The Game Perspective

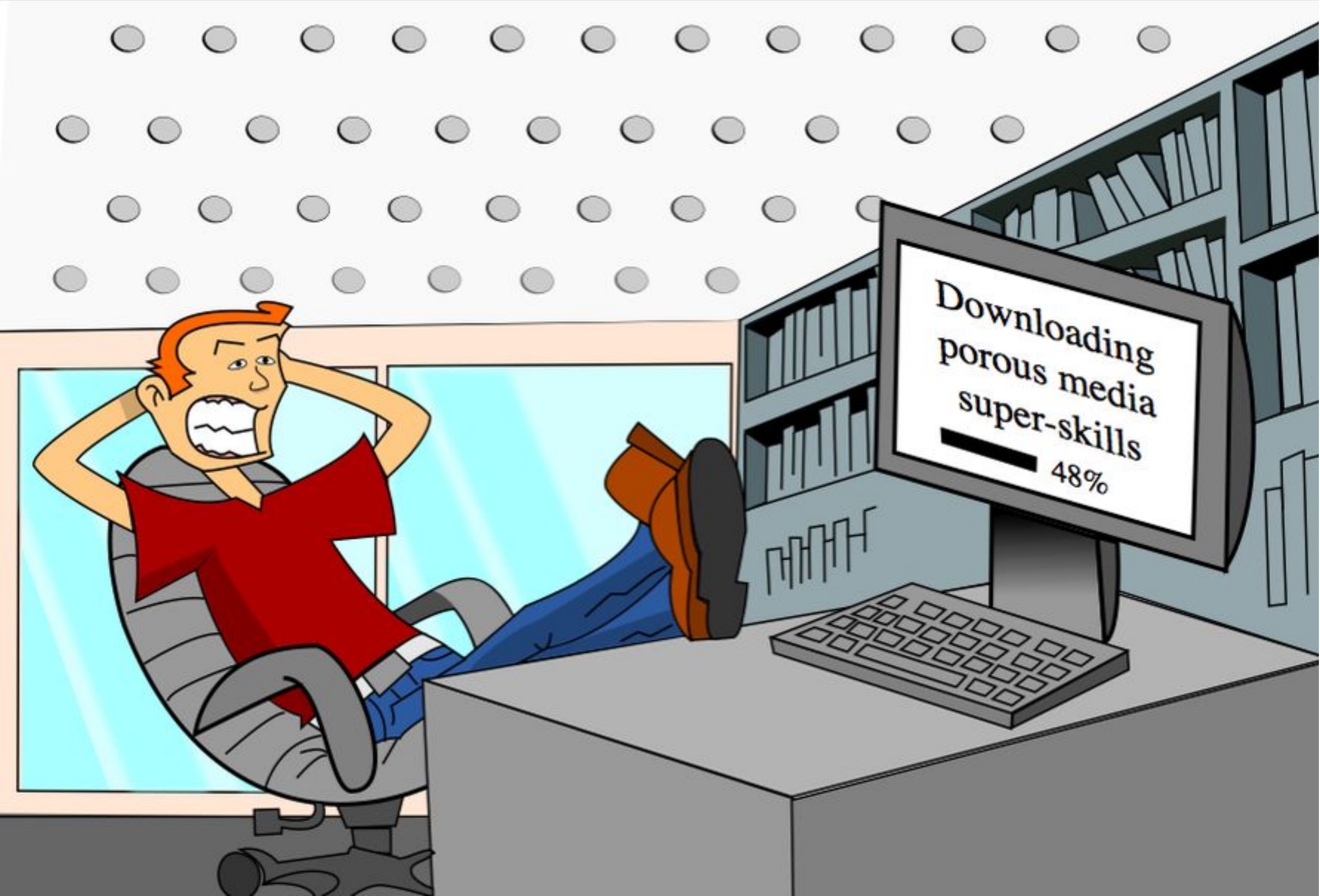
Luc Jaouen, Matelys

A video of this talk is available at http://youtu.be/0kdV3YzN9XU

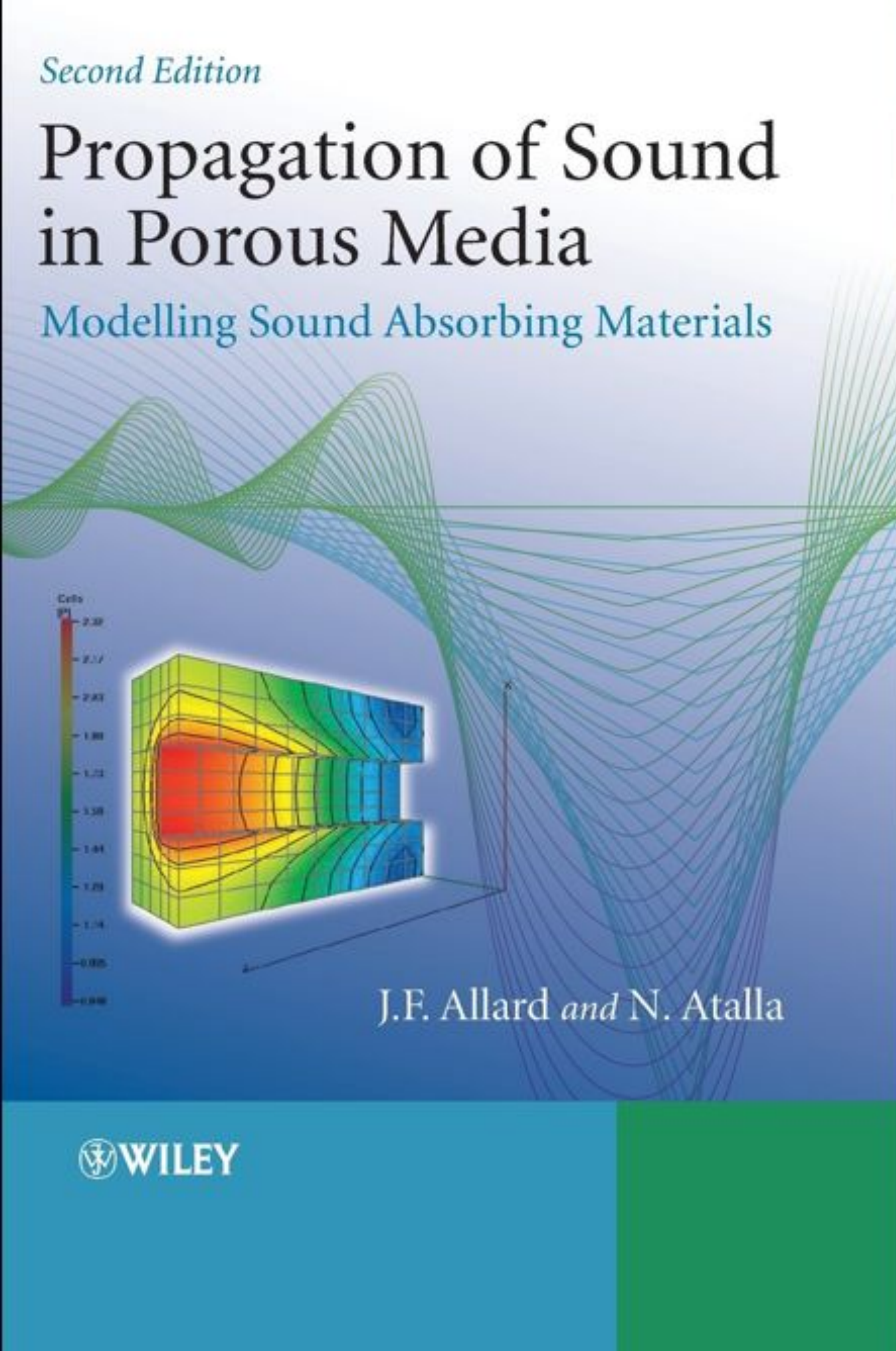
Below are links to the works cited or used in these slides:

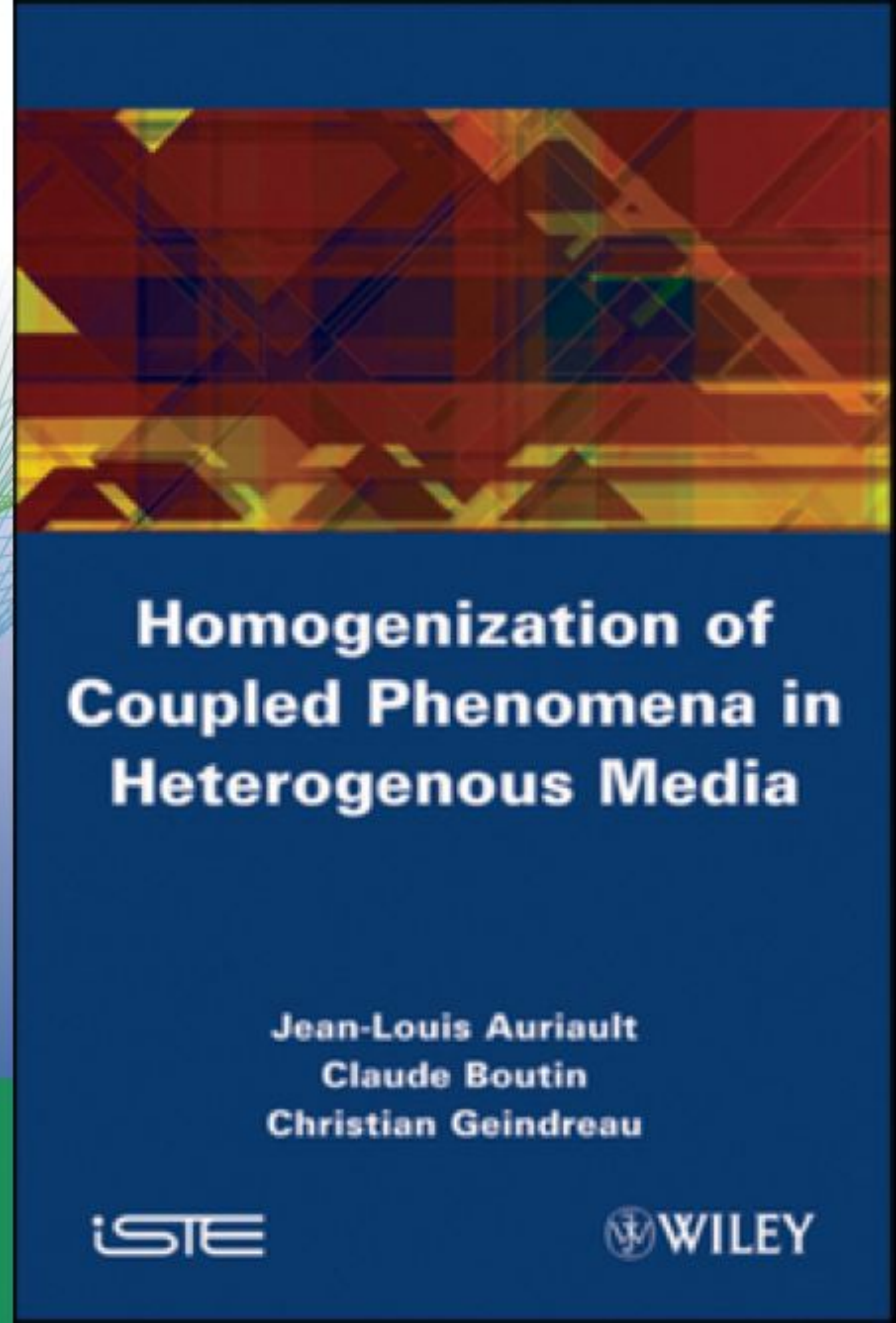
- Mike Morgan: http://morgamic.com
- Bret Victor: http://worrydream.com
(He's also the author of the Tangle javascript library used for the "reactive document")
- Joe M. L. Davis' Telescopic Text: http://www.telescopictext.org
- Three.js library initiated by mrdoob is used to display the 3D object
(See http://threejs.org and http://mrdoob.com)
- These slides are made with DZSlides by Paul Rouget
(http://paulrouget.com/dzslides/)
- I borrowed the colored theme from microjs website
- As in 2011, I have drawn all images of Sponge Bob from scratch and I credit his creator Stephen Hillenburg and its copyright owner Viacom International Inc. so I assume it is a fair use of intellectual property. Correct me if I am wrong.
- Augustin was the source of inspiration for the picture on slide "Because we are not there yet".
- Finally, I found a game with a similar gameplay to my work-in-progress : Microtrip.

Because we are not there yet



Reading *(books, articles, web...)*


Second Edition
Propagation of Sound in Porous Media
Modelling Sound Absorbing Materials
J.F. Allard and N. Atalla
WILEY


Homogenization of Coupled Phenomena in Heterogenous Media
Jean-Louis Auriault
Claude Boutin
Christian Geindreau
ISTE
WILEY

J. Fluid Mech. (1987), *vol.* 176, *pp.* 379–402
Printed in Great Britain

Theory of dynamic permeability and tortuosity in fluid-saturated porous media

By DAVID LINTON JOHNSON, JOEL KOPLIK AND ROGER DASHEN†

Schlumberger–Doll Research, Old Quarry Road, Ridgefield, CT 06877-4108, USA

We consider the response of a Newtonian fluid, saturating the pore space of a rigid isotropic porous medium, subjected to an infinitesimal oscillatory pressure gradient across the sample. We derive the analytic properties of the linear response function as well as the high- and low-frequency limits. In so doing we present a new and well-defined parameter Λ, which enters the high-frequency limit, characteristic of dynamically connected pore sizes. Using these results we construct a simple model for the response in terms of the exact high- and low-frequency parameters; the model is very successful when compared with direct numerical simulations on large lattices with randomly varying tube radii. We demonstrate the relevance of these results to the acoustic properties of non-rigid porous media, and we show how the dynamic permeability/tortuosity can be measured using superfluid ^{4}He as the pore fluid. We derive the expected response in the case that the internal walls of the pore space are fractal in character.

1. Introduction

The elastodynamic properties of porous media are interesting in part because of the possibility of macroscopic relative motion between the fluid and the solid constituents. These effects are of prime importance in understanding fourth sound in a superfluid/superleak system (Johnson 1980), pressure diffusion through porous media (Chandler & Johnson 1981; Chandler 1981), slow waves and the consolidation transition (Johnson & Plona 1982), elastodynamics of gels (Johnson 1982) as well as the acoustic properties of 'ordinary' porous media saturated with 'ordinary' fluids (Johnson *et al.* 1982). These properties are discussed in a review of recent work (Johnson 1984). One of the ingredients of the theory of these phenomena, as well as being an interesting effect in its own right, is the response of a simple fluid entrained in a rigid porous medium and subjected to a harmonic pressure drop across the sample; this article is devoted to an understanding of that response, which has been the subject of other recent work (Attenborough 1983; Auriault, Borne & Chambon 1985; Bedford, Costley & Stern 1984).

In §2 we pose the problem and we show that the relevant response functions, the dynamic permeability or dynamic tortuosity, are analytic functions of frequency except for singularities on the negative imaginary axis. We also derive the rigorous results for the high- and low-frequency behaviour; the distinction between high and low frequencies is whether the viscous skin depth, $\delta = (2\eta/\rho_f\omega)^{\frac{1}{2}}$, is small or large compared to the sizes of the pores. These results are used in §3 to construct a simple model of the response for arbitrary frequency; the parameters in this theory are those appropriate to the high- and low-frequency behaviour. As a test of the model we compare it with numerical simulations on large lattices constructed by randomly

† Also at Institute for Advanced Study, Princeton, NJ 08540, USA.

How do we read text today ?

To survive, or publish for the academic folks here, in our newly connected world submerged with large and growing amounts of information (sometimes named as "big data") it appears, most of the time, **we don't** read text as we were used to do it. We usually have a quick look at the book, the article or whatever source of information we have access to. In other words, most of the time, **we scan** texts rather than reading them. The text we are reading should pique our curiosity for a deeper reading. Another important point is the fact that using one medium to communicate (such as books or articles) is like doing an extraordinary compression of the information acquired during a long research time and trying to transfer the compressed data to someone else who do not necessarily have the knowledge to unzip these data. It may solve the problem, partly, to offer multiple perspectives or media to transmit the information.

The ideas behind this slide are borrowed from Mike Morgan & Bret Victor.

From keywords to details (Telescopic Text)

Sound absorbing materials dissipate energy.

They require open porosities.

The size of their pores should be of the order of 10 to 500 µm.

Telescopic Text is an original idea by Joe M. L. Davis

From keywords to details (Telescopic Text)

Sound absorbing materials dissipate energy.

They require open porosities for sound waves to propagate through their micro-structures and dissipate the acoustic energy.

The size of their pores should be of the order of 10 to 500 µm.

Telescopic Text is an original idea by Joe M. L. Davis

Switch between notations

The harmonic propagation of sound in fluids

is described by the Helmholtz equation:

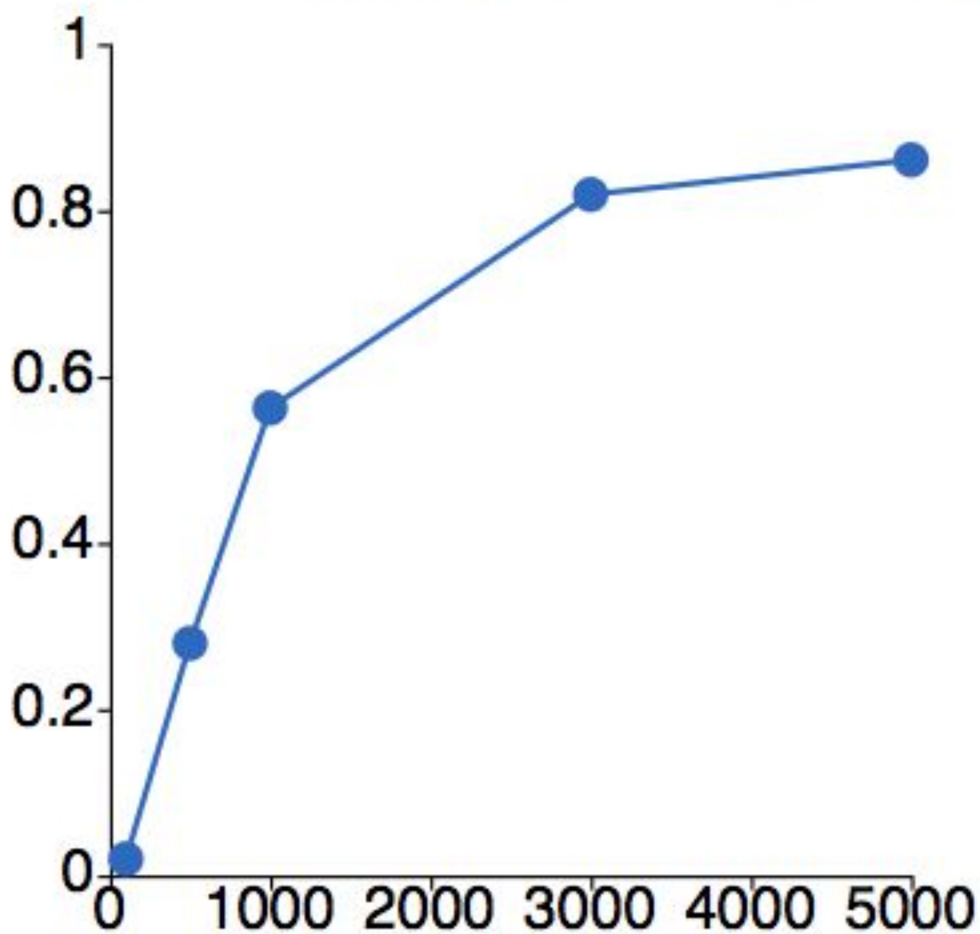
$$(\Delta + k^2)p = 0$$

Change notations : ∇ | $\partial/\partial x$ | words

Strut thickness: 40 microns.

Acoustic properties:

Sound abs. coefficient vs. frequency



Elastic parameters:

E = 500 kPa

Thermal conductivity:

λ = 0.36 W.K^{-1}.m^{-1}

Reading *(books, articles, web...)* | **1 day**

Reading *(books, articles, web...)* | **1 day**

Lecture

Reading *(books, articles, web...)*	**1 day**
Lecture *(any regular lecture on ac. porous media ?)*	**2 hours**

Reading *(books, articles, web...)* | **1 day**

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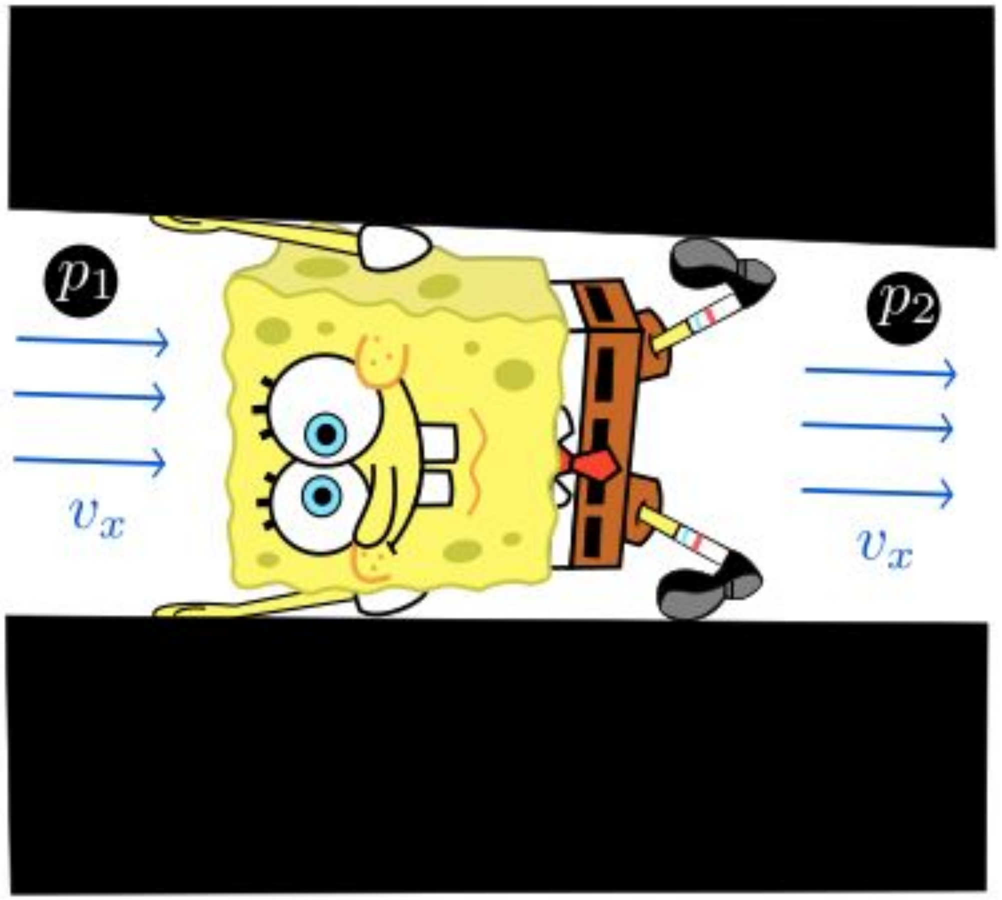
Poster / Comics

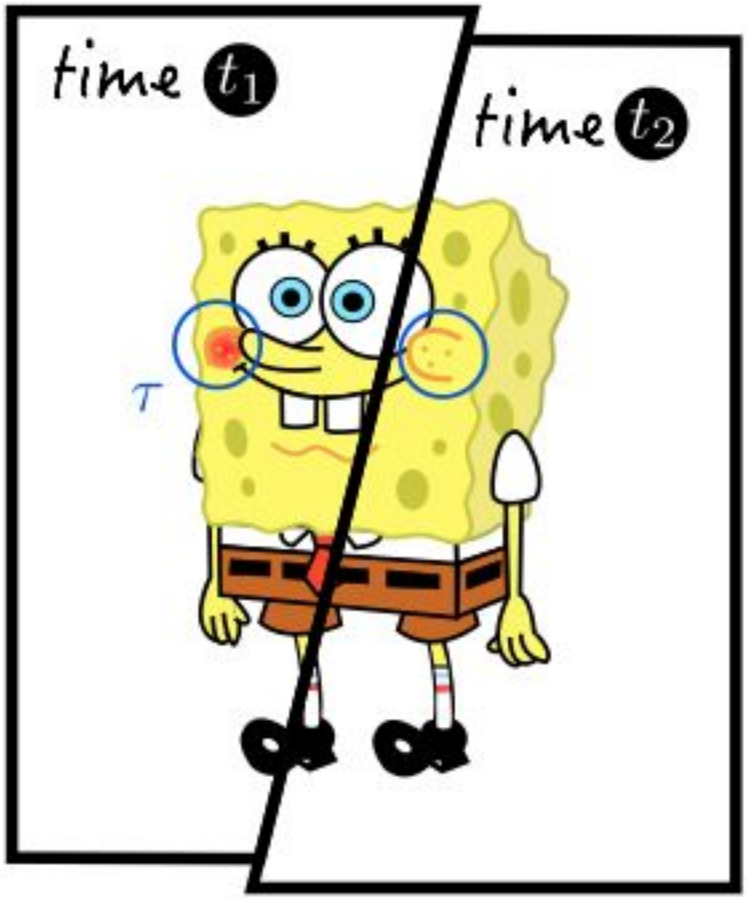
Definitions of the static permeabilities k_0 and k'_0

k_0 links pressure drop to flow velocity



$$\phi v_x = -\frac{k_0}{\eta}\frac{\partial p}{\partial x}$$

k'_0 links pressure variation with time to excess of temperature τ



$$\phi \tau = \frac{k'_0}{\kappa}\frac{\partial p}{\partial t}$$

Reading *(books, articles, web...)*	**1 day**
Lecture *(any regular lecture on ac. porous media ?)*	**2 hours**
Poster / Comics	**30 min.**

Reading *(books, articles, web…)*	1 day
Lecture *(any regular lecture on ac. porous media ?)*	2 hours
Poster / Comics	30 min.
Game	

New parameter

Static air-flow resistivity

New parameter

Open porosity


Tortuosity area
1.43

Reading *(books, articles, web...)*	**1 day**
Lecture *(any regular lecture on ac. porous media ?)*	**2 hours**
Poster / Comics	**30 min.**
Game *(example of an arcade video game)*	**5 min.**

I welcome your comments

@ljaouen on

luc.jaouen@matelys.com