



## EMMC Training for Translators

Joint ECCOMAS Conferences

11 – 15 June 2018, Glasgow, UK

6th European Conference on  
Computational Mechanics  
(Solids, Structures and Coupled Problems)  
- ECCM 6

7th European Conference on  
Computational Fluid Mechanics  
- ECFD 7

**ECCM - ECFD  
2018**

**June 14<sup>th</sup> 2018, Glasgow**

EMMC-CSA H2020-NMPB-2016-2017 Grant 723867





# The European Materials Modelling Council

## EMMC Training for Translators: Agenda

- 11:00 - 13:00 MS 147A Translation of materials modelling – Introduction and Theoretical Background**  
Chairs: **Natalia Konchakova** and **Daniel Höche** (Helmholtz-Zentrum Geesthacht, GERMANY)
- 11:00 – 11:20 **Key-note lecture:** [Translation from industrial challenges to materials modeling solutions](#),  
Natalia Konchakova (EMMC)
- 11:20 – 11:40 [Translation case: Challenges in the translation of materials modeling techniques to industry](#),  
Tobias Neumann (Nanomatch GmbH, GERMANY)
- 11:40 – 12:00 [Translation case: Residual Stresses and structural changes generated at different steps of the manufacturing of gears: Modelling and Validation](#), Jon Lambarri (IK4-TEKNIKER, SPAIN)
- 12:00 – 12:20 [Translation case: Rebooting materials discovery and design](#), Michael Haverty (Property Vectors, USA)
- 12:20 – 12:40 [Translation case: Optimal cooling system design for injection molding process](#), Ronan Le Goff (IPC, FR)
- 12:40 – 13:00 [Q&A, Discussion](#), Natalia Konchakova and Daniel Höche (EMMC)
- 16:30 – 18:30 MS 147B Translation of materials modelling – Practical Tips and Implementation**  
Chairs: **Natalia Konchakova** (HZG, Germany) and **Tom Verbrugge** (DOW, NIEDERLANDS)
- 16:30 – 16:50 **Key-note lecture:** [An industry perspective on translation and the usage of materials modelling](#),  
Tom Verbrugge (EMMC)
- 16:50 – 17:10 [Translation in practice: How to prepare a Translation Case? Translation on EMMC-Marketplace](#),  
Denka Hristova-Bogaerds/ Natalia Konchakova (EMMC)
- 17:10 – 17:50 [How to estimate the economic impact of materials modelling applications and modelling projects?](#)  
R. Le Goff, J. Lambarri, M. Haverty, T. Neumann
- 17:50 – 18:30 [Wrap-up and follow-up](#), Natalia Konchakova and Tom Verbrugge (EMMC)





## Translation from industrial challenges to materials modeling solutions

Natalia Konchakova, Denka Hristova-Bogaerds, Daniel Höche,  
Pietro Asinari and Luca Bergamasco  
European Materials Modelling Council (EMMC)

**EMMC Training for Translators  
ECCM-ECFD 2018  
June 14<sup>th</sup> 2018, Glasgow, ECCOMAS**

**EMMC-CSA H2020-NMPB-2016-2017 Grant 723867**





- EMMC: Goal and Structure
- How can you join the EMMC?
- Materials Modelling and Industrial Feedback
- Translator as a stakeholder
- Translation process and methodology
- Materials Modelling Standardization: MODA concept / CEN/CWA Document
- EMMC-CSA: Translation and Training





# The European Materials Modelling Council

## Leadership in Enabling and Industrial

### Translators

(non exhaustive list)



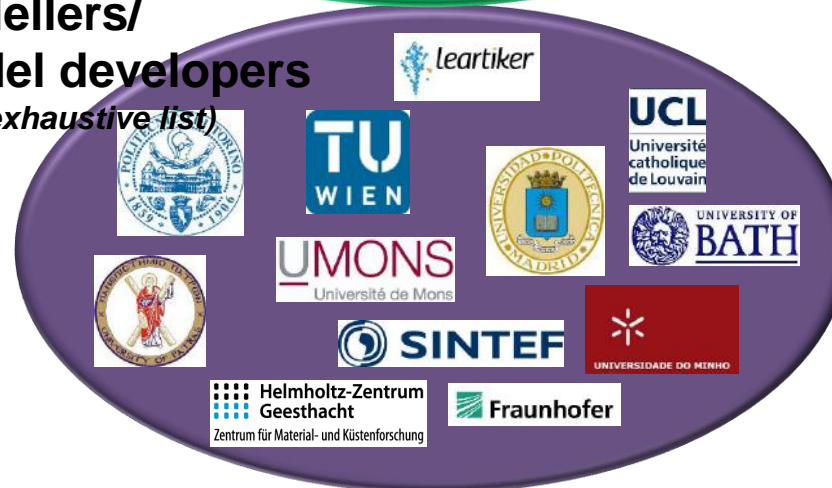
### End-Users

(non exhaustive list)



### Modellers/ model developers

(non exhaustive list)



### Software Owners

(non exhaustive list)



**Goal** → to connect & coordinate & enlarge existing activities of the European materials modelling community

EMMC Training for Translators, Glasgow, 14<sup>th</sup> June 2018





# The European Materials Modelling Council

## EMMC Working Groups

<https://emmc.info/main/working-groupsPS/>

### **Modelling and Validation**

Aims to identify model gaps and establish roadmaps for model development



### **Interoperability and Integration**

Develops, supports and coordinate the use of a common terminology and European Materials Modelling Ontology (EMMO).

### **Translation and Training for Companies**

Develop the role of translators as the bridge between manufacturers and materials modelling experts.

### **Repositories and Marketplace**

Marketplaces provide manufacturers a one-stop shop, a single access point to materials modelling resources and data repositories in Europe

### **Professional Software Deployment**

Stimulates and supports the industrial exploitation of materials modelling software and innovations in Europe.

### **Industrial Integration and Economic Impact**

Bring materials modelling closer to manufacturers and measures its economic impact on industry.

**The Working Groups are open to all stakeholders.**

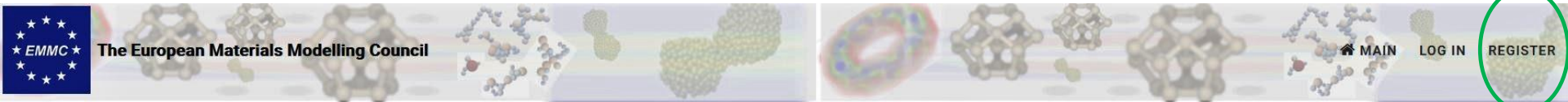




# The European Materials Modelling Council

Open community: [www.emmc.info](http://www.emmc.info)

Everybody from  
European Materials Modelling Community  
Is Invited to Join and Share Opinions



## SPECIAL TOPICS

[Advice for LEIT Proposers](#)

## EVENTS

[EMMC-Training for Translators within Joint ECCOMAS Conferences](#)

[ECCM-ECFD 2018](#)

14/06/2018

## Participation



Join Us And Help Shape Europe's Material Modelling Vision

**The EMMC is a bottom-up initiative! In practice this means that anybody can start an activity.**

- The best way to become active is to look at the pages of the [Working Groups](#) and their charters.
- Join the working group of your interest by inscribing on the [EMMC members](#) website if you feel that you can make valuable contributions to the field.
- Use the EMMC-Marketplace social networking components to connect with the [Operational Team Manager](#) and other members of the group!





# The European Materials Modelling Council

## Materials Modelling and Industrial Feedback

### *Modelling offers unique insight into*

- properties and in-service behaviour of materials,
- industrial manufacturing processes,
- provides understanding of the underlying physics of materials, devices and processes;

### *Modelling complements experiments by*

- guiding experiments, replacing time and cost expensive trials,
- reducing cost and hardware for testing,
- interpreting the experiments;

THEORY

PRACTICE

### *Modelling helps design prototypes by enabling*

- pre-screening, faster screening of alternative materials and designs,
- predicting final product properties and performance,
- determination if a design concept works without having to build it,
- optimisation of production processes;

### *Modelling reduce development time by*

- shortening lead and qualification time,
- facilitating the debottlenecking,
- decreasing the time-to-market;

Source:

<https://publications.europa.eu/en/publication-detail/-/publication/ec1455c3-d7ca-11e6-ad7c-01aa75ed71a1>





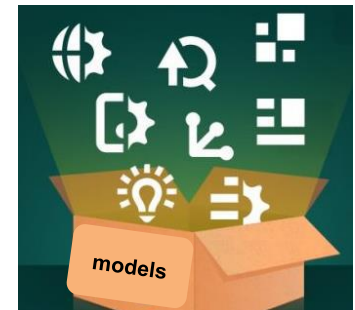


# The European Materials Modelling Council

Translation = bridging the gap between  
modellers and industry

## Industrial world:

- Often not aware of the full potential of modelling or/and
- Often needs guidelines in selecting suitable modelling workflow(s) for their problems



## Academic modelling world:

- Often not fully aware of the nature, differences and complexity of industrial problems

## Translators:

- ✓ Understand both worlds and speak both languages!





# The European Materials Modelling Council

## Translation and Translators

BUSINESS

□ all stages:

design  
testing  
up-scaling  
market introduction



TRANSLATOR

Business  
Activities

Science

R&D



BUSINESS  
AIM

TRANSLATION  
FOCUS

INDUSTRIAL  
PROBLEM

Necessary:  
**full understanding** of  
the problem and its  
**industrial context**



**support**  
the **implementation**  
and **utilization** of  
**modelling** and **simulation**  
by enhancing the skills of  
the industrial operators





# The European Materials Modelling Council

## Tasks of the Translator

**1) Understands the business case**

**2) Understands the industrial case**

**3) Analyse the data (experimental and modelling) available within the client**

**4) Translate to (preferably more than one) modelling workflows**

**5) Propose to the client modelling executor(s) and strategy for model validation**

**6) Translate the modelling results to information that is understandable, reliable and usable by the client**





# The European Materials Modelling Council

## The Translation process

### Good understanding of the business case:

- *Impact (e.g. profit, jobs, ...)*
- *Risks*
- *Timeline of the client*
- *Expected by the client outcomes (soft and hard)*

### Good understanding of the industrial case:

- *Where and what exactly is the problem: material or processing related or other*
- *Factors that have an effect e.g. technical specifications.*

### Analysis of the experimental data available within the client:

- *This data is needed for model input and validation.*
- *The quality and accuracy/uncertainty of this data must be well understood.*
- *If needed, the Translator can propose “dedicated experiments”*





# The European Materials Modelling Council

## The Translation process

**Translation to (preferably more than one) modelling workflows, considering:**

**MS147B**

- *The specifications of different potentially useful models/software tools:*
  - *Availability*
  - *Suitability,*
  - *Efficiency,*
  - *Level of maturity (user friendliness, especially for SMEs),*
  - *Accuracy*
- *Client's experience and preferences*
- *Costs: investments in person months and hardware, simulation time*
- *Return of investment / benefit*
- *Validation of the model: available experimental data and generation of new data*
- *Give good/objective argumentation for the proposed modelling workflows*





# The European Materials Modelling Council

## The Translation process

**Proposition to the client with the most suitable modelling executor(s) and strategy for model validation**

- *Give good/objective argumentation for the proposed executors*
- *Based on executor's expertise, experience, availability and client's preference (if any)*
- *Follow the project execution and represents the client interests*

**Translation of the modelling results to information that is understandable, reliable and usable by the client**

- *A follow-up, evaluation of the process, interpretation and recommendations are desirable but not always required*





# The European Materials Modelling Council

## Skills of Translators

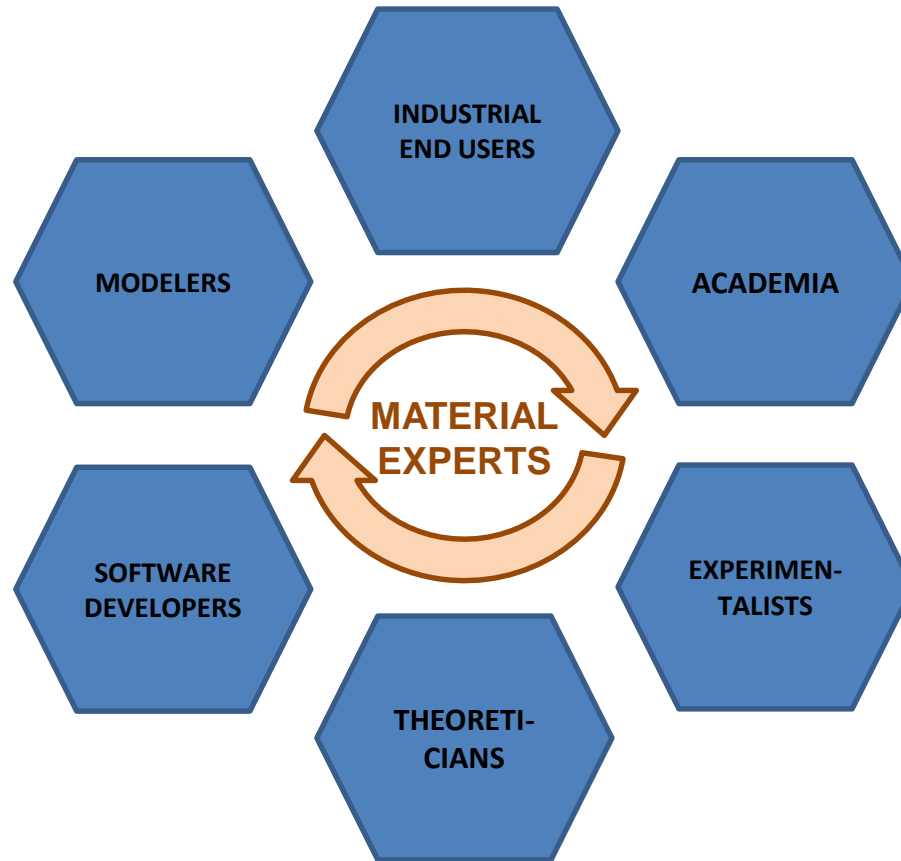
- ❑ **Industrial background**
- ❑ **Academic/technical background**
- ❑ **Deep and broad knowledge of modelling and software tools**, including the limitations and pitfalls of the tools and methods.
- ❑ **Broad understanding of different experimental techniques and data analysis**
- ❑ **Softs skills**
- ❑ **Knowledge of economic impact:** Balance between investments and expected return
- ❑ **Being neutral: find the best expert and the most suitable modelling tools, with objective argumentation**
- ❑ **Expected to show a proven “track record” of expertise on translation**, including success stories.
- ❑ **Managing data confidentiality**





# The European Materials Modelling Council

**EACH COMMUNITY HAS ITS OWN TERMINOLOGY !!!**



**The translator needs to talk and understand the language of each community**

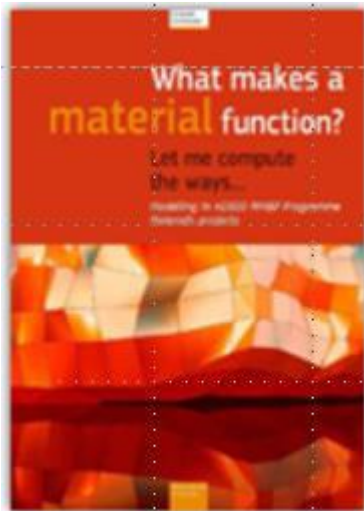






# The European Materials Modelling Council

## Review of Materials Modelling - MODA



Review of Materials Modelling VI  
**RoMM**

Vocabulary, classification and metadata for materials modelling (130 FP7 and H2020 projects)

Source:

<https://bookshop.europa.eu/en/what-makes-a-material-function--pbKI0616197/>

## MODA (M**O**delling D**A**ta)

is a **template** for the **standardised description** of **materials models** (<https://emmc.info/moda-workflow-templates/>)

The **MODA** is meant to **guide users** towards a complete **high-level documentation** of material models, starting from the **end-user case** via the **computational details** to the **results**.

It provides all necessary aspects for: **description**, **reproducibility**, **curation** and **interfacing** with other models and databases.

The MODA -- **model concepts**

PHYSICS ENTITY

EQUATIONS  
(physics- or data-based)





# The European Materials Modelling Council

## Materials Modelling Standardization



European Committee for Standardization

- Materials Modelling Standardization:

The CEN Workshop Agreement

**CWA 17284 “Materials modelling – terminology, classification and metadata”**

<https://www.cen.eu/news/workshops/Pages/WS-2017-012.aspx>

- **European Materials Modelling Ontology (EMMO)** – **STRATEGIC IMPORTANCE** for the modelling community





# The European Materials Modelling Council



EMMC-CSA H2020-NMPB-2016-2017 Grant 723867

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 723867



EMMC Training for Translators, Glasgow, 14<sup>th</sup> June 2018