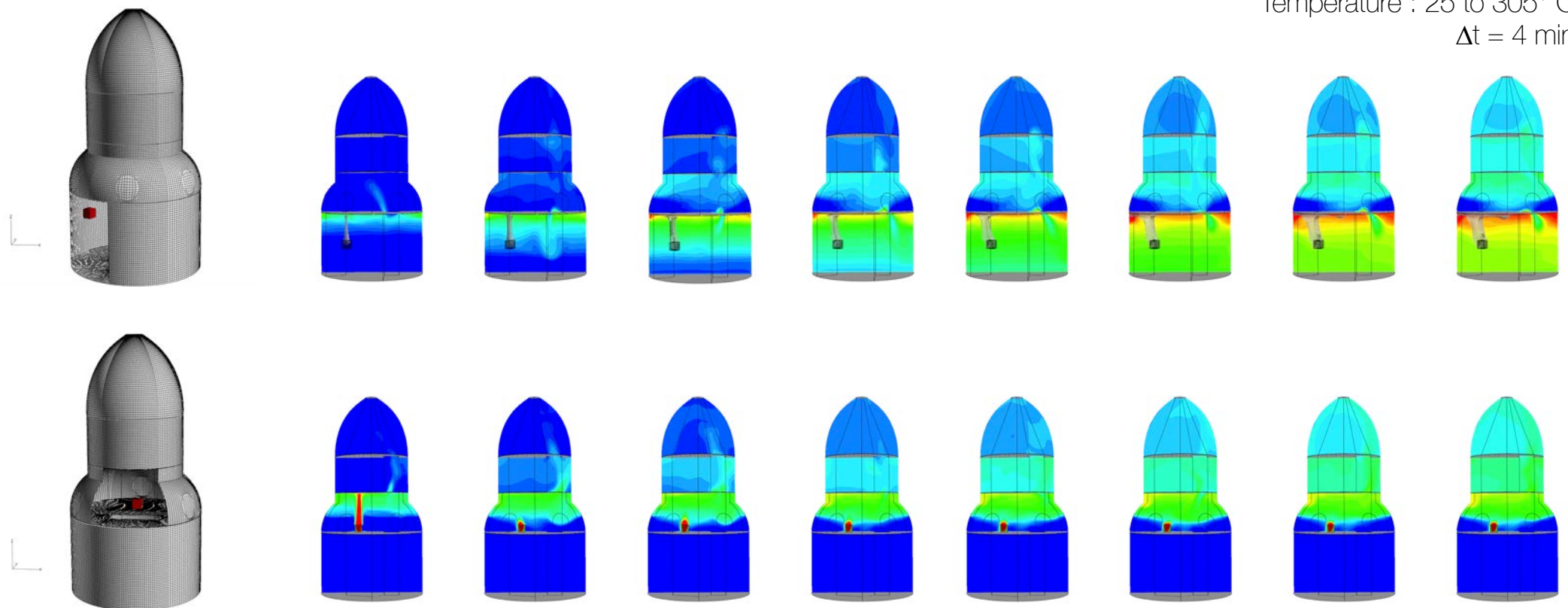
Introduction

- > Once upon a time...
 - > Fire of the Chapel of the Holy Shroud (Turin, Italy)
 - > April 11, 1997
 - > renovation work in progress



Introduction

- > Two possible scenarios (of fire origin and cause) were experienced through fire modelling



Fire computer modelling application

- > Mainly for fire safety or prevention purposes (anticipation of potential fire scenarios, prediction)
- > **Limited number of applications for reconstruction process** (fire investigation, post event analysis, explanation)

Yet, the usefulness of modelling was early acknowledged:

The King's Cross Station Fire; London (1987; Flow3D)

Simcox S et al., « Computer Simulation of the Flows of Hot Gases from the Fire at King's Cross Underground Station », Fire Safety Journal, 1992; 18: 49-73.

Woodburn PJ & Drysdale DD, « Fires in Inclined Trenches : Steady-State and Transient CFD Simulations », Interflam '96, Interscience Communications Ltd.

The 62 Watts Street Fire, NY (1994; CFAST)

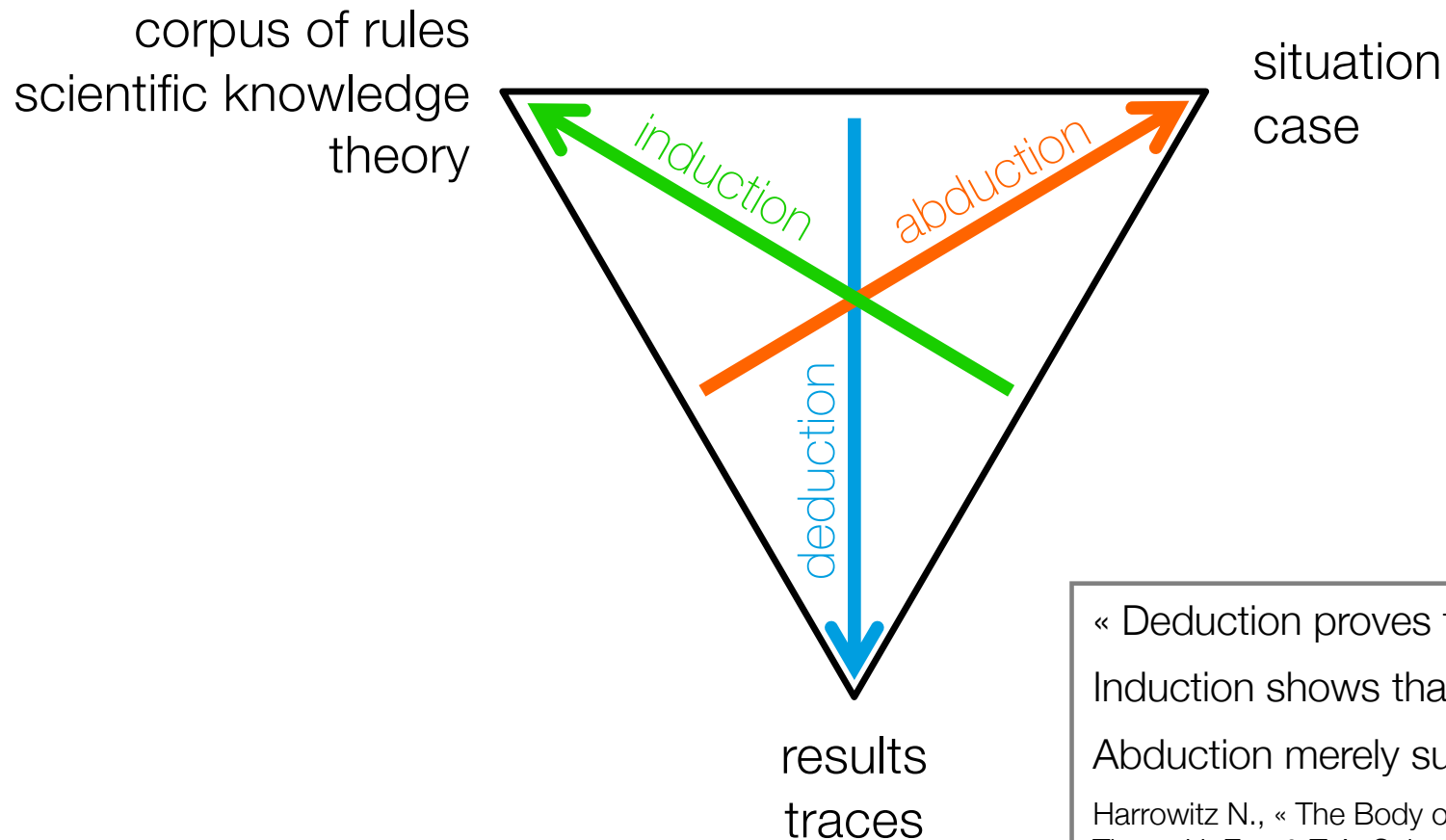
Bukowski RW, « Modelling a Backdraft: The Fire at 62 Watts Street », NFPA Journal, 1995; 85-89.

The logo of the University of Lausanne (UNIL) is displayed in a white, stylized script font.

UNIL | Université de Lausanne

Ecole des sciences criminelles

Peirce semiotic: fundamental reasoning schemes

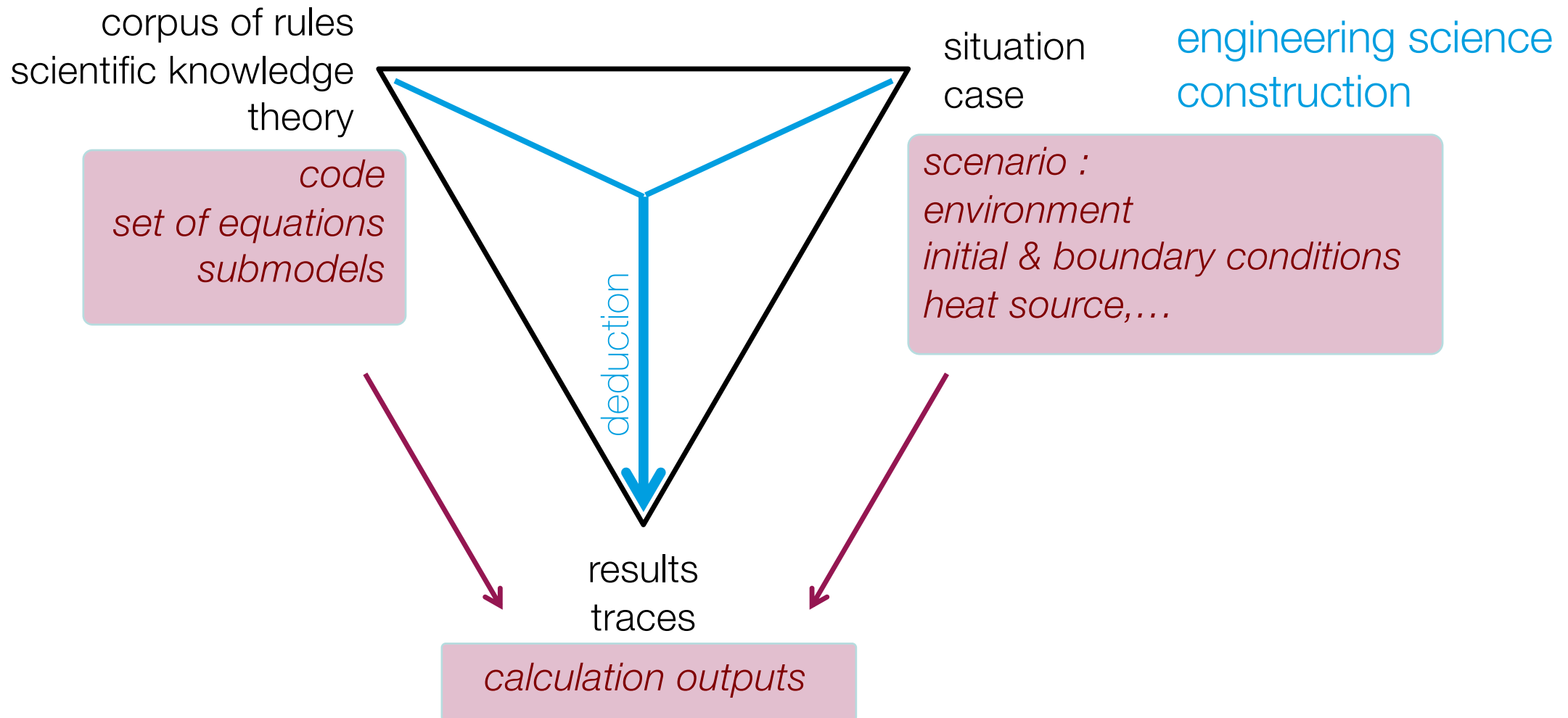


Charles Sanders Peirce
(1839 – 1914)

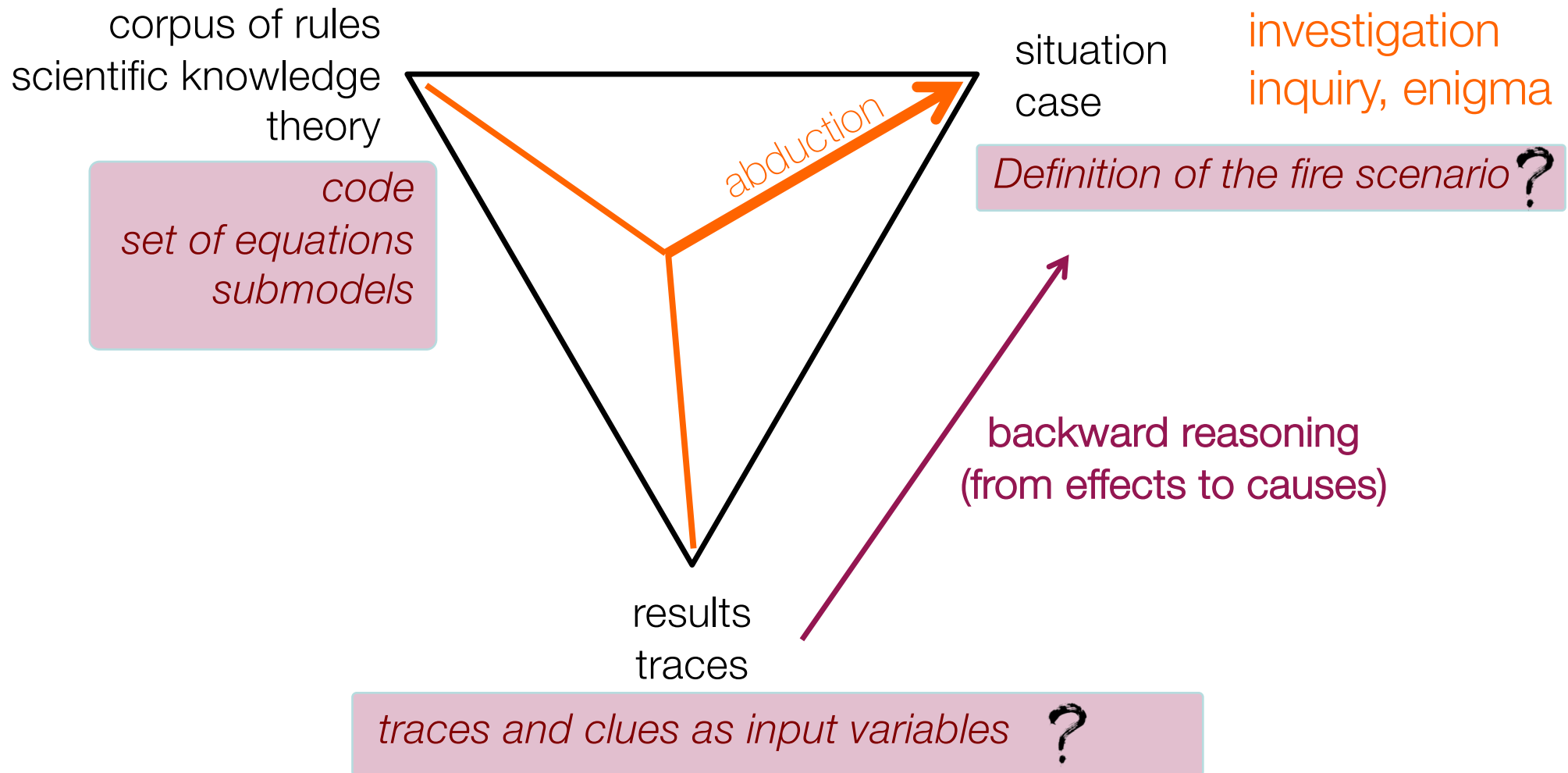
« Deduction proves that something **must be**;
Induction shows that something **actually is** operative;
Abduction merely suggests that something **may be**. »

Harrowitz N., « The Body of the Detective Model », in The Sign of Three, U. Eco & T.A. Sebeok ed., 1983, Indiana University Press, p. 181.

Peirce semiotic: fundamental reasoning schemes



Peirce semiotic: fundamental reasoning schemes

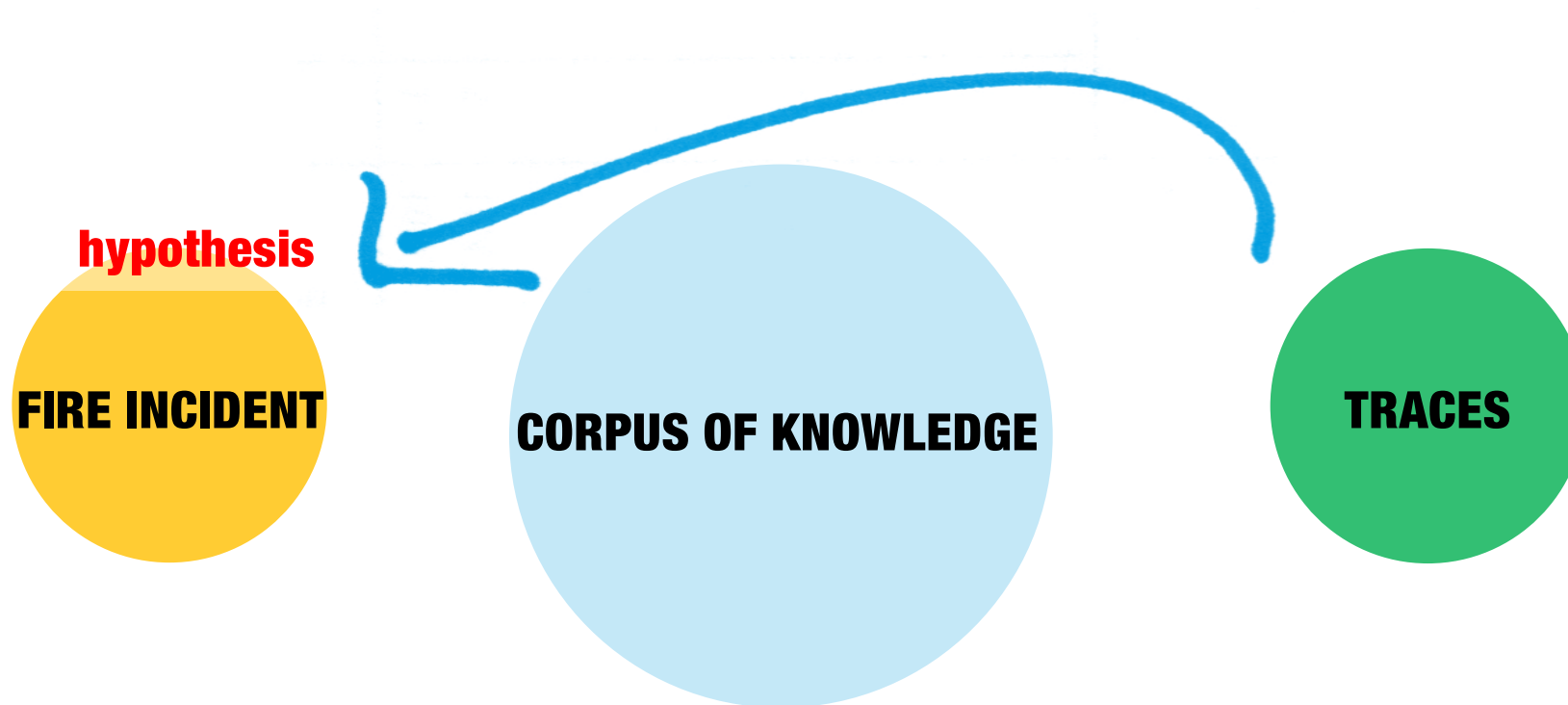


Observation

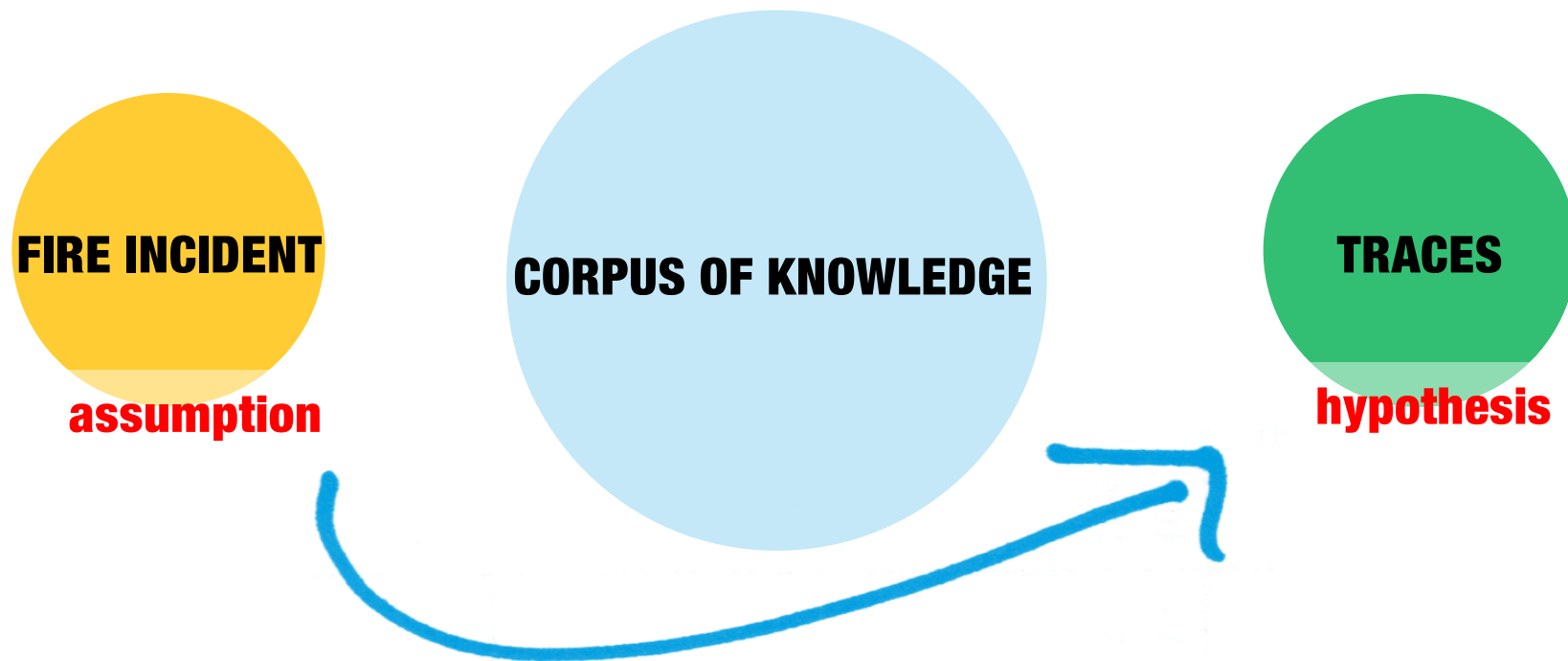
- > Computer modelling is a **purely deductive process** : it starts from a specific situation, and applies mathematical relations to obtain results
 - ➡ It naturally fits into the perspective of fire safety
- > Forensic investigation and fire safety are based on different perspectives, rely on different fundamental reasoning schemes
 - ➡ Distinct disciplines that share a common field of knowledge

Can they be reconciled?

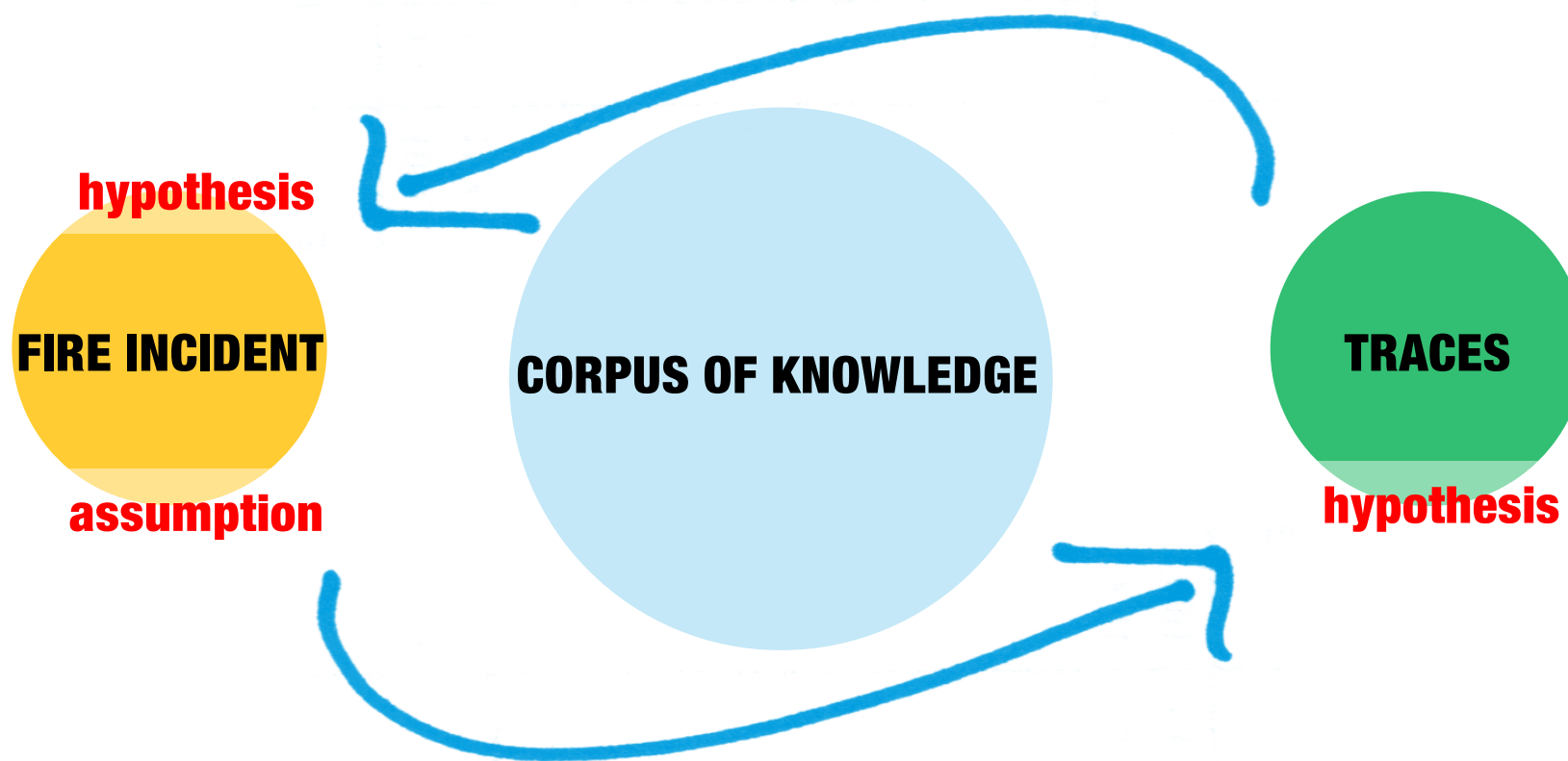
Fire investigation: an hypothetico-deductive process



Fire investigation: an hypothetico-deductive process

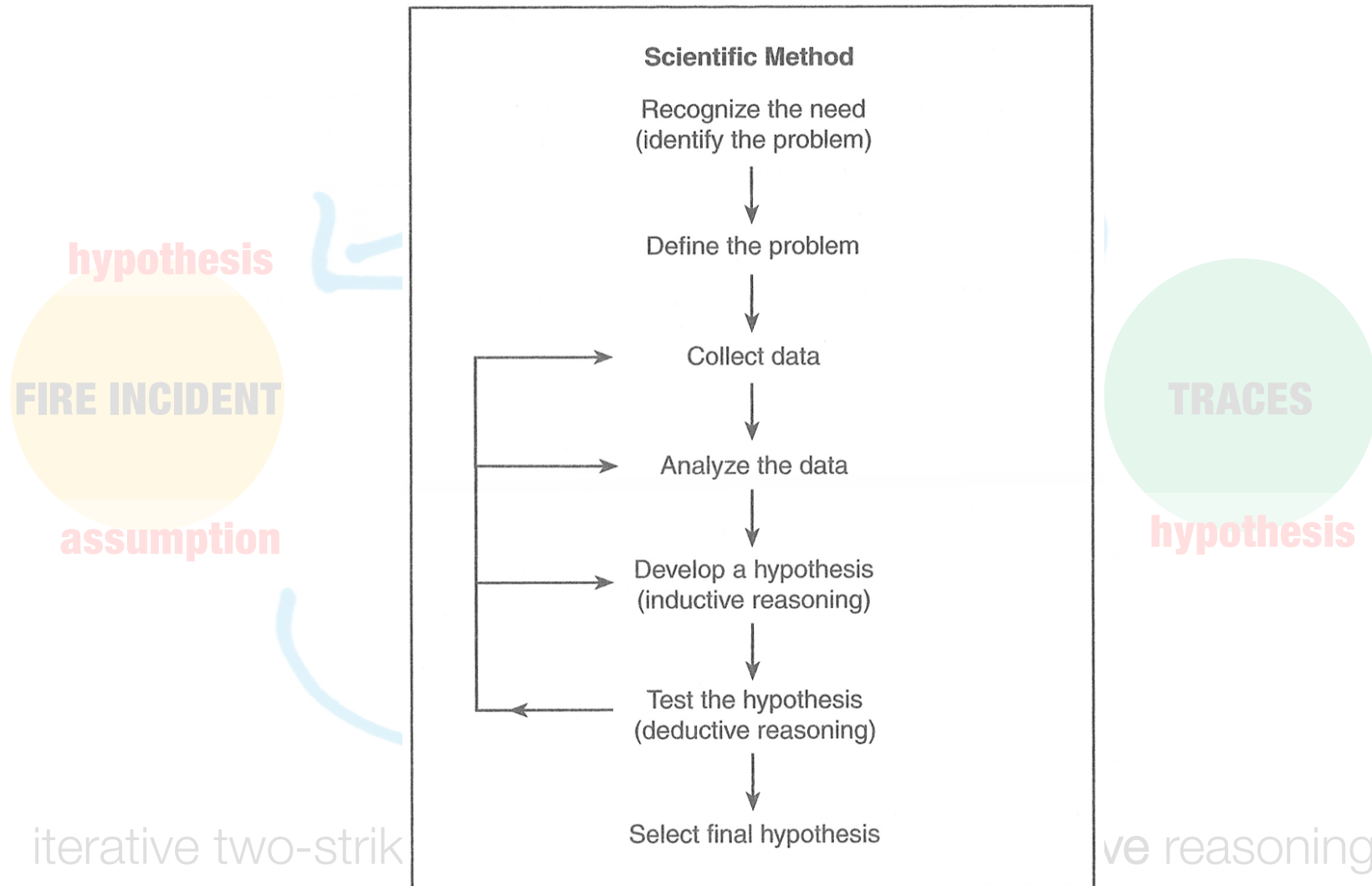


Fire investigation: an hypothetico-deductive process



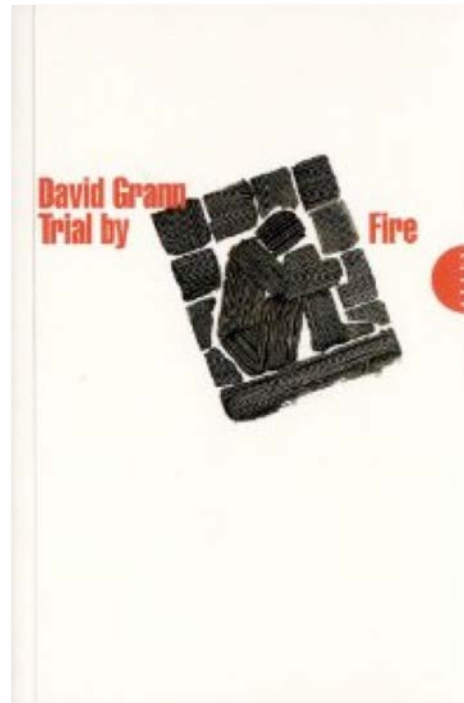
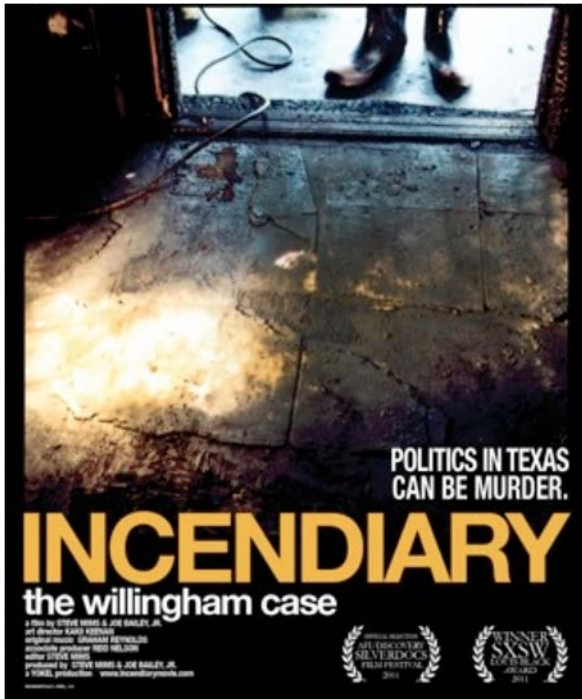
iterative two-strike process : hypothetico-deductive reasoning

Fire investigation: an hypothetico-deductive process



Fire investigation: an hypothetico-deductive process

> Risk of bias and errors...



Cameron Todd Willingham

melted aluminium puddles
fast and hot accelerant
multiple starting points

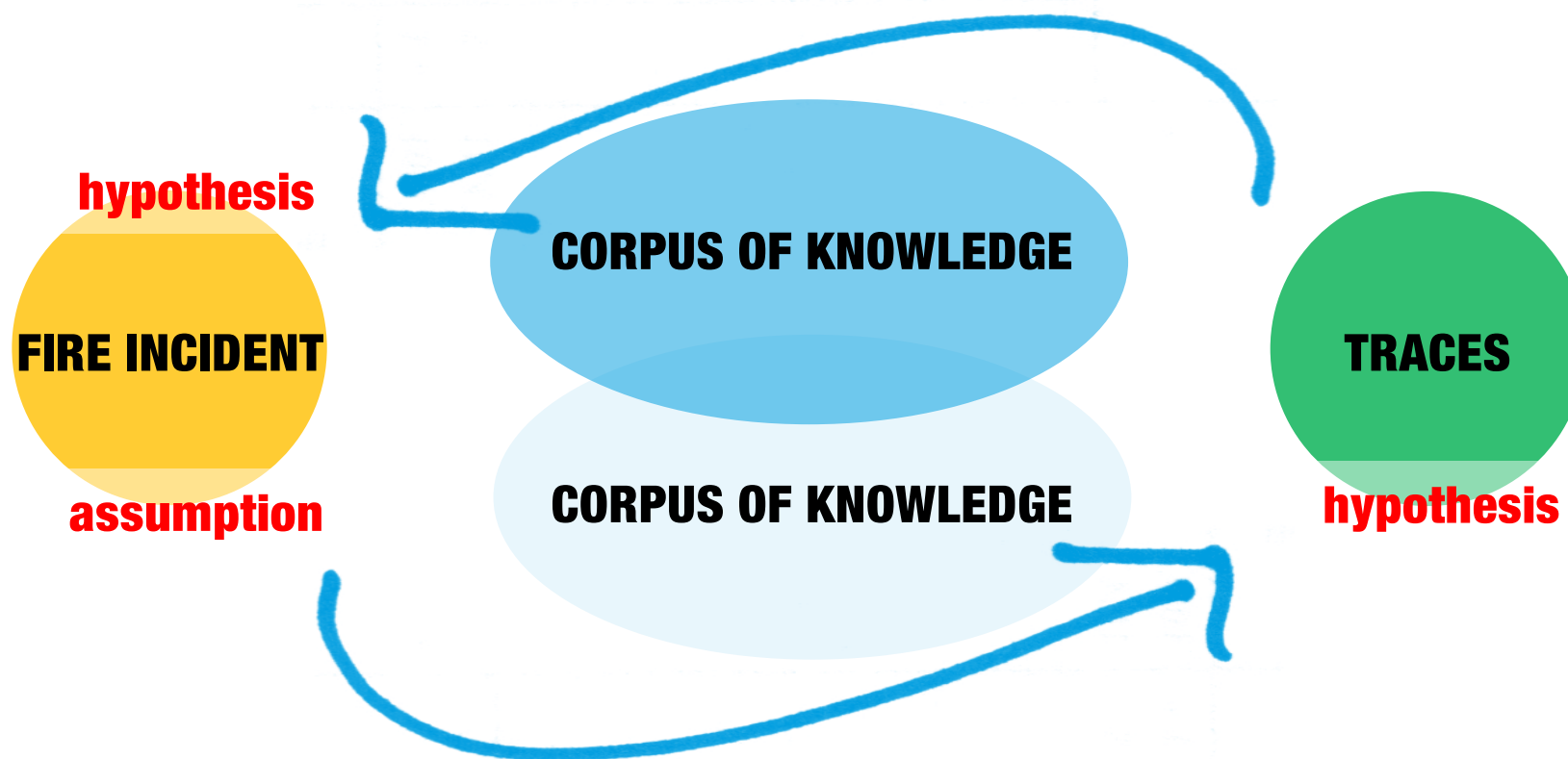
The Texas Forensic Science Commission investigating evidence of arson presented in the case acknowledged on July 23, 2010, that state and local arson investigators used "flawed science" in determining that the blaze had been deliberately set

Unil

UNIL | Université de Lausanne

Ecole des sciences criminelles

Fire investigation: an hypothetico-deductive process



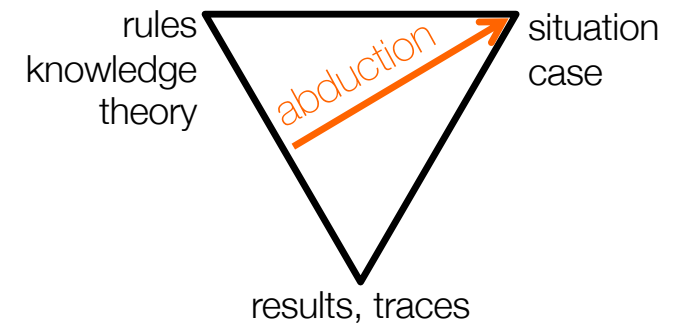
iterative two-strike process : hypothetico-deductive reasoning

Interface between forensic science and fire safety

> Fire investigation should rely on instruments or processes that are:

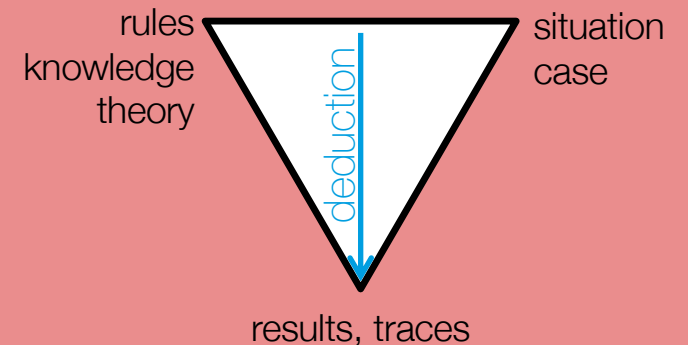
> oriented on the **generation of hypotheses**

- > scene investigation
- > trace (patterns, images, ...) detection and documentation
- > ...



> oriented on the **testing of the hypotheses**

- > «peer-review»
- > experiments
- > calculations
- > ...



Interface between forensic science and fire safety

Fire investigation is an **interface** of disciplines

- > **Fire safety science** can make a valuable contribution to the **deductive phase** of an investigation process
 - > to provide independent scientific means to test hypotheses
- > Conversely, the findings of **forensic investigations** can offer the potential :
 - > to unveil **new risks/dangers**, and **draw lessons** from real incidents (*learning from failures*)
 - > to propose **actual and plausible scenarios** as a starting point for fire safety analyses

The logo of the University of Lausanne (UNIL) is displayed in a white, stylized script font.

UNIL | Université de Lausanne

Ecole des sciences criminelles

Conclusion

- > Fire investigation is the interface of forensic science and fire safety
 - > Reasoning schemes underlying the fire investigation are conducive to an efficient collaboration between these disciplines
 - > Understanding and respecting the mutual contribution of each of these sciences is a cornerstone of such collaboration



Knowledge doesn't comply with the silos of disciplines