

DYALOG ^ Academia

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DYALOG



Academia

OUTLINE

1. Academia
2. Dyalog and academia
3. APL in research and education

Academia

Academia

Education



Research

Academia

Education

Teach what we already know



Research

Learn new things nobody knew

Academia

STEM

Education

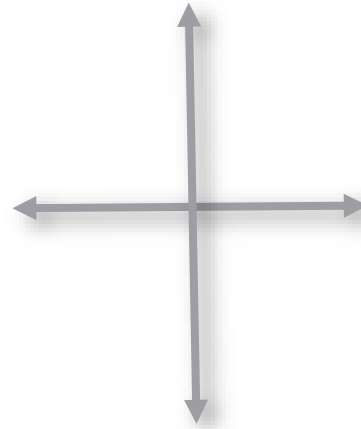
Teach what we already know

Science

Engineering

Research

Learn new things nobody knew



Science and Engineering

Engineers use science to solve their problems if the science is available. But available or not, the problem must be solved, and whatever form the solution takes under these conditions is called engineering.

– Joseph E Shigley. *Shigley's mechanical engineering design*

Academia

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Teach what we already know

Science

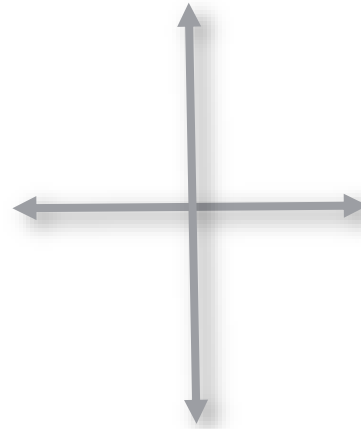
Understand how things works

Engineering

Make things work as we want

Research

Learn new things nobody knew



Academia

STEM

Education

Teach what we already know

Science

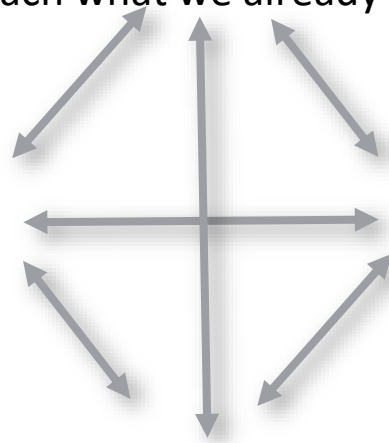
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DYALOG



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DYALOG



Academia

GOAL

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GOAL

Promote and improve the use of Dyalog APL in academic environments

DYALOG



Academia

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Promote and improve the use of Dyalog APL
in academic environments

- Get visibility in academic and research environments

DYALOG



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- Learn about them and from them

DYALOG



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- Learn about them and from them
- Study and improve the use of APL as a tool for education and research of technical topics

DYALOG



Academia

GOAL

Promote and improve the use of Dyalog APL in academic environments

- Get visibility in academic and research environments
- Learn about them and from them
- Study and improve the use of APL as a tool for education and research of technical topics
- Introduce a new generation to APL

DYALOG



Academia

GOAL

Promote and improve the use of Dyalog APL in academic environments

- Get visibility in academic and research environments
- Learn about them and from them
- Study and improve the use of APL as a tool for education and research of technical topics
- Introduce a new generation to APL
- Establish fruitful relationships with the academic world

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Academia

HOW

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HOW

Work together with academia to solve difficult research problems and take part in education

DYALOG



HOW

Work together with academia to solve difficult research problems and take part in education

- First, start working with a specific university

DYALOG



GHENT
UNIVERSITY

Materials Science & Technology

HOW

Work together with academia to solve difficult research problems and take part in education

- First, start working with a specific university and a specific department

DYALOG



GHENT
UNIVERSITY

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HOW

Work together with academia to solve difficult research problems and take part in education

- First, start working with a specific university and a specific department
- Take part in academic life

DYALOG



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- First, start working with a specific university and a specific department
- Take part in academic life
- Apply APL to the solution of research problems



HOW

Work together with academia to solve difficult research problems and take part in education

- First, start working with a specific university and a specific department
- Take part in academic life
- Apply APL to the solution of research problems
- Participate in research projects and education



HOW

Work together with academia to solve difficult research problems and take part in education

- First, start working with a specific university and a specific department
- Take part in academic life
- Apply APL to the solution of research problems
- Participate in research projects and education
- Teach APL to students and researchers



HOW

Work together with academia to solve difficult research problems and take part in education

- First, start working with a specific university and a specific department
- Take part in academic life
- Apply APL to the solution of research problems
- Participate in research projects and education
- Teach APL to students and researchers
- Establish contacts for future collaboration



ugent.be

GENT UNIVERSITEIT

Ghent (Belgium), since 1817

Almost 50k students and 15k
staff members in 11 faculties

Research (more than 8000
publications each year)

Dare To Think

Materials Science & Technology

Faculty of Engineering and Architecture

Master, PhDs, postdocs

Research (industry / academy)

Mechanical material behaviour

Physical metallurgy

Microstructural observations

Metals processing



Computational problems in Materials Science and Engineering

Computational problems in Materials Science and Engineering

Microstructural Analysis

Crystal Plasticity

Transformation Models

Computational problems in Materials Science and Engineering

Microstructural Analysis

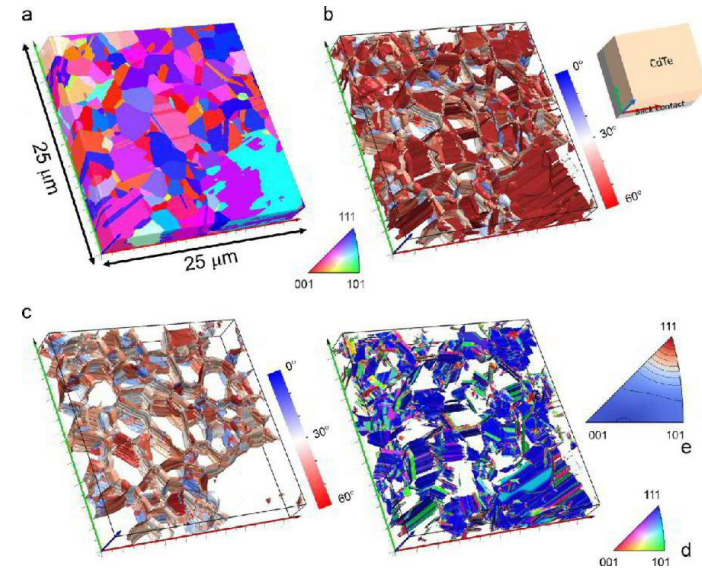
Large amounts of SEM/EBSD
and simulation data (2D/3D)

Study properties,
relationships, topology

Calculate distributions

Crystallographic texture
analysis (boundaries, ODFs)

Bridge between simulations
and experiments



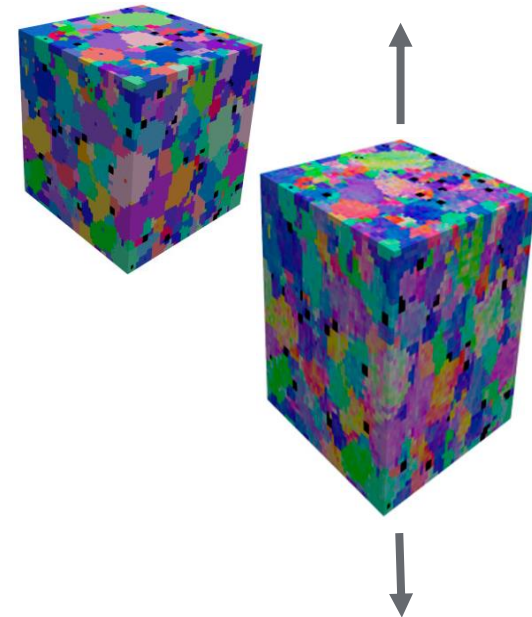
Computational problems in Materials Science and Engineering

Crystal Plasticity

Mesososcopic models of plastic deformation in polycrystalline materials

Materials science (crystallography) + mechanical engineering (tensor algebra) + HPC (days long simulations)

Mean Field, Finite-Element Method (CPFEM), Fast Fourier Transforms (CPFEM), ...



doi.org/10.3390/cryst10090819

Computational problems in Materials Science and Engineering

Transformation Models

Mesososcopic models of thermal
processes in polycrystalline
materials

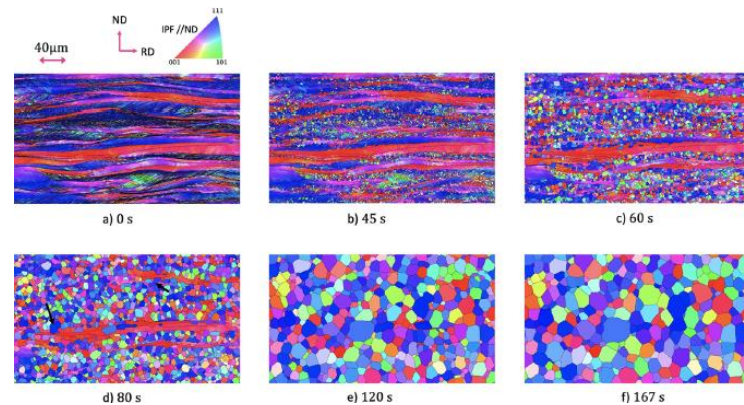
Phase transformations

Recrystallization

Solidification

Thermodynamics (energy)

Cellular Automata, Monte Carlo,
Finite-Elements, Phase Field, ...



doi.org/10.1016/j.commatsci.2021.110643

Computational problems in Materials Science and Engineering

Microstructural Analysis

Crystal Plasticity

Transformation Models

Computational problems in Materials Science and Engineering

Microstructural Analysis

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Analysis of tensile experiments

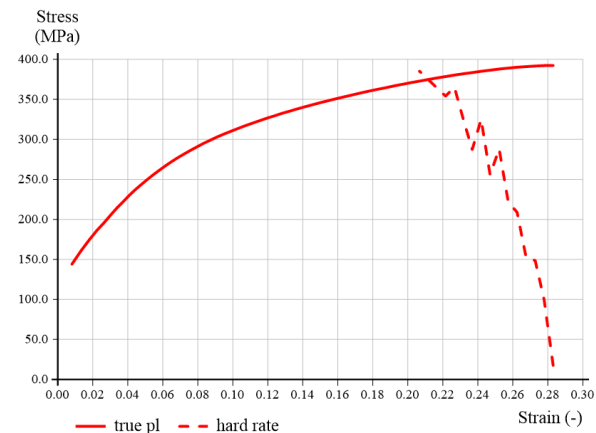
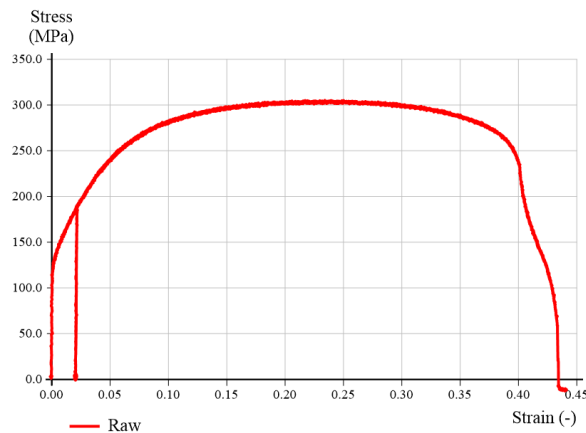
Computational problems in Materials Science and Engineering

Analysis of tensile data

Typical example of workflow (and data):

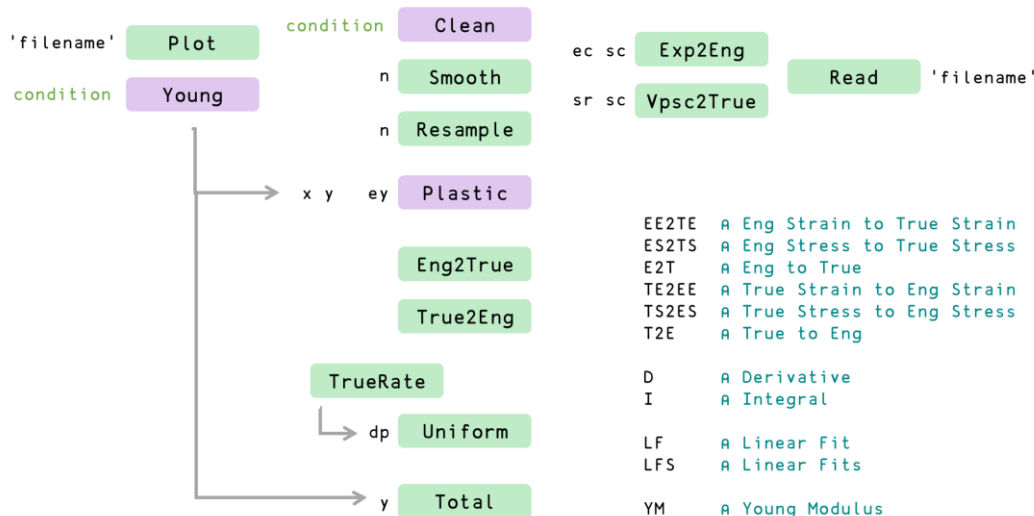
Read → Clean up → **Process** → Plot

- Filtering and smoothing of curves, derivatives and integrals, find properties



Computational problems in Materials Science and Engineering

Analysis of tensile data



```

ec sc Exp2Eng
sr sc Vpsc2True

Read 'filename'

EE2TE A Eng Strain to True Strain
ES2TS A Eng Stress to True Stress
E2T A Eng to True
TE2EE A True Strain to Eng Strain
TS2ES A True Stress to Eng Stress
T2E A True to Eng

D A Derivative
I A Integral

LF A Linear Fit
LFS A Linear Fits

YM A Young Modulus
    
```

```

wc -l *.aplf
 4 Clean.aplo
21 Demo.aplf
 1 Eng2True.aplf
 1 Exp2Eng.aplf
 1 PE.aplf
 4 Plastic.aplf
41 Plot.aplf
 6 Read.aplf
 1 Resample.aplf
 1 Smooth.aplf
 3 Total.aplf
 1 True2Eng.aplf
 6 TrueRate.aplf
 1 UTS.aplf
 6 Uniform.aplf
 1 Vpsc2True.aplf
 1 YS.aplf
 4 Young.aplo
21 fns.apln
125 total
    
```



Research

Materials Science &
Technology



Research

Materials Science &
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Use APL to solve interesting problems

Data analysis (mechanical experiments,
microstructures, texture)

Modelling of thermo-mechanical processes



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Compare with previous solutions using other
software and programming languages



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Materials Science &
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Compare with previous solutions using other
software and programming languages

More presence in research projects and
scientific publications



Education

Materials Science &
Technology



Education

Materials Science &
Technology

Use APL to teach / learn about complex topics

Mathematical methods

Crystallography and crystal plasticity

Modelling of thermo-mechanical processes



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Materials Science &
Technology

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Evaluate capacities of APL as a teaching tool
when compared with mainstream languages



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Materials Science &
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Mathematical methods

Crystallography and crystal plasticity

Modelling of thermo-mechanical processes

Evaluate capacities of APL as a teaching tool
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More presence in the classroom and the
student community

**What can
Dyalog learn
from
academy?**

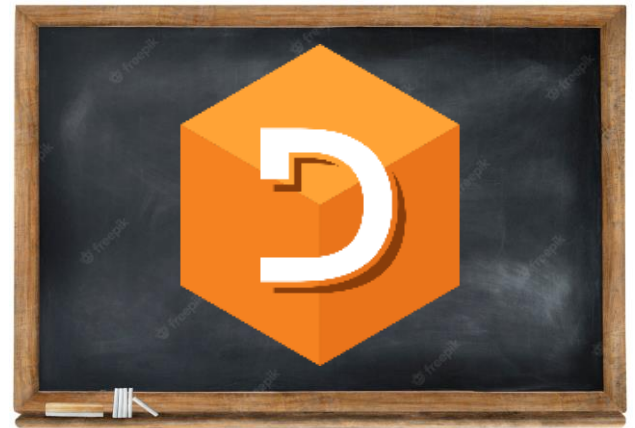


What can Dyalog learn from academy?



Interesting – and hard! – problems that
need to be solved (by domain experts)

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New and different workflows

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Interesting – and hard! – problems that
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New and different workflows

Participate in academic gatherings and
publications (conferences, peer-review)

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Interesting – and hard! – problems that
need to be solved (by domain experts)

New and different workflows

Participate in academic gatherings and
publications (conferences, peer-review)

Take part in research and innovation

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DYALOG ^ Academia

Thank you!

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