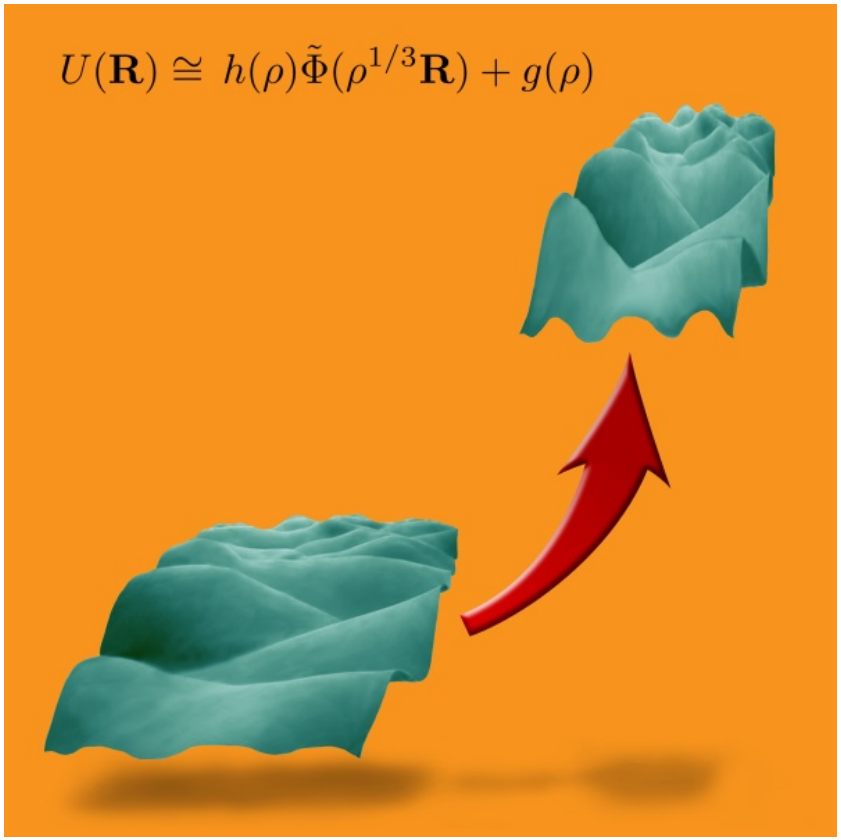
The trace back to the 1960s

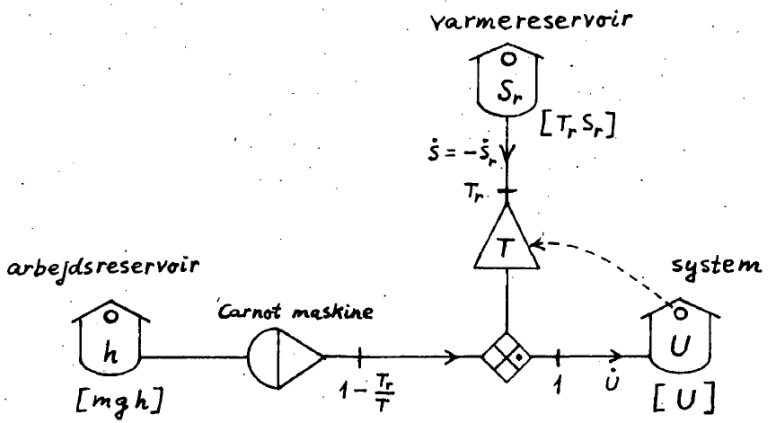
Jeppe Dyre



Glass &time

The liquid solidified!

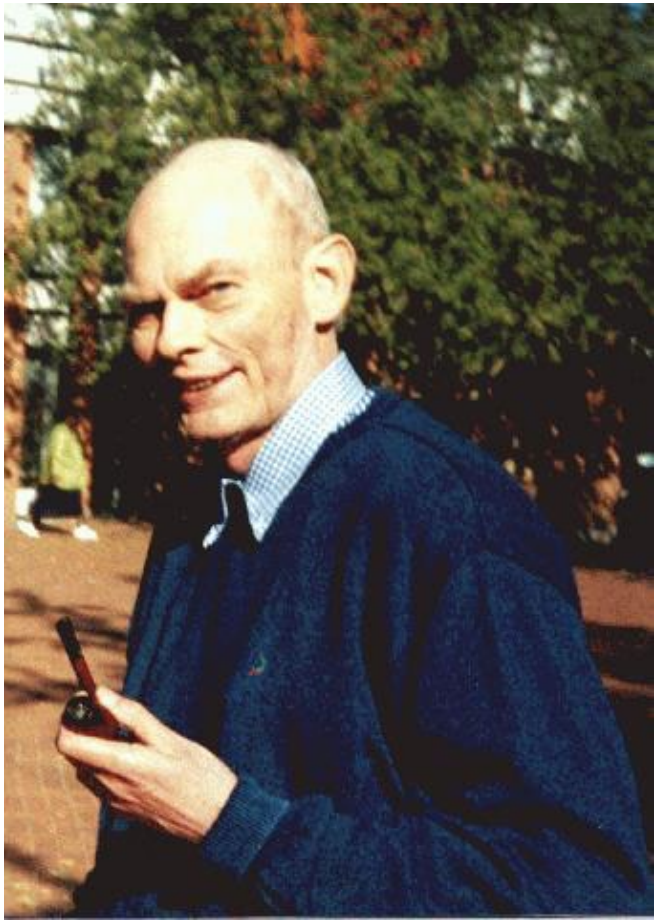
(1960s)



Energy-bond graph formalism

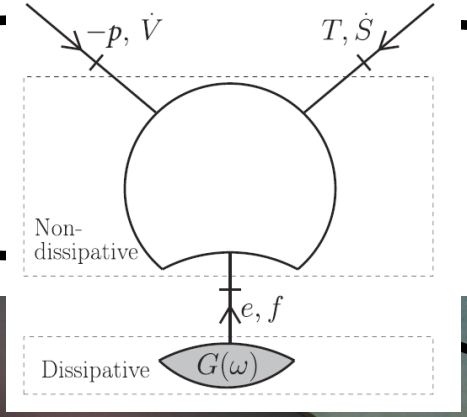
”Fuglebursformalismen”

Peder Voetmann Christiansen (1978)



What is the energy-bond diagram for a single-parameter liquid? (2000)

(2002)


$-p, \dot{V}$
$T, \dot{S}$
Non-
dissipative
e, f
Dissipative
$G(\omega)$

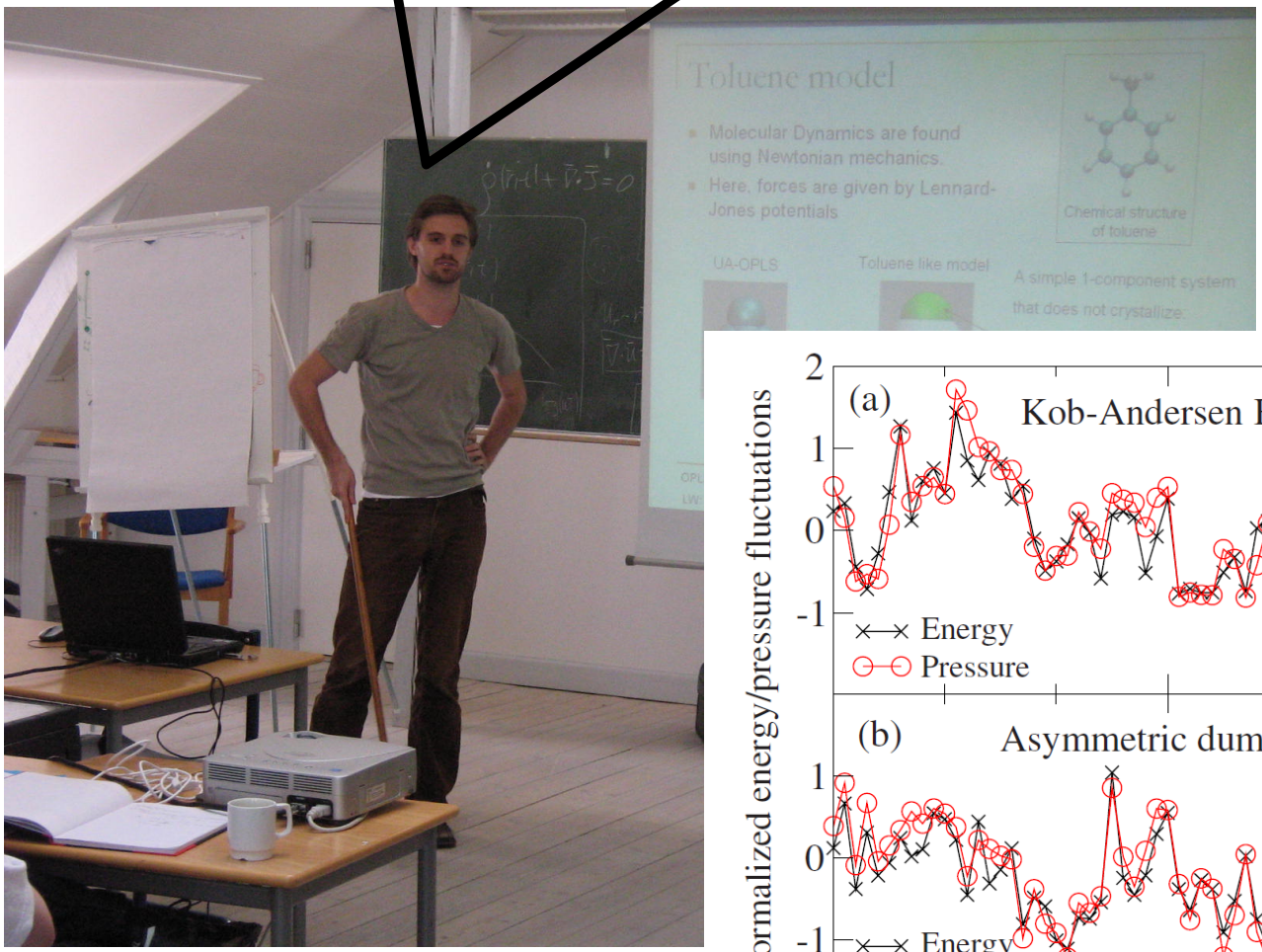

GRØN
TUBORG

$$\frac{c_p''(\omega)\,\kappa_T''(\omega)}{T_0[\alpha_p''(\omega)]^2} = 1$$

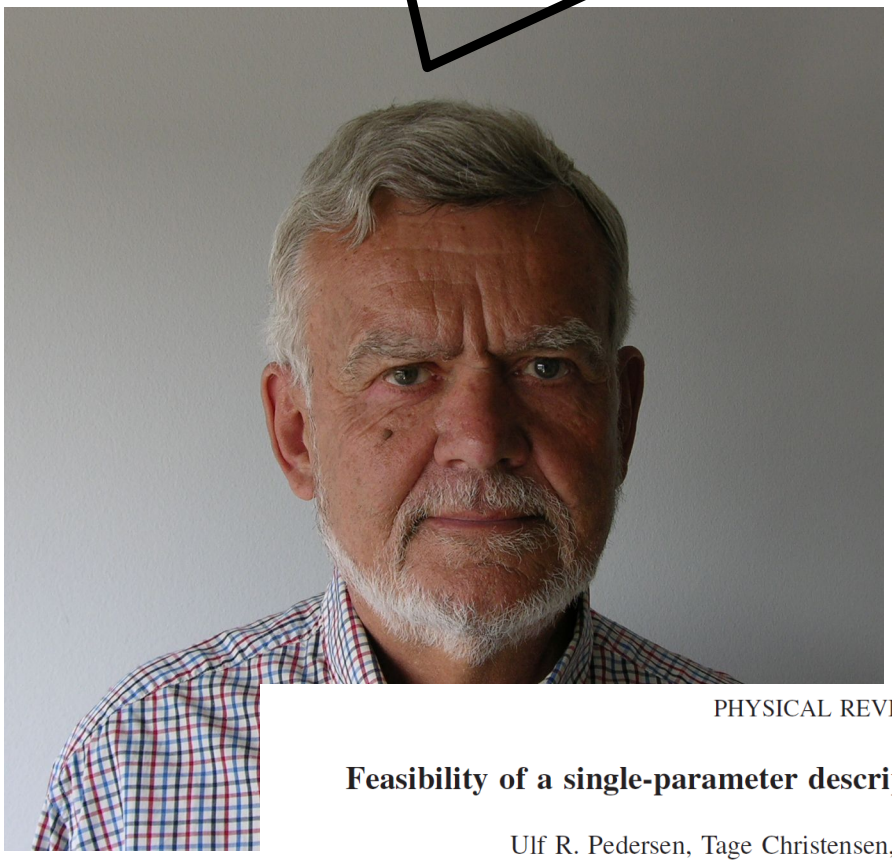
(2004)

Ulf, why not check whether single-parameter liquids exist? (2006)

They are all! – Is there a bug in my program? (2006)



Strong energy-pressure correlations have not been noticed before (2007)



PHYSICAL REVIEW E **77**, 011201 (2008)

Feasibility of a single-parameter description of equilibrium viscous liquid dynamics

Ulf R. Pedersen, Tage Christensen, Thomas B. Schrøder, and Jeppe C. Dyre
DNRF centre "Glass and Time," IMFUFA, Department of Sciences, Roskilde University, Postbox 260, DK-4000 Roskilde, Denmark
(Received 24 November 2006; revised manuscript received 22 April 2007; published 15 January 2008)

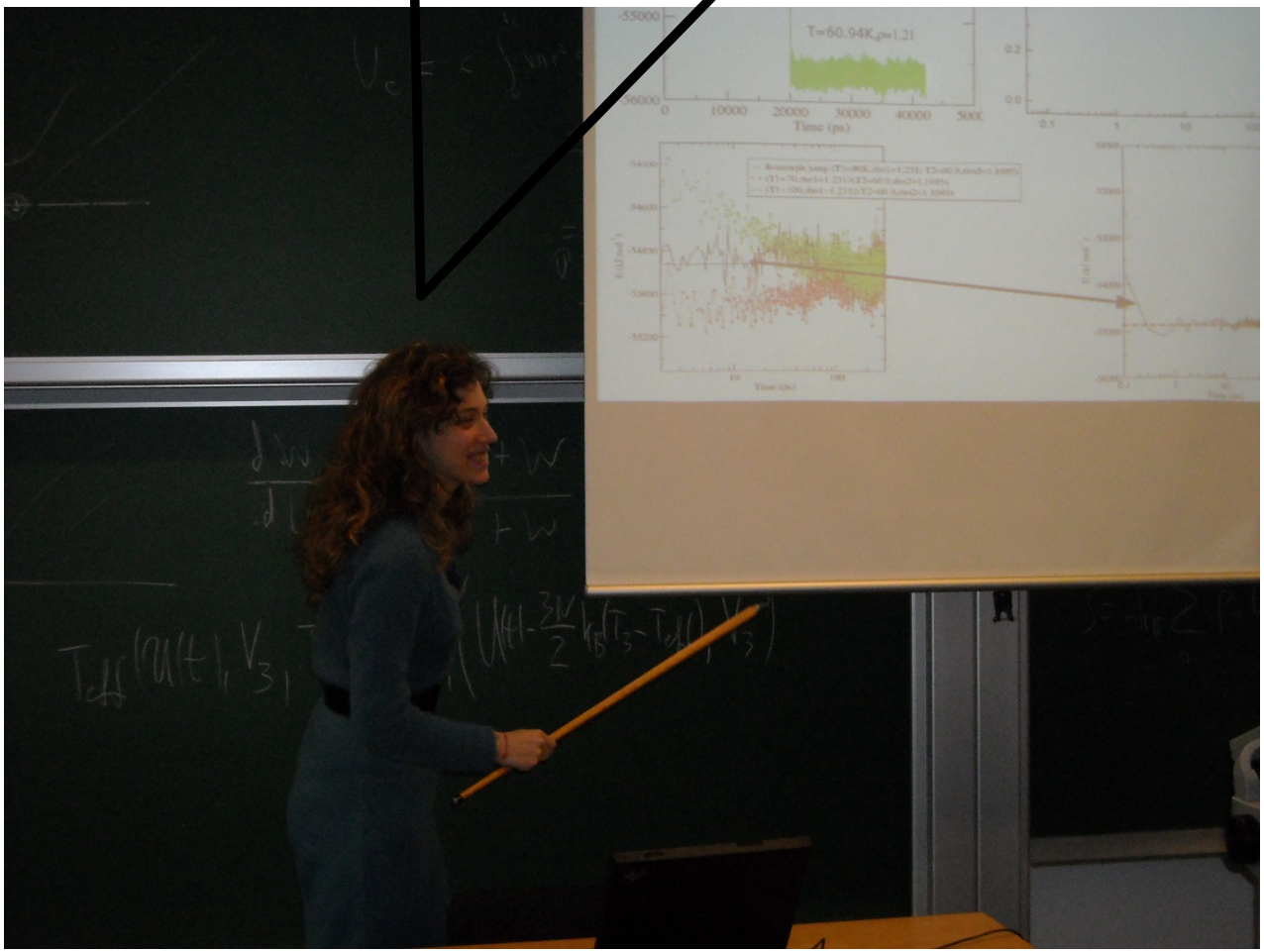
I can explain the correlations!

(2008)

Can one ”jump” directly into equilibrium in the phase diagram? (2008/2009)

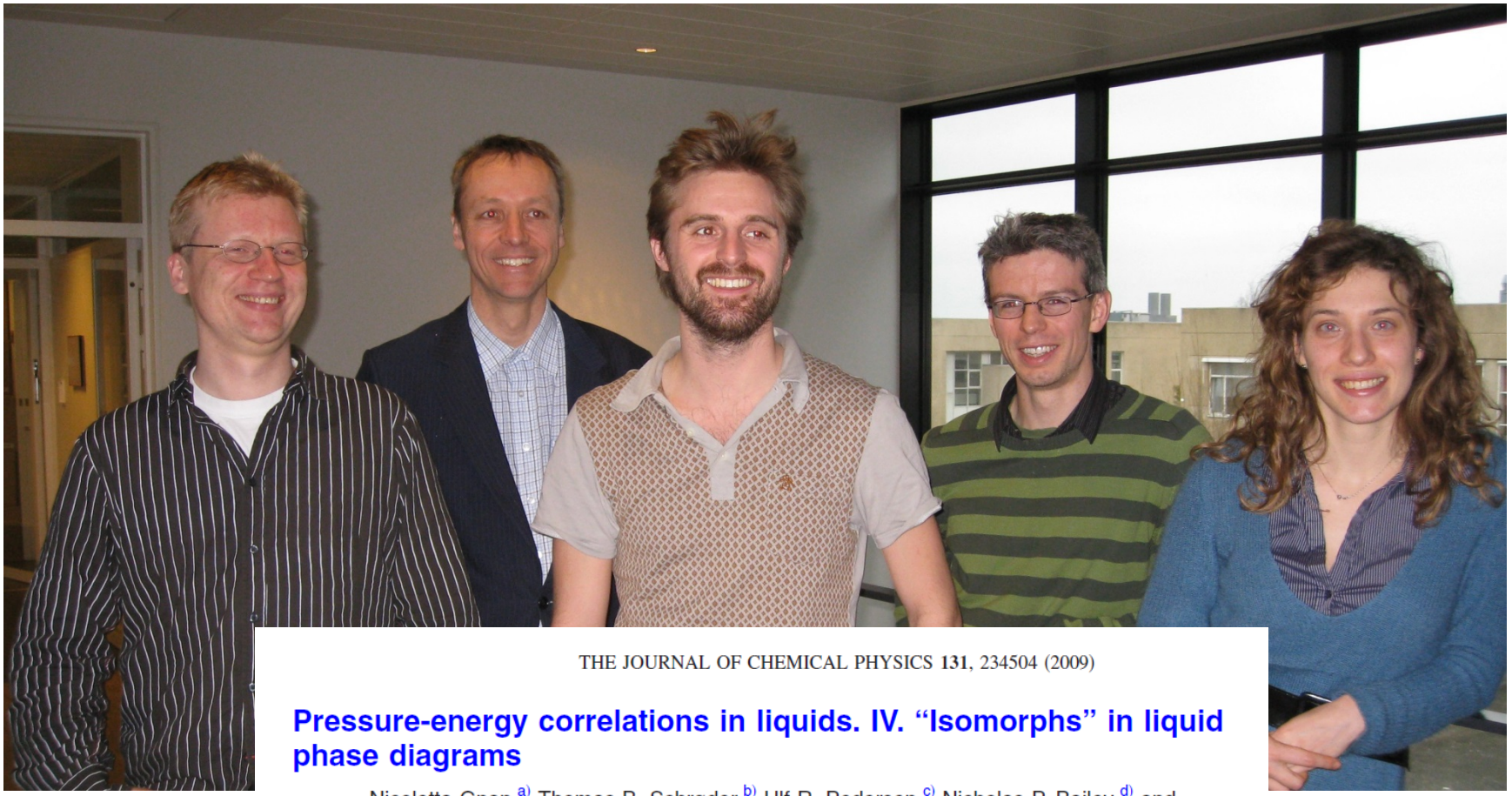
… it works…

(2009)



The isomorph theory

(2009)



THE JOURNAL OF CHEMICAL PHYSICS **131**, 234504 (2009)

Pressure-energy correlations in liquids. IV. "Isomorphs" in liquid phase diagrams

Nicoletta Gnan,[a)] Thomas B. Schrøder,[b)] Ulf R. Pedersen,[c)] Nicholas P. Bailey,[d)] and Jeppe C. Dyre[e)]

DNRF Center "Glass and Time," IMFUFA, Department of Sciences, Roskilde University, P.O. Box 260, DK-4000 Roskilde, Denmark

(Received 29 May 2009; accepted 27 October 2009; published online 17 December 2009)

ARTICLES
PUBLISHED ONLINE: 3 JULY 2011 | DOI: 10.1038/NPHYS2031
nature physics

Predicting the density-scaling exponent of a glass-forming liquid from Prigogine–Defay ratio measurements

Ditte Gundermann[1], Ulf R. Pedersen[2], Tina Hecksher[1], Nicholas P. Bailey[1], Bo Jakobsen[1], Tage Christensen[1], Niels B. Olsen[1], Thomas B. Schrøder[1], Daniel Fragiadakis[3], Riccardo Casalini[3], C. Michael Roland[3], Jeppe C. Dyre[1] and Kristine Niss[1]*

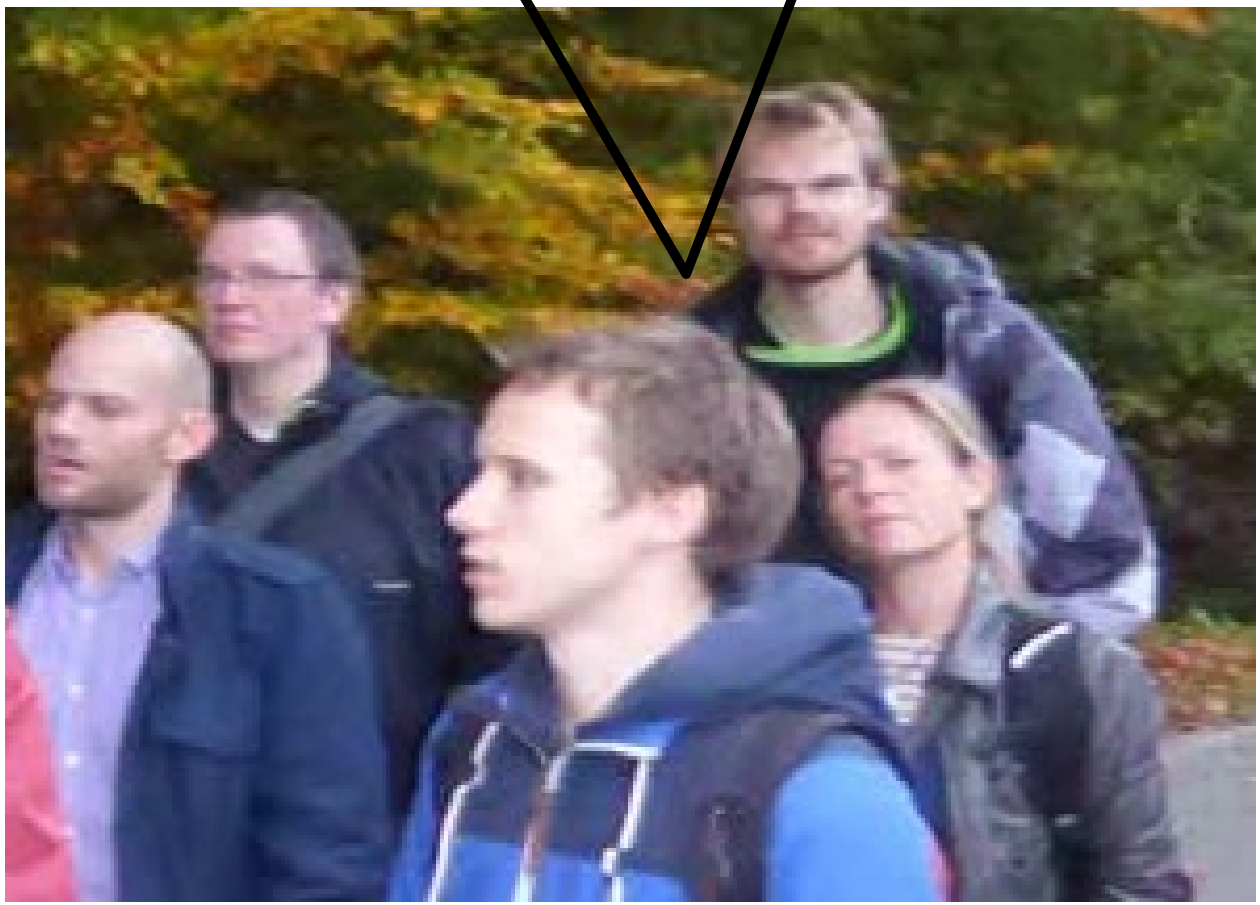
(2011)

The theory also works for molecules!

(2012)

and for solids! (2014)

- and polymers! (2015)



I think we can make a better isomorph theory… (2014)

THE JOURNAL OF CHEMICAL PHYSICS **141**, 204502 (2014)

Simplicity of condensed matter at its core: Generic definition of a Roskilde-simple system

Thomas B. Schrøder[a] and Jeppe C. Dyre[b]
DNRF Centre "Glass and Time," IMFUFA, Department of Sciences, Roskilde University, Postbox 260, DK-4000 Roskilde, Denmark

$$U(\mathbf{R}_a) < U(\mathbf{R}_b) \Rightarrow U(\lambda\mathbf{R}_a) < U(\lambda\mathbf{R}_b)$$

nature COMMUNICATIONS

ARTICLE

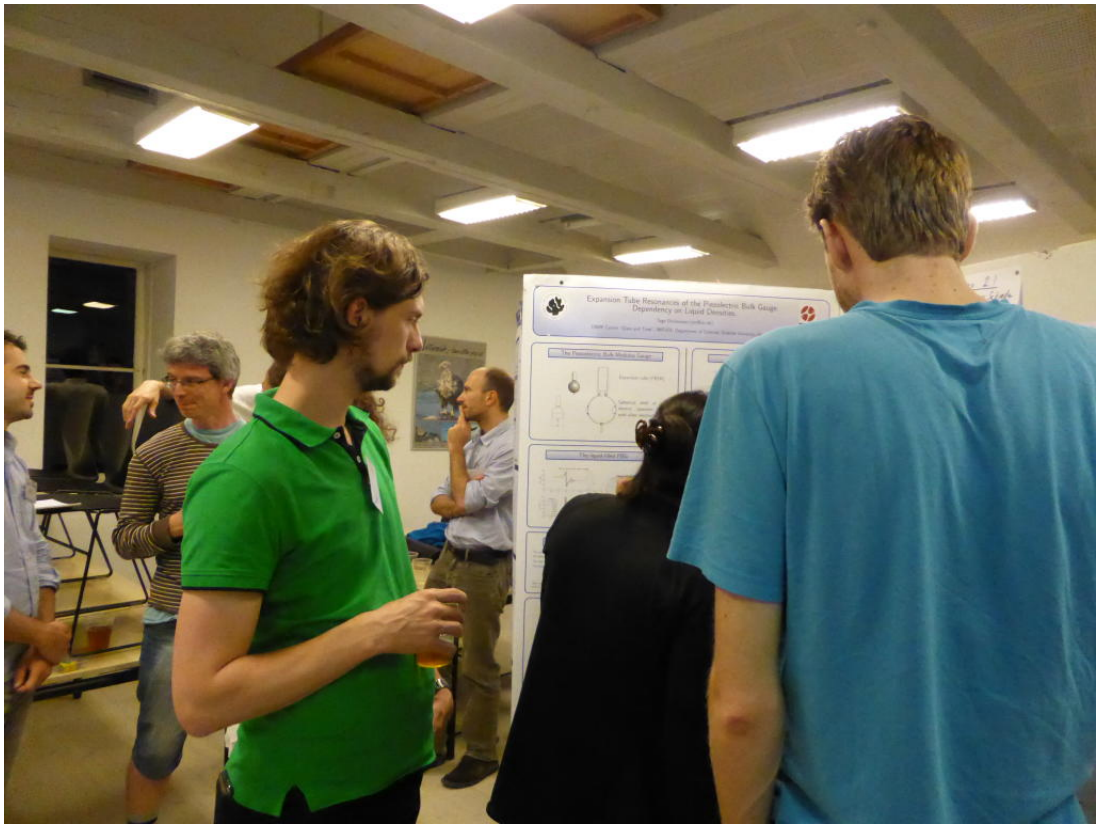
Received 15 Jul 2014 | Accepted 30 Sep 2014 | Published 14 Nov 2014

DOI: 10.1038/ncomms6424

Explaining why simple liquids are quasi-universal

Andreas K. Bacher[1], Thomas B. Schrøder[1] & Jeppe C. Dyre[1]

(2014)



nature COMMUNICATIONS

ARTICLE

Received 25 Apr 2016 | Accepted 27 Jun 2016 | Published 17 Aug 2016

DOI: 10.1038/ncomms12386 OPEN

(2016)

Thermodynamics of freezing and melting

Ulf R. Pedersen[1], Lorenzo Costigliola[1], Nicholas P. Bailey[1], Thomas B. Schrøder[1] & Jeppe C. Dyre[1]

nature COMMUNICATIONS

ARTICLE

DOI: 10.1038/s41467-017-02324-3 OPEN

Evidence of a one-dimensional thermodynamic phase diagram for simple glass-formers

H.W. Hansen[1], A. Sanz[1], K. Adrjanowicz[2], B. Frick[3] & K. Niss[1]

(2018)

Further developments

- Pressure variation of the dielectric loss (Wence, Jon, Troels, Kristine)
- Density scaling & isomorph jumps in experiment (Kristine, Lisa, Tina)
- NVU dynamics (Trond, Thomas)
- Nanoconfinement (Trond, Tom T., Ben C.)
- Plasma physics (Arno, Federico C., Jesper)
- Crystallization (Karolina, Ulf, Nick, Kristine)
- Pseudoisomorphs (Andreas O, Samaneh, Thomas)
- Hydrodynamics (Solvej, Jesper)
- Stokes-Einstein relation (Lorenzo, David H.)
- Quasiuniversal viscosity equation (Lorenzo)
- Physical aging (Saeed, Jeppe)
- Isomorph filter (Nick, Jeppe)
- Plastic flows of glasses (Edan L., Nick, Younglun J., Jeppe)
- DFT and EMT simulated metals (Laura, Nick)
- Noble gasses (Aditya S., Ulf)
- Varying dimensions (Lorenzo, Thibaud M.)
- Repulsive and attractive forces do not play separate roles (Lasse)
- Rosenfeld-Tarazona relation for the specific heat (Trond)
- Steady-state shear flows of liquids (Leila S., Nick)
- Glass effective temperatures (Nicoletta, Cladio)
- New periodic table (Felix H., Ulf)
- Runge-Kutta method for mapping out isomorphs (Emy, Ulf)