

# Mathieu Bouville

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## Broad experience in modeling and simulations

- **Mathematical modeling and numerical simulations**
  - modeling: turning the real world into equations;
  - solving these equations in closed form (by hand or with Mathematica) or numerically;
  - atomistic and continuum simulations: Monte Carlo, molecular dynamics, phase field;
  - C++ programming: several numerical simulation codes written from scratch;
  - first author of two articles in *Physical Review Letters*, a top 3 physics journal.
- **Variety of fields**
  - materials science work on various materials systems: semiconductors (silicon, III–V compounds), metals (formation of martensite and pearlite), polymers (glass transition);
  - applied mathematics in my spare time: from the differential equations governing alcoholic fermentation to modeling the game of carom billiards as a Markov process;
  - quantitative personal finance: simulations to optimize the asset allocation of a stock–bond portfolio (e.g. <http://mathieu.bouville.name/finance/CAPE/>).

## Personal Aptitudes

- **Initiative and self-drive to learn new competences to a high level of proficiency**
  - taking charge of my projects: even as a student I took active part in research decisions;
  - self-driven work in applied maths, philosophy and finance in my spare time.
- **Analytical and critical thinking**
  - keen eye for hidden assumptions and inconsistencies, as well as new possibilities;
  - ability to reframe and clarify issues, even outside my sub-field (e.g. reviewing for journals).
- **International experience:** two fluent languages, three continents, four countries.
- **Communication and interpersonal skills**
  - technical communication: 24 journal articles, over 20 conference presentations;
  - collaboration with experimentalists and theorists, autonomous work on other projects.

## Experience

- 2008–2010 **Postdoctoral researcher**, Department of Materials Science, University of Cambridge.
  - I developed a new, faster (factor 100) computer simulation method within the framework of Monte Carlo lattice model to predict polymer glass-transition temperatures.
- 2004–2008 **Postdoctoral researcher**, Institute of High Performance Computing (Singapore).
  - Collaborating with experimentalists, I used phase-field simulations to explain how alloying may stabilize polycrystalline thin films and dramatically enhance their performance.
  - On a project I initiated, I showed how various parameters affect the interplay between martensite and pearlite formation in steel (which cannot be done experimentally).

- 2000–2004 **Graduate student research assistant**, University of Michigan (Ann Arbor, MI, U.S.A.).
- Working closely with experimentalists, I determined under what conditions pits would form in heteroepitaxial semiconductor thin films.
  - In order to better control dopant diffusion during device processing, I studied the effect of stress on point defects in semiconductors in collaboration with mechanical engineers.

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## Education

- 2004 **Ph.D. in Materials Science and Engineering**, University of Michigan, Ann Arbor.  
award Rackham predoctoral fellowship — “substantial and prestigious fellowships” of ca. US\$ 40 000 awarded by the Rackham School of Graduate Studies to about 60 out of 3 400 students.
- 2001 *Diplôme d’ingénieur civil des Mines*, École Nationale Supérieure des Mines de Nancy.  
Top 2% of class in this top 10 French Engineering school.
- 1996–1998 *Mathématiques supérieures et spéciales*, Lycée Pierre de Fermat (Toulouse, France).

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## Publications

**15 articles in materials science and engineering** — 8 as first author, including

- M. Bouville and R. Ahluwalia: “Microstructure and mechanical properties of constrained shape-memory alloy nanograins and nanowires”, *Acta Mater.* **56**, 3558 (2008).
- M. Bouville, D. Z. Chi and D. J. Srolovitz: “Grain-boundary grooving and agglomeration of alloy thin films with a slow-diffusing species”, *Phys. Rev. Lett.* **98**, 085503 (2007).
- M. Bouville and R. Ahluwalia: “Interplay between diffusive and displacive phase transformations: Time-temperature-transformation diagrams and microstructures”, *Phys. Rev. Lett.* **97**, 055701 (2006).
- M. Bouville, J. M. Millunchick and M. L. Falk: “Pit nucleation in the presence of three dimensional islands during heteroepitaxial growth”, *Phys. Rev. B* **70**, 235312 (2004).

**2 articles in applied mathematics and statistics**

- M. Bouville: “Position play in carom billiards as a Markov process”, *J. Quant. Anal. Sports* **3**(4), 4 (2007).
- M. Bouville: “Fermentation kinetics including product and substrate inhibitions plus biomass death: A mathematical analysis”, *Biotech. Lett.* **29**, 737 (2007).

**7 articles in philosophy and education**, including

- M. Bouville: “Why is cheating wrong?”, *Stud. Philos. Educ.* **29**, 67 (2010).
- M. Bouville: “Plagiarism: Words and ideas”, *Sci. Eng. Ethics* **14**, 311 (2008).
- M. Bouville: “Whistle-blowing and morality”, *J. Bus. Ethics* **81**, 579 (2008).

**A book on personal finance** for a broad audience (in French, to be published in March) — excerpts are available at <http://mathieu.bouville.name/finance/Fr/livre/>

**A website on mead (honey wine) making:** <http://www.meadmadecomplicated.org/>

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## Interests

Reading fiction as well as specialized works (philosophy, finance and economics, art history), billiards, mathematical modeling of everyday life (billiards, investing).