## Mathis Plapp

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## Presentations and Conferences

# International

## Invited Talks

 Condensed Matter in Paris 2014, Paris, France, august 24-29, 2014: "Phase-field models for the growth of liquid crystals and polycrystals: the quest for an orientation field".

 4th International Conference on Advances in Solidification Processes (ICASP 4), Old Windsor, UK, july 8-11, 2014: "Phase-field simulations of eutectic solidification: Pattern dynamics in three dimensions".

 Workshop on Complex Fluids in Evolving Domains, Leeds, UK, august 19-21, 2013: "Equilibrium and growth shapes of fiber-covered surfaces".

 12th Joint European Thermodynamics Conference (JETC 2013), Brescia, Italy, july 1-5, 2013: "Grand-canonical formulation of phase-field models for alloy solidification".

 TMS (The Minerals, Metals and Materials Society) meeting, San Antonio, TX, USA, march 3-7, 2013: "Phase-field simulations and geometrical analysis of cellular solidification fronts".

 The 7th International Workshop on Modelling in Crystal Growth (IWMCG7), Taipei, Taiwan, october 28-31, 2012: "Phase-field simulations and geometrical analysis of cellular solidification fronts".

 Directionally Solidified Eutectic Ceramics IV, Washington, DC, USA, october 14-17, 2012: "Phase-field modeling of pattern dynamics in eutectic solidification".

 Nanoscale Pattern Formation at Surfaces, El Escorial, Spain, september 18-22, 2011: "Ion abrasion induced pattern formation on compound surfaces" (in replacement of Elin Søndergård).

 ICIAM (International Congress on Industrial and Applied Mathematics), Vancouver, Canada, July 18-22, 2011: "Dynamics of eutectic solidification patterns: Insights from phase-field simulations".

 TMS (The Minerals, Metals and Materials Society) meeting, San Diego, CA, USA, february 27-march 3, 2011: "Unified derivation of phase-field models for alloy solidification from a grand potential functional".

 The 16th International Conference on Crystal Growth (ICCG16), Beijing, China, August 8-13, 2010: "Role of transverse temperature gradients in the generation of lamellar eutectic solidification patterns".

 Solid-Solid Phase Transformation in Inorganic Materials (PTM2010), Avignon, France, June 6-12, 2010: "Phase-field modelling of the discontinuous precipitation reaction".

 4th International Conference on Solidification Science and Processing (ICSSP4), Chennai, India, November 20-23, 2009: "Phase-field simulations of the lamella-to-rod transition in eutectic solidification".

 CECAM workshop Classical Density Functional Theory Methods in Soft and Hard Matter, Lausanne, October 21-23, 2009: "Phase-field crystal study of grain boundary premelting".

 CECAM workshop Multiscale modeling of heterogeneous nucleation and structure formation in colloids and metals, Zürich, Switzerland, April 15-17, 2009: "Phase-field crystal study of grain boundary premelting".

 TMS (The Minerals, Metals and Materials Society) meeting, San Francisco, CA, USA, february 15-19, 2009: "Phase-field modelling of liquid crystal solidification".

 Potential Theory and Analysis of Growth Processes, Orléans, France, January 12-16, 2009: "Modelling crystal growth with the phase-field method".

 Annual meeting of the Linné FLOW centre, Stockholm, Sweden, January 13-14, 2009: "Phase-field models with nematic order parameters".

 International Focus Workshop on Phase Field Simulations: Material Science meets Biology and Medicine, Dresden, Germany, November 12-14, 2008: "Phase-field models with nematic order parameters".

 Symposion on Trends in Applications of Mathematics to Mechanics (STAMM), Levico Terme, Italy, September 22-25, 2008: "Phase-field models for moving boundary problems: from the physics of phase transitions to applications in mechanics".

 Multi-scale modeling of moving interfaces in materials, Leuven, Belgium, july 2-4, 2008: "Phase-field crystal study of grain boundary premelting".

 European Congress on Advanced Materials and Processes (EUROMAT), Nuremberg, Germany, september 10-13, 2007: "Three-dimensional phase-field simulations of cellular solidification microstructures" (keynote lecture).

 Workshop "Evolution of Interfaces and Applications", Roscoff, France, may 9-11, 2007: "Phase-field simulations of pattern formation in solidification".

 Workshop "Polymorphism in Condensed Matter", Max-Plack-Institute for the physics of complex systems, Dresden, Germany, november 13-17, 2006: "On phase-field models for polycristalline solidification".

 Symposium in honor of Rohit Trivedi, "Critical Issues and Future Directions in Solidification Science", Iowa State University, Ames, Iowa, USA, september 20-22, 2006: "Pattern Dynamics".

 The 5th International Workshop on Modeling in Crystal Growth, Bamberg, Germany, september 10-13, 2006: "Three-dimensional phase-field simulations of directional solidification".

 Workshop "Mathematical Biology", Mathematisches Forschungszentrum Oberwolfach, Germany, may 14-19, 2006: "Modelling of moving boundaries with the phase-field method: Interfaces, membranes, and skins".

 European Congress on Advanced Materials and Processes (EUROMAT), Prague, Czech Republic, september 5-8, 2005: "Quantitative phase-field simulations of solidification microstructures" (keynote lecture).

 The 12th International Conference on Rapidly Quenched and Metastable Materials, Jeju, South Korea, august 21-26, 2005: "Three-dimensional phase-field simulations of eutectic coupled growth".

 XXV Dynamics Days Europe, Berlin, Germany, july 25-28, 2005: "Pattern formation during solidification: Insights from phase-field modelling".

 TMS (The Minerals, Metals and Materials Society) meeting, San Francisco, CA, USA, february 13-17, 2005: "Morphological stability of lamellar and rod eutectic growth".

 3e Congrès International en Sciences et Génie des Matériaux (CISGM3), Jijel, Algeria, May 25-27, 2004: "Modélisation de la croissance cristalline par la méthode du champ de phase" (plenary talk).

 DFG Schwerpunktprogramm workshop "Modelling of phase transition and interface dynamics across the length scales", Fachhochschule Karlsruhe, Germany, January 28-30, 2004: "Multi-scale problems in solidification: dendritic and eutectic growth".

 DFG Schwerpunktprogramm workshop "Solidification and Simulation II", Fachhochschule Karlsruhe, Germany, January 27, 2004: "Trijunction motion and pattern stability in binary and ternary eutectic alloys".

 IHP Workshop on Dynamics, Growth, and Singularities of Continuous Media, Paris, France, July 7 - 13, 2003: "Simulating free-boundary problems with the phase-field method".

 CECAM Workshop on Crystal-Melt Interfaces: Structure, Thermodynamics and Growth, Lyon, France, June 23 - 25, 2003: "Phase-field modeling of eutectic solidification".

 The 14th American Conference on Crystal Growth and Epitaxy, Seattle, USA, August 4 - 9, 2002: "Quantitative three-dimensional phase-field simulations of dendritic growth".

 International Workshop on Computational Physics of Transport and Interface Dynamics, Dresden, Germany, February 18 - March 8, 2002: "Multiscale Finite-Difference-Diffusion-Monte-Carlo method for simulating interfacial pattern formation".

 Materials Research Society (MRS) 2001 Fall Meeting, Boston, november 25-29, 2001: "Phase-field modeling of solidification and epitaxial growth".

 Workshop on Thermodynamic and Structural Properties of Materials (TSPM), Avignon, France, september 9-14, 2001: "Phase-field simulations of solidification microstructures".

## Contributed Talks

 EUROMAT (European Congress on Advanced Materials and Processes), Montpellier, France, september 12-15, 2011: "Phase-field simulations and geometrical analysis of cellular solidification fronts".

 EUROMAT (European Congress on Advanced Materials and Processes), Glasgow, UK, september 7-10, 2009: "Phase-field crystal study of grain boundary premelting", and "Phase-field simulations of the lamellar-to-rod transition in eutectic solidification".

 2nd Symposion on Phase-field modelling in Materials Science, Rolduc Abbey, Netherlands, august 30-september 2, 2009: "Phase-field models with nematic order parameters".

 TMS (The Minerals, Metals and Materials Society) meeting, New Orleans, LA, USA, march 9-13, 2008: "Phase-field modelling of the discontinuous precipitation reaction".

 European Congress on Advanced Materials and Processes (EUROMAT), Nuremberg, Germany, september 10-13, 2007: "Modelling of the discontinuous precipitation reaction with the phase-field method" (highlight lecture).

 MCWASP XI (Modelling of Casting, Welding and Advanced Solidification Processes XI), Opio, France, may 28 - june 2, 2006: "Three-dimensional phase-field simulations of eutectic solidification and comparison to in situ experimental observations".

 TMS (The Minerals, Metals and Materials Society) meeting, San Antonio, TX, USA, march 12-16, 2006: "Phase-field study of the cellular bifurcation in dilute binary alloys".

 European Congress on Advanced Materials and Processes (EUROMAT), Prague, Czech Republic, september 5-8, 2005: "Three-dimensional phase-field simulations of eutectic solidification".

 DPG (Deutsche Physikalische Gesellschaft) Tagung Berlin, Germany, march 4-9, 2005: "Phase-field study of the cellular bifurcation in dilute binary alloys".

 The Fourteenth international conference on crystal growth (ICCG-14), Grenoble, France, august 9-13, 2004: "Instabilities of hexagonal solidification patterns".

 TMS (The Minerals, Metals and Materials Society) meeting, Charlotte, NC, USA, march 15-19, 2004: "Three-dimensional phase-field simulations of directional solidification".

 DPG (Deutsche Physikalische Gesellschaft) Tagung Regensburg, Germany, march 8-12, 2004: "Dreidimensionale Phasenfeld-Simulationen der Erstarrung eutektischer Legierungen", and "Instabilitäten hexagonaler Erstarrungsmuster".

 Fractals Network Meeting, Sils Maria, Switzerland, march 26-31, 2000: "Scaling transients in dendritic growth at low undercooling".

 MRS (Materials Research Society) 1999 Fall Meeting, Boston, November 29-December 3, 1999: "A diffusion Monte Carlo algorithm for simulations of dendritic crystal growth".

 APS (American Physical Society) Centennial Meeting, Atlanta, March 20-26, 1999: "Spiral Surface Growth Without Desorption".

 MRS (Materials Research Society) 1998 Fall Meeting, Boston, November 30-December 4, 1998: "Spiral Surface Growth Without Desorption".

 Second Workshop on Solidification Microstructures, Zermatt, Switzerland, July 5-10, 1998: "Eutectic colony formation: A stability analysis".

 8th Joint EPS-APS International Conference on Physics Computing, Krakow, Poland, September 17-21, 1996: "Interface dynamics in a mean-field lattice gas model: Dendritic growth".

 Tagung der Deutschen Physikalischen Gesellschaft, Regensburg, Germany, March 1996: "Dendritisches Wachstum in einem mean-field- Gittergasmodell".

 Workshop on Instabilities, Chaos and Franctals in Crystal Growth, ETH Zurich, Switzerland, March 11-13, 1996: "Dendritic growth in a mean-field lattice gas model".

## Seminars and Colloquia

 Seminar at Matematics Department, Southern Methodist University, Dallas, TX, "Phase-field models for microstructure formation in materials", March 8, 2013.

 Seminar "Advances in Materials", Institut des Matériaux, EPFL Lausanne, Switzerland, "Phase-field models for microstructure formation in materials", October 8, 2012.

 Seminar at Centro de Fisica Teorica e Computational, Universidade de Lisboa, Portugal, "Phase-field simulations of pattern formation in solidification", November 4, 2009.

 Seminar at Institut für Materialphysik im Weltraum, DLR Köln, Germany, "Phase-field crystal study of grain boundary premelting", September 29, 2009.

 Seminar at Department of Chemical Engineering, University of Tarragona, Spain, "Phase-field models for the evolution of complex structures", May 8, 2009.

 Seminar at Department of Mathematics, Darmstadt University of Technology, Germany, "Phase-field modelling of pattern formation in solidification and of other moving boundary problems, April 24, 2009.

 Seminar ICAMS, University of Bochum, Germany, "Grain-boundary premelting in the phase-field crystal model", December 1, 2008.

 Seminar, Institute for Solid State Research (IFF), Forschungszentrum Jülich, Germany: "Pattern formation in solidification: New insights from phase-field simulations", October 9, 2008.

 Kolloquium at Otto-von-Guericke-Universität Magdeburg, Germany: "Phasenfeld-Simulationen der Strukturbildung beim Kristallwachstum", November 21, 2006.

 Seminar at Institut für angewandthe Mathematik, Universität Bonn, Germany: "Multi-Scale random walk algorithm for simulating dendritic solidification", April 26, 2005.

 Seminar at Institut für Gesteinshüttenkunde, RWTH Aachen, Germany: "Phasenfeld-Simulationen der gerichteten Erstarrung", January 20, 2005.

 Seminar at DLR, Köln, Germany: "Dreidimensionale Phasenfeld-Simulationen der Erstarrung: Dendriten, Zellen, Eutektika", June 23, 2004.

 Seminar at Max-Planck-Institut für Physik Komplexer Systeme, Dresden, Germany: "Simulating free boundary problems with the phase field method", April 28, 2004.

 Seminar at Ames National Lab, Ames, Iowa, USA: "Phase-field simulations of directional solidification", May 19, 2003.

 Seminar at Access e.V., RWTH Aachen, Germany: "Phasenfeld-Simulationen der freien und gerichteten Erstarrung: Ein Multi-Skalen-Problem", November 6, 2002.

 Seminar at Otto-von-Guericke Universitaet, Magdeburg, Germany: "Phasenfeld-Simulationen von Musterbildung beim Kristallwachstum", October 23, 2000.

 Seminar at Universitat de Barcelona, Spain: "Phase-field simulations of pattern formation during crystal growth", September 18, 2000.

 Seminar at Access e.V., RWTH Aachen, Germany: "Phasenfeld-Simulationen von Musterbildung beim Kristallwachstum: Direkter Vergleich mit Theorie und Experimenten", June 19, 2000.

 Seminar at EPFL Lausanne, Switzerland: "Numerical simulations of crystal growth using the phase-field method", May 17, 2000.

 Seminar at Northeastern University, Boston, USA: "A dynamical mean-field approach for pattern formation processes in lattice gas models", November 4, 1997.

 Seminar SFB 513, Universitaet Konstanz, Germany: "Interface dynamics in a mean-field lattice-gas model and application to dendritic growth", October 22, 1996.

## Courses in Summer Schools

 Summer school "Simulation within the field of production - Microscopic and macroscopic simulation approaches", KIT Karlsruhe, Germany, October 13-14, 2010: "Phase-field models for the evolution of complex structures".

 The 14th international summer school of crystal growth (ISSCG14), Dalian, China, August 1-7, 2010: "Phase-field simulations of crystal growth".

 Modelling in Materials Science: Theory and Applications, CCMX Summer School Course, EPFL Lausanne, Switzerland, August 26-28, 2009: "Phase-field simulations of pattern formation in solidification".

 Multiphase Microfluidics - The Diffuse Interface Model, June 15-19, 2009, Centre International pour les Sciences Mecaniques, Udine, Italy, "Phase-field models: from the physics of phase transitions to the evolution of complex structures".

## Meetings

 Computational Materials Science Network (CMSN) meeting, Oak Ridge National Lab, Oak Ridge, TN, USA, march 18-19, 2004: "Three-dimensional phase-field simulations of directional solidification".

 CETSOL meeting on phase-field modeling, Magdeburg, Germany, may 3, 2002: "Three-dimensional phase-field simulations of directional solidification".

# En France

## Organisation de conférences

 Symposion "Solidification" aux Journées annuelles de la Société Française de Métallurgie et de Matériaux, Paris, 4-6 juin 2008 (avec Charles-André Gandin et Gabriel Faivre).

 Minicolloque "Méthodes de champ de phase" aux Journées de la Matière Condensée (JMC 8), Marseille, 27-30 août 2002 (avec Yann Le Bouar).

 Journée thématique sur "Méthodes de champ de phase et interfaces diffuses" du GDR 2258 "Phénomènes de Transport et Transitions de Phase en Micropesanteur", ESPCI, Paris, le 27 mai 2002.

## Conférences invitées

 Congrès Français de Mécanique, Besançon, 28 août-2 septembre 2011: "Modélisation des microstructures de solidification par la méthode du champ de phase".

## Communications orales

 Rencontre de Physique Statistique, ESPCI, Paris, 26-27 janvier 2006: "Formes d'équilibre et de croissance de surfaces fibrées".

 Journées de la Matière Condensée, Nancy, 30 août-3 septembre 2004: "Algorithme Monte Carlo multi-échelle pour simuler la croissance dendritique".

 Journées de la Matière Condensée, Marseille, 27-30 août 2002: "Instabilités de cellules de solidification en trois dimensions".

 Rencontre de Physique Statistique, ESPCI, Paris, 25-26 janvier 2001: "Méthode Monte Carlo multi-échelle pour simulations numériques de la croissance dendritique".

 Journées de la Matière Condensée, Université de Poitiers, 29 août-1 septembre 2000: "Modes de surface dans la décomposition spinodale d'un mélange binaire".

 Journées du Non-linéaire, Institut Henri Poincaré, Paris, 9-10 mars 2000: "Formation de colonies eutectiques: Simulations et théorie".

 Rencontre de Physique Statistique, ESPCI, Paris, 25-26 janvier 1996: "Croissance dendritique dans un gaz sur réseau en approximation de champ moyen".

## Affiches

 Journées de la Matière Condensée, Université de Poitiers, 29 aout-1 septembre 2000: "Simulations quantitatives de la croissance dendritique en trois dimensions", "Formation de spirales durant la croissance épitaxiale: le régime sans désorption".

 Journées d'automne de la SF2M, Paris, 2-5 novembre 1999: "Simulations of dendrite tip morphology at low undercoolings".

## Séminaires

 **Modèles de champ de phase pour la croissance de structures arborescentes**: Laboratoire de Physique des Solides, Orsay, 2 octobre 2012; Laboratoire SVI, Saint Gobain Recherche, Aubervilliers, 9 décembre 2010; Laboratoire PMMH, ESPCI Paris, 8 octobre 2010; IUSTI, Marseille, 23 avril 2010; Laboratoire MSC, Paris, 26 janvier 2009.

 **Modélisation de la solidification directionnelle en trois dimensions par la méthode du champ de phase**: L2MP, Marseille, 29 mai 2008.

 **Modélisation de la croissance cristalline par la méthode du champ de phase**: CEA, Bruyères-le-Châtel, 26 mai 2008; Laboratoire de Photonique et de Nanostructures, Marcoussis, 7 juin 2006; Laboratoire d'Electrochimie et de Chimie Analytique (LECA), Ecole Nationale Supérieure de Chimie de Paris, 14 novembre 2003; Institut de Recherche sur les Phénomènes Hors Equilibre (IRPHE), Marseille, 16 février 2001; Laboratoire PMC, Ecole Polytechnique, Palaiseau, 22 juin 2000; Laboratoire de Mathématiques et ses Applications, Ecole Normale Supérieure de Cachan, 8 juin 2000; Centre de Recherche Physique Théorique et Modélisation, Université de Cergy, 11 mai 2000; Laboratoire d'Etude des Microstructures, ONERA, Chatillon, 2 mai 2000; Section de Recherches de Métallurgie Physique, CEA Saclay, 2 mars 2000; Centre de Mathématiques Appliquées, Ecole Polytechniqe, 24 février 2000.

 **Modélisation de microstructures de solidification par la méthode du champ de phase**: Laboratoire de Modelisation en Mécanique, Université Pierre et Marie Curie, Paris, 13 décembre 2002; Institut Non Linéaire de Nice (INLN), Sophia Antipolis, 6 décembre 2002.

 **Quelques applications de la méthode 'phase-field': Colonies eutectiques, bandes péritectiques et spirales de croissance**: Laboratoire de Physique de la Matière Condensée, Ecole Polytechnique, Palaiseau, 3 septembre 1998; Groupe de Physique des Solides, Universités Paris VI et VII, Paris, 4 septembre 1998.

## Ecoles d'été

 Ecole thématique "Les changements de phase solide-liquide-vapeur : fondements et applications", Les Embiez, 25-31 octobre 2009: "Modélisation des interfaces solide-liquide à l'échelle mésoscopique: la méthode du champ de phase".

 Ecole thématique "Solidification des alliages métalliques", Saint-Pierre d'Oléron, 22-27 juin 2014: "Méthodes de champ de phase".

## Réunions, workshops, etc.

 Colloque du GdR "Microgravité Fondamentale et Appliquée", Porticiio, 9-12 octobre 2012: "Simulations par champ de phase de la formation de branches dendritiques secondaires en trois dimensions".

 Journées Expériences in situ et simulations, GdR SAM, Faculté de St. Jérôme, Marseille, 11-12 juin 2012: "La méthode du champ de phase - possibilités et limitations".

 Colloque du GdR "Microgravité Fondamentale et Appliquée", Fréjus, 6-9 novembre 2011: "Fronts de solidification cellulaires: Simulation par champ de phase et analyse géométrique".

 Journée "Matière Complexe" du RTRA "Triangle de la Physique", Orsay, 24 septembre 2009: "Irrégularité, morphologies et phénomènes de transport".

 Colloque du GDR "Micropesanteur Fondamentale et Appliquée", Carry Le Rouet, 17-29 octobre 2005: "Stabilité morphologique de microstructures eutectiques: Simulations par la méthode du champ de phase".

 Journée "Electrochimie et fractales", Ecole Normale Supérieure de Cachan, 28 janvier 2005: "Modélisation de la croissance électrochimique".

 Journée thématique du GDR 2258 "Phénomènes de Transport et Transitions de Phase en Micropensanteur" sur l'influence des champs externes sur la ségrégation et la structuration en solidification: expériences et simulations, Laboratoire EPM, Grenoble, 21 mars 2003: "Simulations de la solidification sans et avec écoulement par la méthode du champ de phase".

 Journées de travail sur la modélisation de problèmes à interfaces avec couplages, PPF "Mécanique numérique hautes performances", Laboratoire de Mécanique et d'Acoustique, ESM2 - Université de la Méditerranée, Marseille, 19-20 novembre 2002: "La méthode du champ de phase".

## Cours

 **Structures fractales et phénomènes chaotiques**, cours électif (18 heures) à SUPELEC, Gif-sur-Yvette.

 Intervention dans un séminaire XCollège (Ecole Polytechnique), **Processus irréversibles dans les systèmes électrochimiques**.