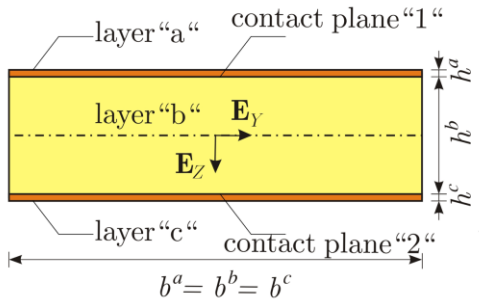
Sveučilište
u Rijeci
**Građevinski**
**fakultet**

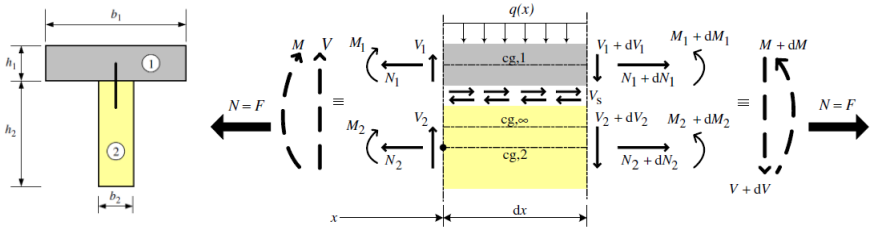
# Predstavljanje iskustva korisnika MSCA Poslijedoktorske stipendije,

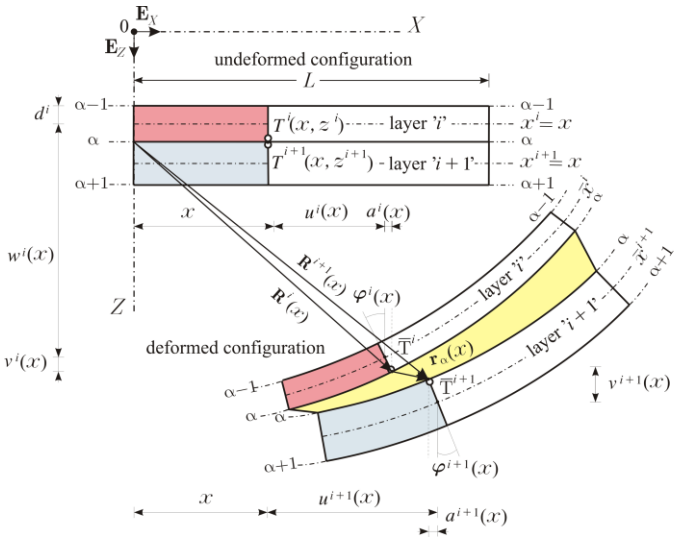
**LEO ŠKEC**

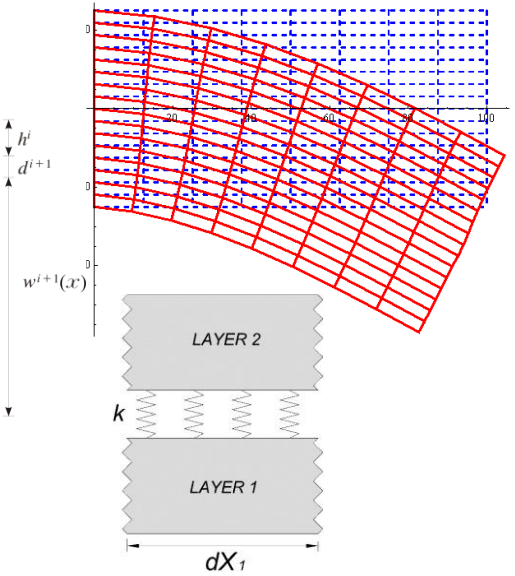
Građevinski fakultet u Rijeci, 3. travnja 2024.

# Kratka povijest




2008 diplomski rad GF UNIRI (mentor A. Bjelanović, komentor G. Jelenić)

→

2009 asistent/dokorand na GF UNIRI (mentor G. Jelenić)

→

2009/2010 doktorska stipendija NZZ → FGG Ljubljana

→

2013 (21/06) obrana teme doktorskog rada

# Kratka povijest

INTERNATIONAL JOURNAL FOR NUMERICAL METHODS IN ENGINEERING
*Int. J. Numer. Meth. Engng* 2001; **50**:1701–1736

Finite element interface models for the delamination analysis of laminated composites: mechanical and computational issues

G. Alfano and M. A. Crisfield*,†,‡

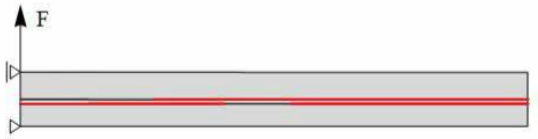
*Department of Aeronautics, Imperial College of Science, Technology and Medicine, London SW7 2AZ, U.K.*

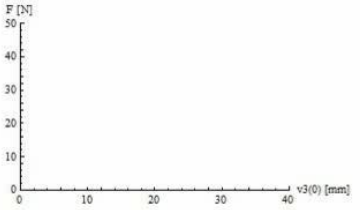
**863 citata na WOS-u**

- Očekivani znanstveni doprinos :

*„…uvođenjem **nelinearnog konstitutivnog zakona za kontaktni sloj** moguće je modelirati **oštećenje** kontaktnog sloja i **delaminaciju** višeslojnog nosača…”*

- Ključna riječ: **DELAMINACIJA** (RASLOJAVANJE)



# Kratka povijest

## Dr Giulio Alfano

Brunel University London

Reader

Mechanical Engineering PGR Director

INTERNATIONAL JOURNAL FOR NUMERICAL METHODS IN ENGINEERING
*Int. J. Numer. Meth. Engng* 2001; **50**:1701–1736

Finite element interface models for the delamination analysis of laminated composites: mechanical and computational issues

G. Alfano and M. A. Crisfield*,†,‡

*Department of Aeronautics, Imperial College of Science, Technology and Medicine, London SW7 2AZ, U.K.*

Research Associate
Imperial College London
Aug 1998 - Oct 2001 · 3 yrs 3 mos

ELSEVIER

Comput. Methods Appl. Mech. Engrg. 171 (1999) 141–171

Computer methods in applied mechanics and engineering

Geometrically exact 3D beam theory: implementation of a strain-invariant finite element for statics and dynamics

G. Jelenić, M.A. Crisfield*

*Department of Aeronautics, Imperial College of Science, Technology and Medicine, London SW7 2BY, UK*

1999. - 31.12.2003.
*EPSRC Advanced Research Fellow*
Imperial College London, Department of Aeronautics

1990. - 1993.
*Mladi raziskovalec*
Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo

# NEWFELPRO 2014

**From:** Gordan Jelenic [mailto:gordan@gradri.hr]
**Sent:** 14 January 2014 18:54
**To:** Giulio Alfano
**Subject:** Newfelpro fellowships

NEWFELPRO 2013 2017

Giulio,

I have a PhD student (Leo Skec) who is considering applying to an outgoing fellowship

http://www.newfelpro.hr/default.aspx?id=63
http://www.newfelpro.hr/default.aspx?id=86

Leo studies layered beam structures, both analytically and numerically, already has so
into his beam model (now that another PhD student, Nikola, who had contacted you

Leo plans to finish his thesis this year and would like to spend a year abroad after tha
year to do some work together?

## II. ABOUT NEWFELPRO

The long-term objective of the NEWFELPRO fellowship project is to raise the presence of research-qualified individuals by providing them with new opportunities to gain relevant international experience, and thus contribute to the further development of international scientific networks.

## VIII.2. RESEARCHERS

NEWFELPRO Fellowships are intended for experienced researchers and senior researchers, namely those who either:

i. have at least 4 years of research experience[4] (full-time equivalent) after obtaining a degree which would formally entitle them to embark on a doctorate either in the country in which the degree was obtained or in the country in which the research training will be provided; or ii. are already in possession of a doctoral degree (PhD) – **EXPERIENCED RESEARCHERS;**

ii. have more than 10 years of research experience (full-time equivalent) – **SENIOR RESEARCHERS.**

The time limit in fulfilling one of these conditions is the deadline for submitting the proposal for the relevant call. The required research experience does not include breaks during the research career of a researcher, irrespective of the reason (e.g. family reasons, etc.).

## VIII.3. NATIONALITY REQUIREMENTS

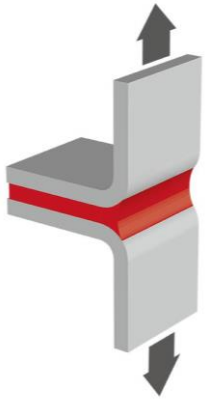
Researchers must have Croatian citizenship for outgoing and reintegration schemes.
Researchers must be of non-Croatian citizenship for the incoming scheme.

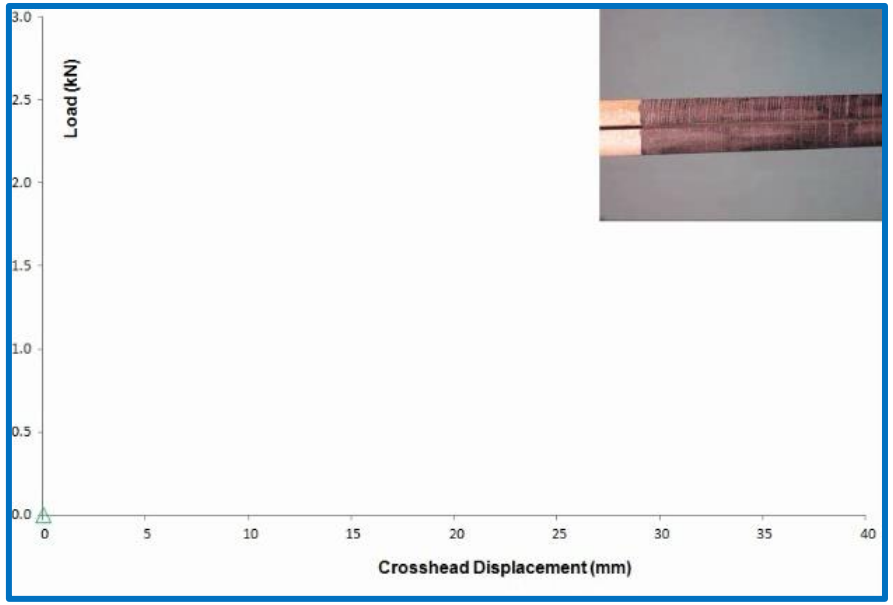
# NEWFELPRO 2014

**From:** Giulio Alfano [mailto:Giulio.Alfano@brunel.ac.uk]
**Sent:** 15. siječanj 2014 12:51
**To:** 'Gordan Jelenic'
**Subject:** RE: Newfelpro fellowships

Hi Goran,

It would be a pleasure to work together. Thanks for thinking of me for that.



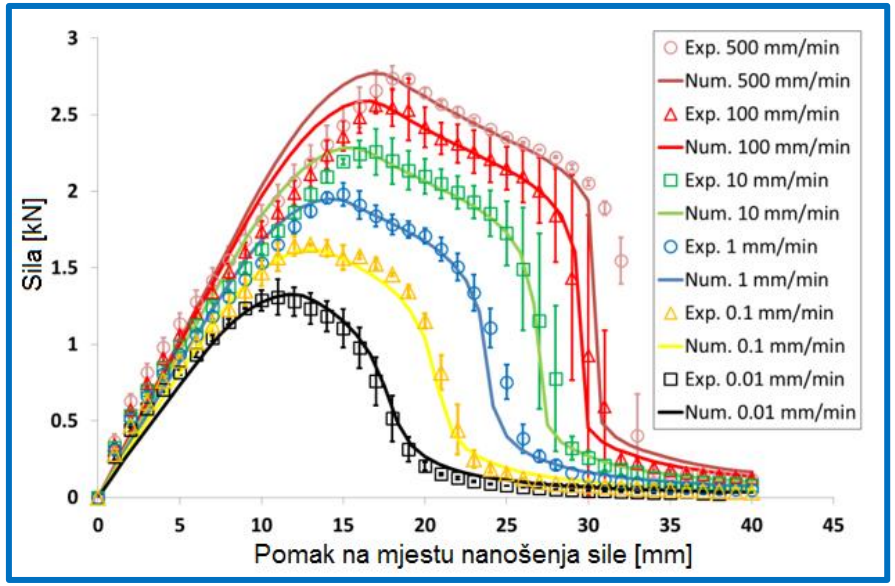



- Prvi draft – 3. veljače 2014.

**IV. Proof of scientific excellence**

a) List of all publications in the last 5 years

- Škec, L., Schnabl, S., Planinc, I., Jelenić, G., (2012) *Analytical modelling of multilayer beams with compliant interfaces*, *Structural Engineering and Mechanics*, **44**(4), 465-485
- Škec, L., Bjelanović, A., Jelenić, G., (2013) Glued Timber-Concrete Beams - Analytical and Numerical Models for Assesment of Composite Action, *Engineering Review*, **33**(1), 41-49
- Šćulac, P., Jelenić, G., Škec, L., (2014) Kinematics of layered reinforced-concrete planar beam finite elements with embedded transversal cracking, *International journal of solids and structures*, **51**(1), 74-92
- Škec, L., Jelenić, G., (2014) Analysis of a geometrically exact multi-layer beam with a rigid interlayer connection, *Acta mechanica*, **225**(2), 523-541



# NEWFELPRO 2014

- 4. ožujka 2014. – Prijavljen projekt na **NEWFELPRO** (Odlazna mobilnost)
- U mjesec dana – 11 verzija projekta, brojni Skype sastanci
- 17. srpnja 2014. – odluka o neprihvaćanju projekta za financiranje

Selekcijski odbor NEWFELPRO-a je na sjednici održanoj 15. srpnja 2014. odobrio recenziju za Vaš projekt, no zbog velikog broja kvalitetnih i zanimljivih projekata, prag za konačnu ocjenu u ovom Natječaju postavljen je na 4,44.

S obzirom da je konačna ocjena Vašeg projekta 4,38, Selekcijski odbor je donio odluku da se Vaš projekt ne preporučuje za financiranje.

Sukladno procedurama projekta, u slučaju da se oslobode dodatna sredstva za financiranje projektnih prijedloga, bit ćemo slobodni obavijestiti vas o tome najkasnije do kraja mjeseca srpnja 2014.

# MSCA-IF 2014

**Experienced researchers** (ER) shall, at the time of the relevant deadline for submission of proposals (IF), recruitment (COFUND) or secondment (RISE) by the host organisation, be in possession of a doctoral degree or have at least four years of full-time equivalent research experience.

- 17. srpnja 2014.

Gordan → Giulio:

*„…what do you think about trying a real **Marie Sklodowska Curie** action based on this proposal?"*

*„One call for Individual Fellowships is open right now and closes on **11.9.2014.**"*

Giulio → Gordan (dan kasnije):

*„… I think your idea that Leo can apply for a MC fellowship is **excellent**"*

- 29. kolovoza 2014. – Giulio skida obrasce i počinjemo raditi na prijavi

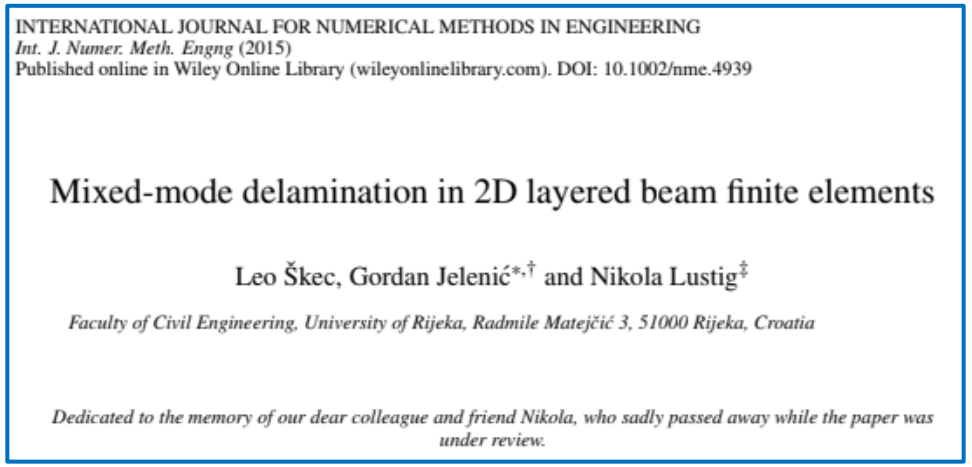
# MSCA-IF 2014

- Priprema prijave u dva tjedna
- Projekt predan 11/09/2014
- Uglavnom recikliranje NEWFELPRO projekta (novi obrasci)

| NEWFELPRO 2014 | MSCA-IF 2014 |
|---|---|
| 12 mjeseci (Brunel) + 6 mjeseci (GFRI) | 16 mjeseci |
| 57.236,09 € + 7.483,22 € | 122.203 € |

- Projektni prijedlog nije odobren za financiranje – 79.20%
- Vrlo pozitivni komentari, slabost je nedostatak **EKSPERIMENATA**
- **10/10/2014 – OBRANJEN DOKTORSKI RAD**

# MSCA-IF 2015



INTERNATIONAL JOURNAL FOR NUMERICAL METHODS IN ENGINEERING
*Int. J. Numer. Meth. Engng* (2015)
Published online in Wiley Online Library (wileyonlinelibrary.com). DOI: 10.1002/nme.4939

Mixed-mode delamination in 2D layered beam finite elements

Leo Škec, Gordan Jelenić*,† and Nikola Lustig‡

*Faculty of Civil Engineering, University of Rijeka, Radmile Matejčić 3, 51000 Rijeka, Croatia*

*Dedicated to the memory of our dear colleague and friend Nikola, who sadly passed away while the paper was under review.*

- Prijava na MSCA-IF-2015 (10/09/2015)

| MSCA-IF 2014 | MSCA-IF 2015 |
|---|---|
| 16 mjeseci | 20 mjeseci (11/2016 – 07/2018) |
| 122.203,00 € | 152.879,00 € |

- Eksperimentalni program uključen u projekt
- 01/12/2015 – izabran u znanstveno-nastavno zvanje **DOCENT**
- 22/01/2016 – **PROJEKT ODOBREN ZA FINANCIRANJE! – 94.80%**
- 08/09/2016 – odobren neplaćeni dopust
- 01/10/2016 – planirani početak projekta (na koncu 01/11/2016)

# ESR – Evaluation Summary report

**Criterion 1 - Excellence**

Score: **4.80** (Threshold: 0/5.00 , Weight: 50.00%)

**Quality, innovative aspects and credibility of the research (including inter/multidisciplinary aspects)**
**Clarity and quality of transfer of knowledge/training for the development of researcher in light of the research objectives**
**Quality of the supervision and the hosting arrangements**
**Capacity of the researcher to reach or re-enforce a position of professional maturity in research**

*Strengths:*

*- Introduction and the state-of-the-art in the field is presented in detail with numerous references.*
*- Objectives are clearly articulated and in line with the planned high quality research.*
*- The project proposes innovative and timely research in the field of modelling of the delamination in layered structures.*
*- The transfer of knowledge from the host organization to the experienced researcher is adequately described regarding the cohesive zone modelling techniques and experimental validation.*
*- Host organization will benefit from researcher's extensive experience on simulation and from the researcher's research network.*
*- The scientific quality of the supervisor and the hosting research team is high and confirmed by numerous papers published in high impact journals and participation in international projects.*
*- The measures taken to integrate the researcher in the host organization group research meetings and the interaction with undergraduate students is well described.*
*- Applicant has obtained their PhD degree in 2014 and their track record of publications in high profile journals is very good. This demonstrates the high potential of the researcher to become independent upon accomplishment of the proposed project.*
*- The fellow will have the opportunity to expand his research network inside Europe, creating an excellent base for future research collaborations.*

*Weaknesses:*

*- Research methodology is not fully described; the model parameter tuning that will be employed to reach the validation targets is not adequately described.*
*- Details are insufficient regarding the training on transferable skills essential for career development, however this is a minor point given the overall high quality of the proposal.*

# ESR – Evaluation Summary report

**Criterion 2 - Impact**

Score: **4.60** (Threshold: 0/5.00 , Weight: 30.00%)

**Enhancing research- and innovation-related human resources, skills, and working conditions to realise the potential of individuals and to provide new career perspectives**
**Effectiveness of the proposed measures for communication and results dissemination**

*Strengths:*
*- The project displays high positive impact on the researcher's career development in terms of new programming competencies and measurement skills.*
*- The researcher would establish mutual beneficial international research collaborations with a large number of research teams.*
*- Dissemination activities are adequately described regarding the publication of scientific papers and the establishment of a website, videos and computer animations to attract potential software users.*
*- The General Public License approach for developed software will be adopted to strengthen the impact of new knowledge.*

*Weaknesses:*
*- The impact of the researcher's future activity on European society, including the science base and/or the economy is not adequately described regarding specific actions for applications within industry and other non-academic settings.*
*- Not enough details are provided in the proposed measures for communication to the general public.*

# ESR – Evaluation Summary report

**Criterion 3 - Implementation**

Score: **4.80** (Threshold: 0/5.00 , Weight: 20.00%)

**Overall coherence and effectiveness of the work plan, including appropriateness of the allocation of tasks and resources**
**Appropriateness of the management structures and procedures, including quality management and risk management**
**Appropriateness of the institutional environment (infrastructure)**
**Competences, experience and complementarity of the participating organisations and institutional commitment**

*Strengths:*

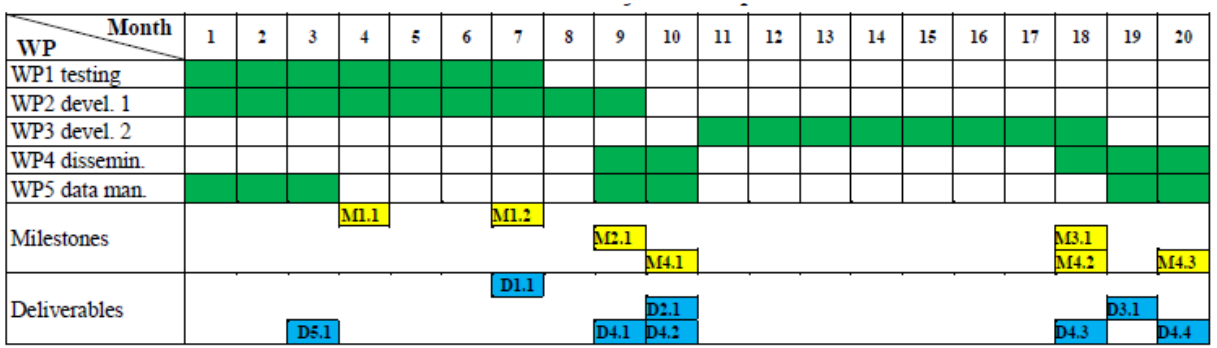
- *The work plan is structured in coherent work-packages which are adequately described regarding the natural progression of WPs and tasks and their duration.*
- *Carefully planned milestones and deliverables are effective measures for research progress.*
- *Management and financial administration of the project would benefit from the assistance of a dedicated team of administrators.*
- *Periodic meetings and reports are scheduled for project progress monitoring.*
- *Presented capacities in terms of computing resources and test facilities are fully in line with the planned research work.*
- *The ER's experience would be well complemented by those of the scientists in charge and their groups, ensuring the success of the project.*
- *The main tasks of the host organization are adequately described, as well the interaction with the current supervisor of the experienced researcher.*

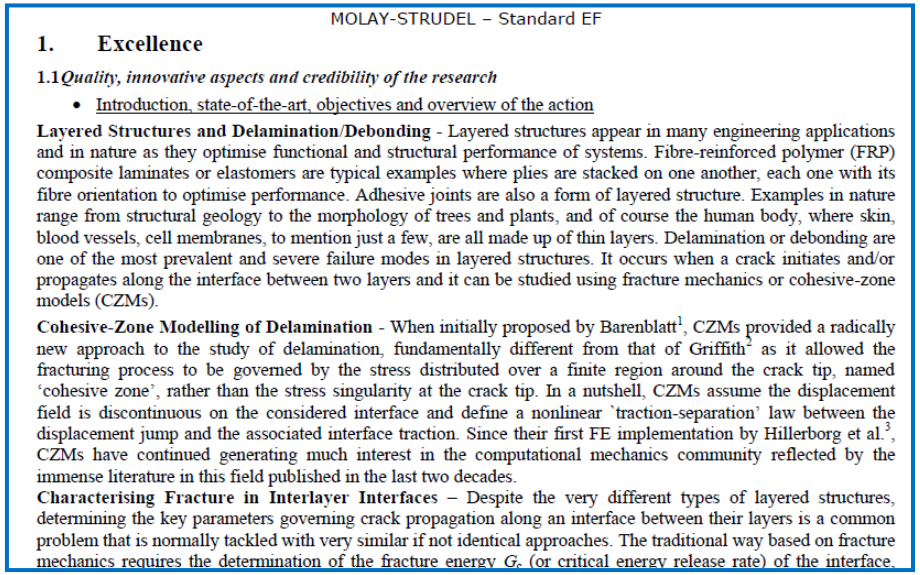
*Weaknesses:*

- *The risks of the fellowship are not clearly identified and contingency plans in case of the non achievement of a milestone are not adequately described.*

# Važno!

- Objectives are clearly defined and S.M.A.R.T. (specific, measurable, achievable, relevant, and time-bound)
- The link between methodology and objectives is emphasized
- Work plan is precisely defined and connected to the objectives
- Link between the work plan, deliverables and milestones
- Dissemination of the results
- Follow the template and pay attention to the structure



MOLAY-STRUDEL – Standard EF

**1. Excellence**

**1.1** ***Quality, innovative aspects and credibility of the research***

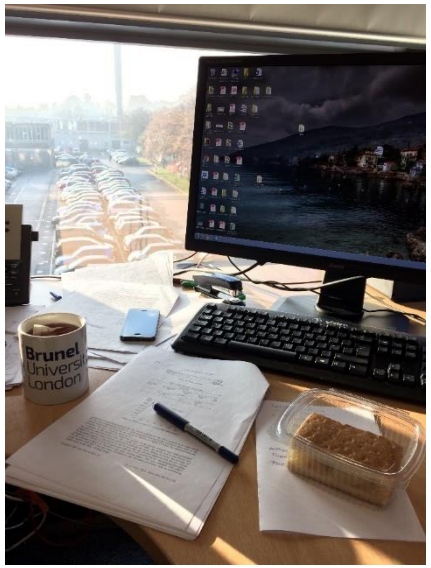
- Introduction, state-of-the-art, objectives and overview of the action

**Layered Structures and Delamination/Debonding** - Layered structures appear in many engineering applications and in nature as they optimise functional and structural performance of systems. Fibre-reinforced polymer (FRP) composite laminates or elastomers are typical examples where plies are stacked on one another, each one with its fibre orientation to optimise performance. Adhesive joints are also a form of layered structure. Examples in nature range from structural geology to the morphology of trees and plants, and of course the human body, where skin, blood vessels, cell membranes, to mention just a few, are all made up of thin layers. Delamination or debonding are one of the most prevalent and severe failure modes in layered structures. It occurs when a crack initiates and/or propagates along the interface between two layers and it can be studied using fracture mechanics or cohesive-zone models (CZMs).

**Cohesive-Zone Modelling of Delamination** - When initially proposed by Barenblatt[1], CZMs provided a radically new approach to the study of delamination, fundamentally different from that of Griffith[2] as it allowed the fracturing process to be governed by the stress distributed over a finite region around the crack tip, named 'cohesive zone', rather than the stress singularity at the crack tip. In a nutshell, CZMs assume the displacement field is discontinuous on the considered interface and define a nonlinear 'traction-separation' law between the displacement jump and the associated interface traction. Since their first FE implementation by Hillerborg et al.[3], CZMs have continued generating much interest in the computational mechanics community reflected by the immense literature in this field published in the last two decades.

**Characterising Fracture in Interlayer Interfaces** – Despite the very different types of layered structures, determining the key parameters governing crack propagation along an interface between their layers is a common problem that is normally tackled with very similar if not identical approaches. The traditional way based on fracture mechanics requires the determination of the fracture energy $G_c$ (or critical energy release rate) of the interface.

# SAVJETI MSCA ALUMNIJA



## ZAŠTO SE PRIJAVITI?

- Veliki zamah karijeri
  - Potpuna posvećenost istraživanju
  - Suradnja s vrhunskim stručnjacima
  - Razvoj samostalnosti, zrelosti i liderstva u znanosti

Engineering Fracture Mechanics 214 (2019) 558–577

Contents lists available at ScienceDirect

Engineering Fracture Mechanics

journal homepage: www.elsevier.com/locate/engfracmech

Identification of parameters of a bi-linear cohesive-zone model using analytical solutions for mode-I delamination

Leo Škec

*Faculty of Civil Engineering, University of Rijeka,*

NAGRADOM ZAKLADE SVEUČILIŠTA U RIJECI

za kalendarsku godinu 2019.

u kategoriji ZNANSTVENIK – područje tehničke i biotehničke znanosti

| | |
|---|---|
| UIP-2020-02-2189 | 27.02.2020. |
| UIP-2019-04-6306 | 22.05.2019. |

Mentorstvo doktorandima

2018. – 2020.

Alfio Francesco Siciliano Doktorat

Università degli Studi di Enna Kore (Italija)

Datum obrane: 07.02.2020.

# SAVJETI MSCA ALUMNIJA


## ZAŠTO SE PRIJAVITI?

- Golemo životno iskustvo
  - Život i rad u novom okruženju
  - Kulturna razmjena
  - Putovanja (moje iskustvo: 5 konferencija u 2017, 3 u 2018)


# SAVJETI MSCA ALUMNIJA

## IMAM LI ŠANSE DOBITI PROJEKT?

- Ne znaš dok ne probaš!
- Kod neuspješne prijave dobije se detaljni izvještaj o jakim i slabim točkama što olakšava sljedeću prijavu
  - Moje iskustvo: Naša treća (uspješna) prijava se konceptualno nije bitno razlikovala od prethodne dvije
- Ne ovisi samo o tebi, već i o mentoru i njegovoj instituciji
- Može ovisiti i o evaluatorima
  - Moje iskustvo: Za MSCA odlični evaluatori, ali ne i za NEWFELPRO

# SAVJETI MSCA ALUMNIJA

## KOLIKO DUGO TREBA RADITI NA PRIJAVI?

- Ovisi… Pomaže ako:
  - Imaš iskustva s pisanjem projekata (tvoj mentor vjerojatno ima)
  - Dobro poznaš stanje područja u kojem prijavljuješ projekt (i tvoj mentor, naravno)
  - Imaš jasnu viziju što i kako želiš istraživati te zašto je to relevantna tema
- Moje iskustvo:
  - **NEWFELPRO** (2013) – aktivno 1 mjesec (11 verzija, brojni sastanci na Skypeu…)
  - **MSCA-IF** (2014) – aktivno 2 tjedna (uglavnom recikliranje)
  - **MSCA-IF** (2015) – aktivno manje od 2 tjedna (popravci prethodne verzije)

# SAVJETI MSCA ALUMNIJA

## KUDA IĆI?

- Bez ustručavanja odabrati najboljeg mentora za svoje istraživanje
  - Ako ste već u kontaktu, time bolje!
  - Ako nemaš kontakte, uspostavi ih!
- Treba odabrati instituciju koja nudi potrebnu infrastrukturu za provedbu istraživanja
- Moje iskustvo:
  - Brunel University nije jedno od vodećih svjetskih sveučilišta (čak niti onih u Velikoj Britaniji), ali je ekspertiza Dr. Alfana iznimno vrijedna

# SAVJETI MSCA ALUMNIJA

## JE LI VRIJEDNO TRUDA?

- Moje iskustvo: Nedvojbeno!
- Prijava je relativno jednostavna
- Budžet se prilagođava zemlji i trajanju projekta
- Izvješće se piše samo na kraju projekta
- Osigurava optimalne uvjete za bezbrižan rad na istraživanju
- Brzi napredak u profesionalnim kompetencijama
- Dragocjeno za CV

# HVALA NA POZORNOSTI!

Modelling mixed-mode rate-dependent delamination in layered structures using geometrically nonlinear beam finite elements

MOLAY Strudel

https://www.brunel.ac.uk/research/projects/molay-strudel

https://cordis.europa.eu/project/id/701032