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# Hydrogen Toolkit

Canadian platform

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# Hydrogen Toolkit

## » Project objective

- Develop a library of modern hazard assessment tools
- Improve current and develop new models for integration in the software library
- Facilitate access to this toolkit through a user-friendly web interface and an Excel sheet calculator.

**Hydrogen Toolkit - Under Development** UQTR Savoir. Surprendre. I R H AVT

Dispersion | [Overpressure effects](#) | [Thermal effects](#) | [LH2](#) | [LNG](#) | [Workbench](#)

Jet extent | [Enclosures](#) | [Confined Areas](#)

**Jet extent**

**Choose your models**

Jet extent:  ?

Equation of State:  ?

Gas:

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This project made possible with funding from Natural Resources Canada

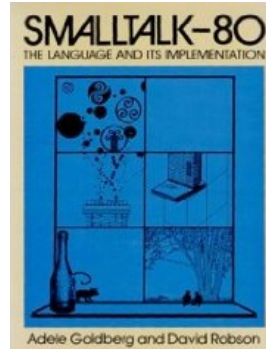
# Programming Language

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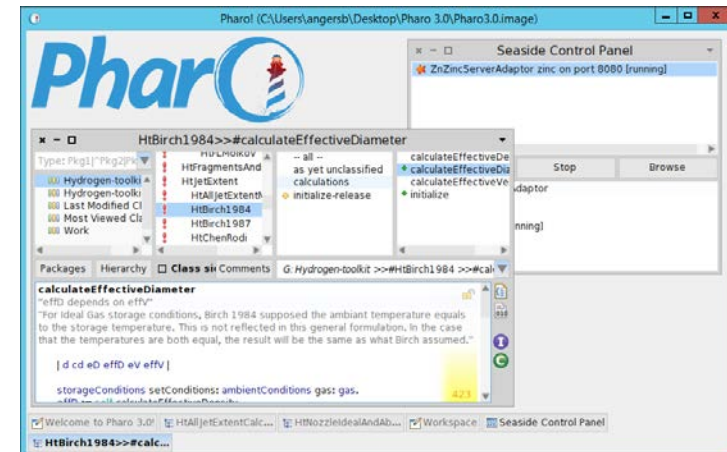
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- » Smalltalk: the language that was ahead of its time
  - Object oriented: one of the first and most influential programming languages
  - Dynamic
  - Reflective
  - Image based
  - Just-in-time compilation (by virtual machine for example)
- » Superseded by C++ and the freely distributed Java in the 90's, Smalltalk is still very much alive and growing in popularity due to projects like Pharo and Squeak which are promoting it well.



# Programming environment

- » Pharo 3 : full programming environment + language
  - Oriented towards research and commercial use
  - MIT license : permissive free software license which means it can be used to build commercial apps, royalty free, with no restrictions.
  - Runs on Mac, Linux, Windows, etc.
  - Actively supported: 1 release per year
    - Pharo 3 released in March 2014
    - Pharo 4 due in 2015



# Librairies

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seaside 

## » Libraries in Pharo

### ■ Seaside : web framework

- Component based
- HTML is generated programmatically
- Fully integrated in Pharo: live debugging support
- Support all modern standards and libraries : HTML 5.0, JQuery, CSS

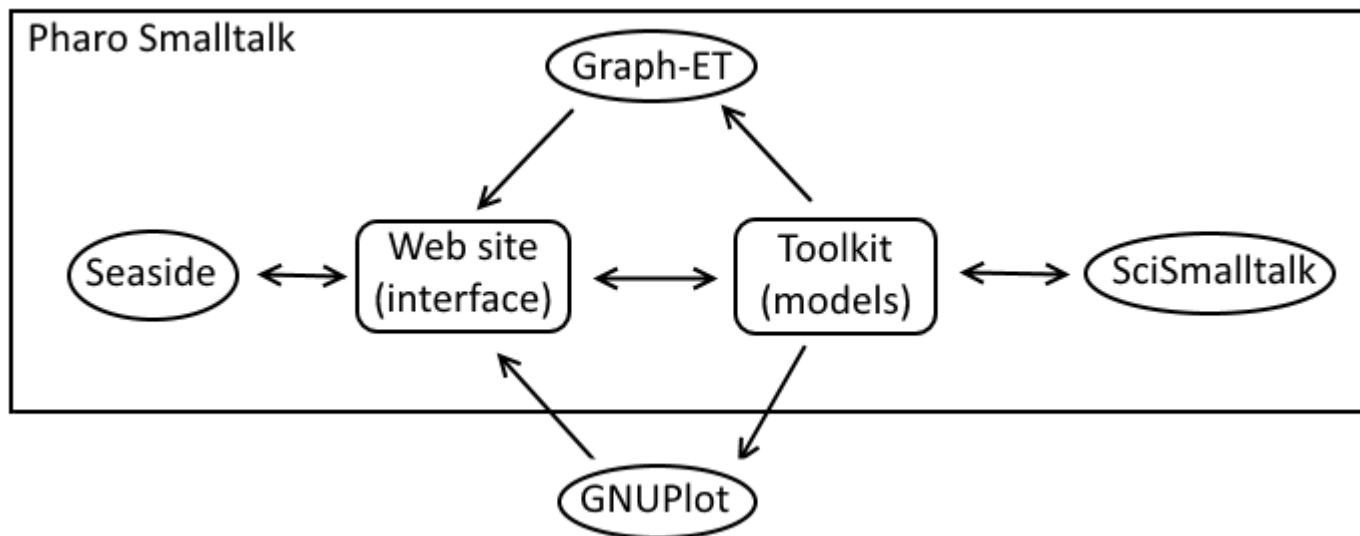
### ■ SciSmalltalk : scientific library

- Various numerical methods (ex: Newton-Raphson)
- Ordinary Differential Equation (ODE) solvers

### ■ Graph-ET : simple graph drawing library

## » GNUPlot : command-line graphing utility

# Program schematic





# Live demonstration

# What's next

- » Validity range framework
  - Partially there, mostly for individual parameters
  - More general approach
- » Unit conversion (Pa, bar, etc.)
- » Default or recommended models (bold or \*)
- » Detailed description for all models (?)
- » More options when comparing results
  - Graphs
  - Results for a range of input parameters



# What's next

- » Workbench
  - Play with individual equations
- » Interface with Refprop (NIST)
- » A list of the constants and a way to change them
- » More models
  - Flares
    - Chamberlain : already implemented in C++, needs to be ported to Smalltalk
  - Enclosures
    - Prasad et. al. from NIST using the ODE solver
  - LNG, LH2, Fragments, and more...

**Questions, suggestions, ideas ?**