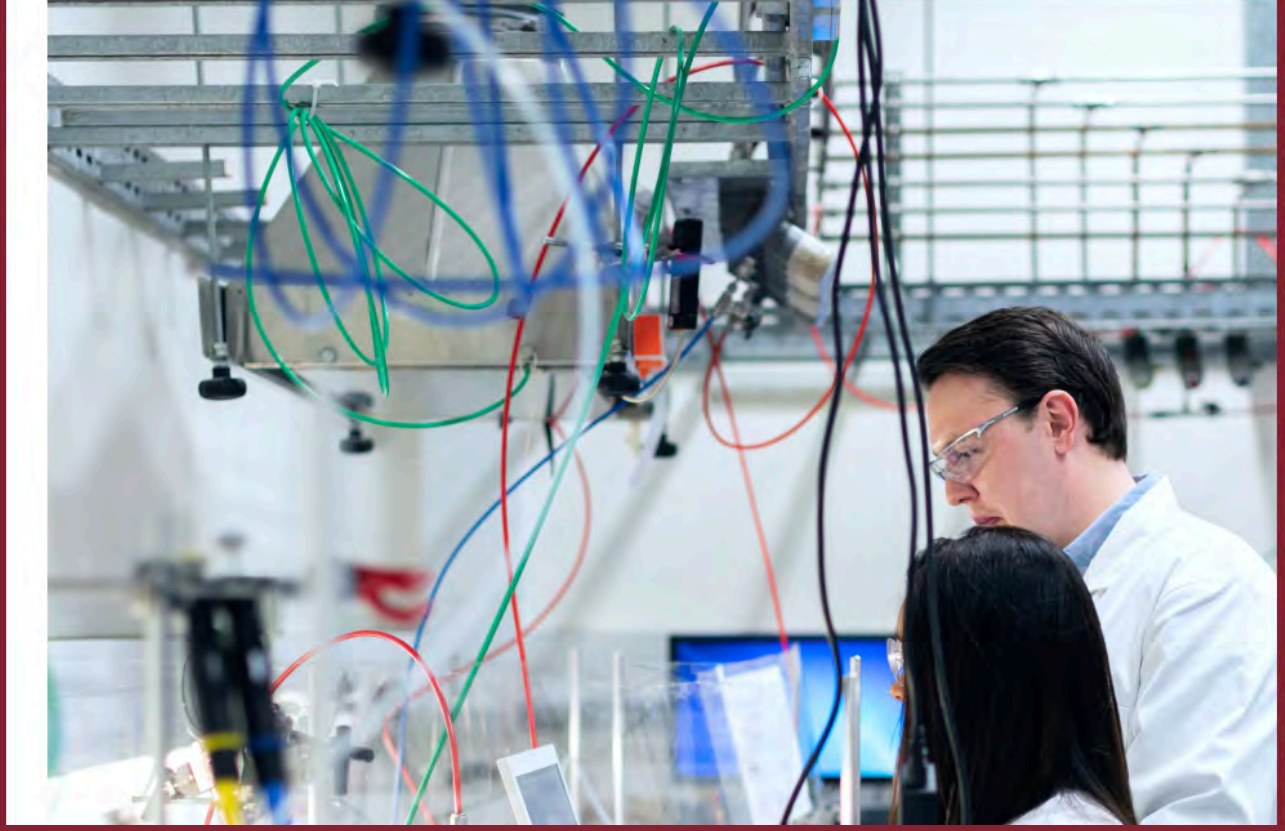
SAPIENZA ERC DAYS

22-23 FEBBRAIO 2021

erc



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Call - European Research Council

Iniziative Sapienza

European Research Council

Supporting top researchers from anywhere in the world

«The ERC's mission is to encourage the highest quality research in Europe through competitive funding and to support investigator-driven frontier research across all fields, on the basis of scientific excellence.»

«The sole criterion for selection is scientific excellence.»

«By challenging Europe's brightest minds, the ERC expects that its grants will help to bring about new and unpredictable scientific and technological discoveries - the kind that can form the basis of new industries, markets, and broader social innovations of the future.»

Il Sistema “ERC Sapienza”

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erc
European Research Council
Established by the European Commission

ERC Open day

ERC Workshop

Fellowship BE-FOR-ERC

SEED ERC

New !

Iniziative per incentivare la partecipazione e la competitività

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SAPIENZA ERC DAYS

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Scegli Sapienza!

Per promuovere ed incentivare la partecipazione al programma ERC, Sapienza ha lanciato, nel 2019 l'azione **BE-FOR-ERC** nell'ambito del programma **Sapiexcellence** che ha permesso in due anni di finanziare 20 giovani ricercatori d'eccellenza.

Nel 2021 Sapienza lancerà una nuova azione nell'ambito del programma **Sapiexcellence**, denominata **SEED-ERC**, destinata a ricercatori che hanno presentato nell'ambito delle call ERC 2021 una proposal di eccellenza scientifica non finanziata per limiti di budget.

Inoltre Sapienza, già da diversi anni, dedica una particolare attenzione ai ricercatori che partecipano al programma ERC attraverso una politica di incentivi e agevolazioni.

Sapienza ti offre!

Sapienza ha sviluppato nel corso degli anni un'offerta di servizi volta ad accompagnare e sostenere i candidati che intendono partecipare ai bandi ERC.

INFODAY E WORKSHOP

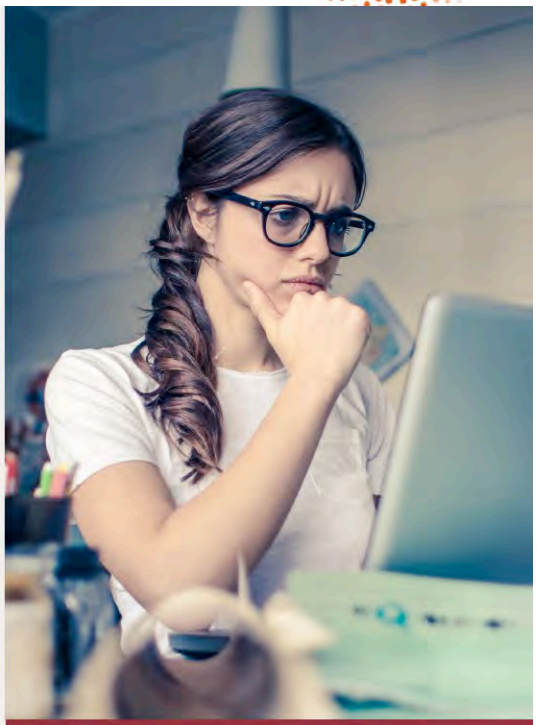
Sapienza organizza ogni anno, in occasione del lancio delle call ERC, giornate informative rivolte a tutta la comunità accademica e workshop formativi specifici per i potenziali applicant.

KIT E MANUALE

I kit, elaborati dallo staff di Sapienza, contengono una serie di documenti utili alla predisposizione delle proposte. Insieme al Kit è stato predisposto un manuale tecnico operativo per supportare gli applicants ERC in tutte le fasi della presentazione di una proposta progettuale.

PRE-SCREENING

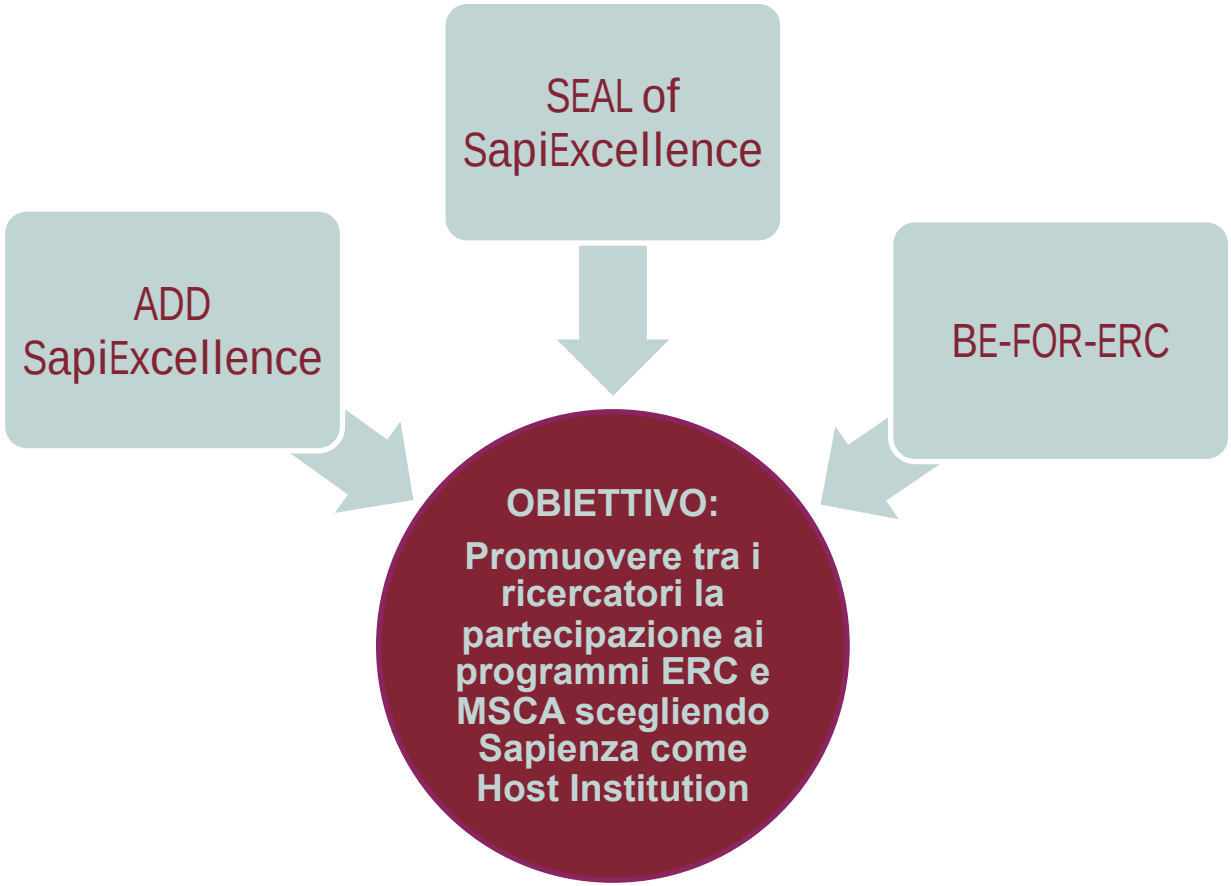
Sapienza effettua un servizio di pre-screening volto a fornire ai proponenti un servizio di revisione delle singole proposte



Prepara la tua interview!

Sapienza offre l'opportunità ai candidati che raggiungono il 2° step di valutazione di seguire un training di preparazione alla interview offerto da società di formazione esterne. I training hanno una durata di 2-3 giorni e consistono in una simulazione del colloquio con un panel di esperti

IL PROGRAMMA «SAPIEXCELLENCE»



IL PROGRAMMA «SAPIEXCELLENCE»

ADD SapiExcellence

Obiettivo: estendere di un anno la durata delle attività di ricerca di progetti MSCA (IF o ITN) in via di conclusione.

Budget Annuale: € 100.000

Allocazione: n. 2 fellowships di € 50.000 ognuna (€40.000 per il salario + €10.000 per costi di ricerca)

Assegnate ad oggi 4 fellowships

3 fellows ITN assunti come post-doc e estensione del progetto di 1 fellow IF

SEAL of SapiExcellence

Obiettivo: finanziare la ricerca di applicants MSCA-IF che hanno ottenuto il Seal of Excellence (score>85)

Budget Annuale: € 200.000

Allocazione: n. 4 fellowships di € 50.000 ognuna (€40.000 per il salario + €10.000 for costi di ricerca)

Assegnate ad oggi 5 fellowships

Data l'opportunità a 5 applicants IF di realizzare il proprio progetto di ricerca

BE-FOR-ERC

Obiettivo: finanziare ricercatori di eccellenza senza una posizione permanente in Sapienza per sottoporre una proposta ERC con Sapienza come HI

Budget Annuale : € 200.000

Allocazione: n. 4 fellowships di € 50.000 ognuna (€40.000 per il salario + €10.000 for costi di ricerca)

Assegnate ad oggi 20 fellowships

a giovani ricercatori di talento

Nuova azione SEED-ERC

Nei prossimi mesi Sapienza implementerà una nuova azione del programma Sapiexcellence, denominata **SEED-ERC**, che prevede l'erogazione di un finanziamento ad hoc per chi presenti, nell'ambito delle call Starting e Consolidator ERC 2021, una proposal di eccellenza scientifica non finanziata per limiti di budget.

MARIE SKŁODOWSKA-CURIE

May

In occasione dell'uscita dei nuovi bandi, Sapienza organizzerà un intero **MESE** dedicato al programma Marie Sklowdoska-Curie

INFODAY MSCA

Una giornata informativa di presentazione dei bandi Doctoral Networks, Post-doctoral Fellowships e Staff Exchange

WORKSHOP MSCA-PF

Un workshop di approfondimento del nuovo bando Post-doctoral Fellowship, articolato su due giorni, dove verranno presentate le caratteristiche principali del programma e il formulario di presentazione di una proposta MSCA-PF

MSCA-PF - GRANT WRITING WORKSHOP

Dedicato ai ricercatori che stanno predisponendo una proposta MSCA Post-doctoral Fellowship. Durante il workshop verranno analizzate in dettaglio le singole sezioni del formulario e verranno fornite indicazioni e suggerimenti per scrivere una proposta di successo.

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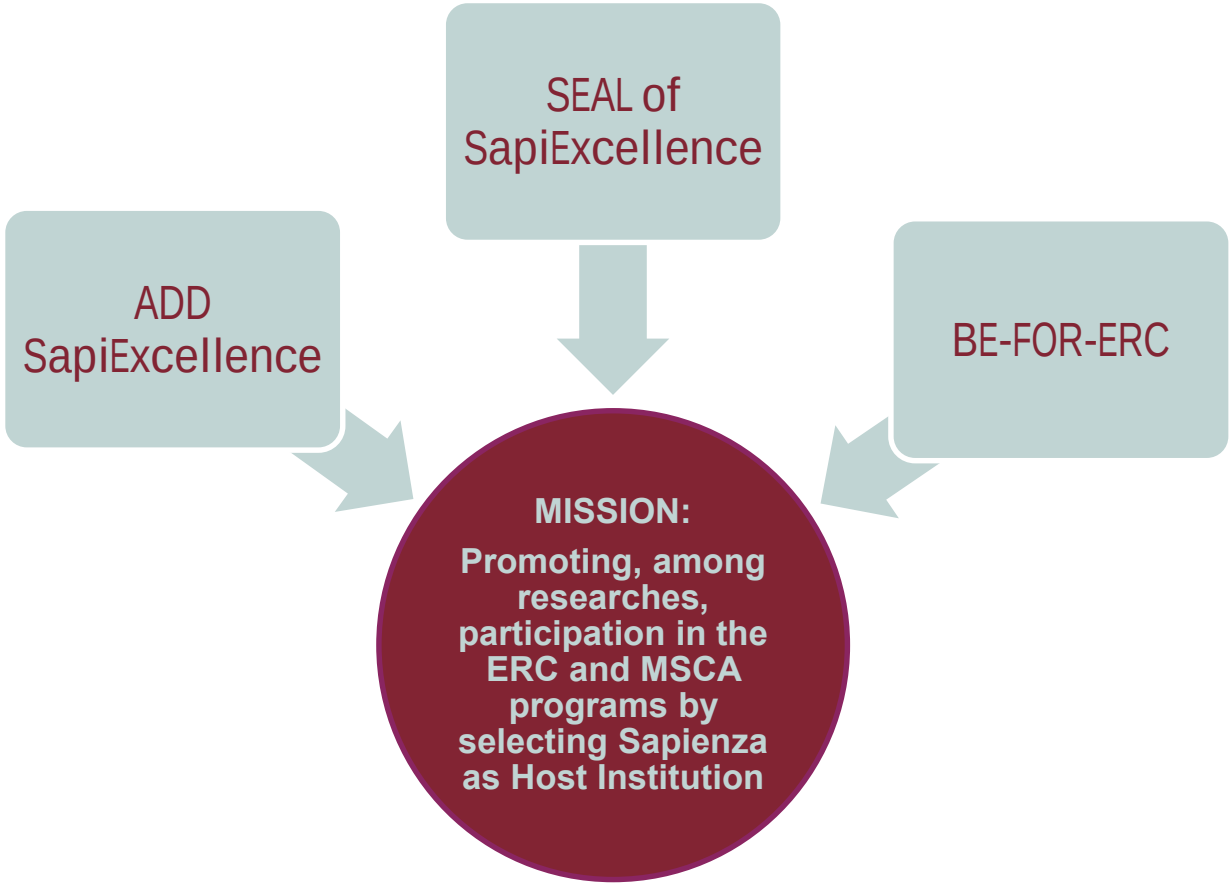
«SAPIEXCELLENCE» PROGRAMME



«SAPIEXCELLENCE» PROGRAMME

ADD SapiExcellence

Purpose: extending by one year the duration of the research projects of MSCA (IF or ITN) nearing the conclusion

Annual budget: € 100.000

Allocation: no. 2 fellowships of € 50,000 each (€ 40,000 for salary + € 10,000 for research costs)

4 fellowships awarded to date

3 ITN fellows hired as post-doc and project extension for 1 IF fellow

SEAL of SapiExcellence

Purpose: funding research activities of MSCA-IF applicants who have obtained the Seal of Excellence (score> 85)

Annual budget: € 200.000

Allocation: no. 4 fellowships of € 50,000 each (€ 40,000 for salary + € 10,000 for research costs)

5 fellowships awarded to date

Opportunity for 5 IF applicants to carry out their own research projects

BE-FOR-ERC

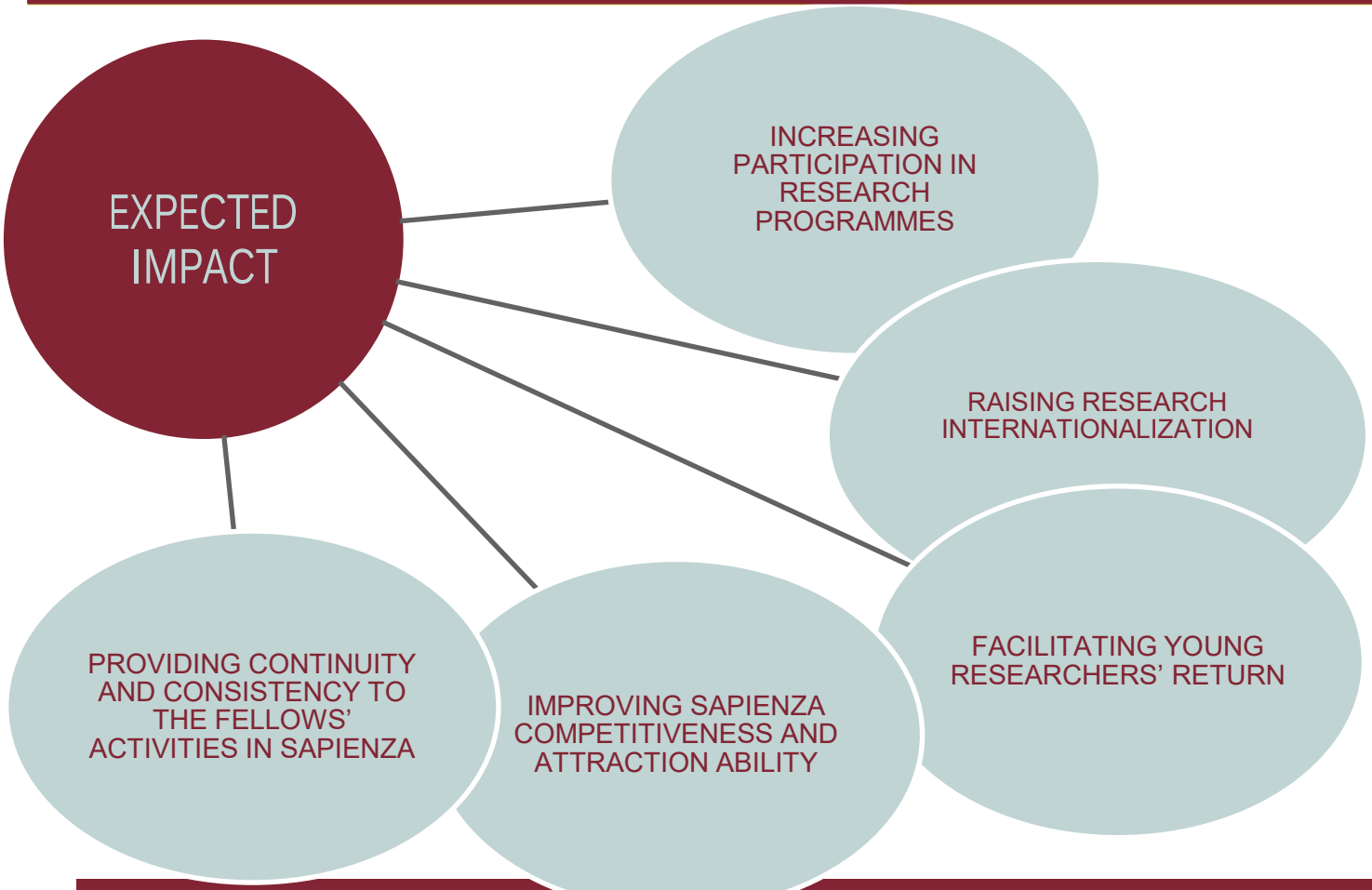
Purpose: funding excellent researchers without a permanent position in Sapienza to submit an ERC proposal with Sapienza as HI

Annual budget: € 200.000

Allocation: no. 4 fellowships of € 50,000 each (€ 40,000 for salary + € 10,000 for research costs)

To date, 20 fellowships awarded to talented young researchers

«SAPIEXCELLENCE» PROGRAMME



NEW SEED-ERC ACTION

In the next few months, Sapienza will implement a new action of the Sapiexcellence programme, called SEED-ERC, to provide ad hoc funding for those who submit, in the framework of ERC 2021 calls, a proposal of scientific excellence not already funded for budget limits

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CHOOSE SAPIENZA!

In 2019, to promote and encourage the participation in the ERC programme, Sapienza launched the BE-FOR-ERC action in the framework of the Sapiexcellence programme which allowed to finance, over two years, 20 young excellent researchers.

In 2021, Sapienza will launch a new action in the framework of the Sapiexcellence programme, called SEED-ERC, dedicated to researchers who presented in the framework of the ERC 2021 calls, an excellent scientific proposal not funded for budget limits.

Furthermore, Sapienza has been dedicating for several years, particular attention to researchers who join the ERC programme through a policy of incentives and benefits.

A LOT OF OPPORTUNITIES!

Over the years, Sapienza has developed a range of services aiming at guiding and supporting candidates who intend to participate in ERC calls.

INFODAYS AND WORKSHOPS

Every year, on the occasion of the launch for ERC calls, Sapienza organizes information days for the whole academic community and training workshops for potential applicants.

KIT AND HANDBOOK

The kit, organized by the staff of Sapienza, contains useful documents to elaborate the proposals. Together with the Kit, an operating handbook is provided to support the ERC applicants at every stage of the project proposal presentation.

PRE-SCREENING

Sapienza implements a pre-screening service designed to provide the papllicants a review service for the individual proposals.

PREPARE YOUR INTERVIEW!

Sapienza offers the opportunity to the candidates who reach the 2nd step of evaluation to attend an interview preparation training offered by external training companies. The training session lasts 2-3 days and consists of a mock interview with a panel of experts.

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MARIE SKŁODOWSKA-CURIE

May

On the occasion of the publication of new calls, Sapienza will organize a full month dedicated to the Marie Skłodowska Curie Programme

MSCA INFODAY

An information day for the launch of the Doctoral Networks, Post-Doctoral Fellows and Staff Exchange calls

MSCA-PF WORKSHOP

A two-days follow-up workshop on the new Post-doctoral Fellowship call, where the main features of the programme and the presentation form of a MSCA-PF proposal will be presented.

MSCA-PF - GRANT WRITING WORKSHOP

Dedicated to researchers who are preparing an MSCA Post-doctoral Fellowship proposal. During the workshop the individual sections of the form will be analyzed in detail and indications and suggestions will be provided to write a successful proposal.

Giuditta Carabella
Settore mobilità dei ricercatori e programmi europei
Area per l'Internazionalizzazione
SAPIENZA Università di Roma

Programma HORIZON EUROPE

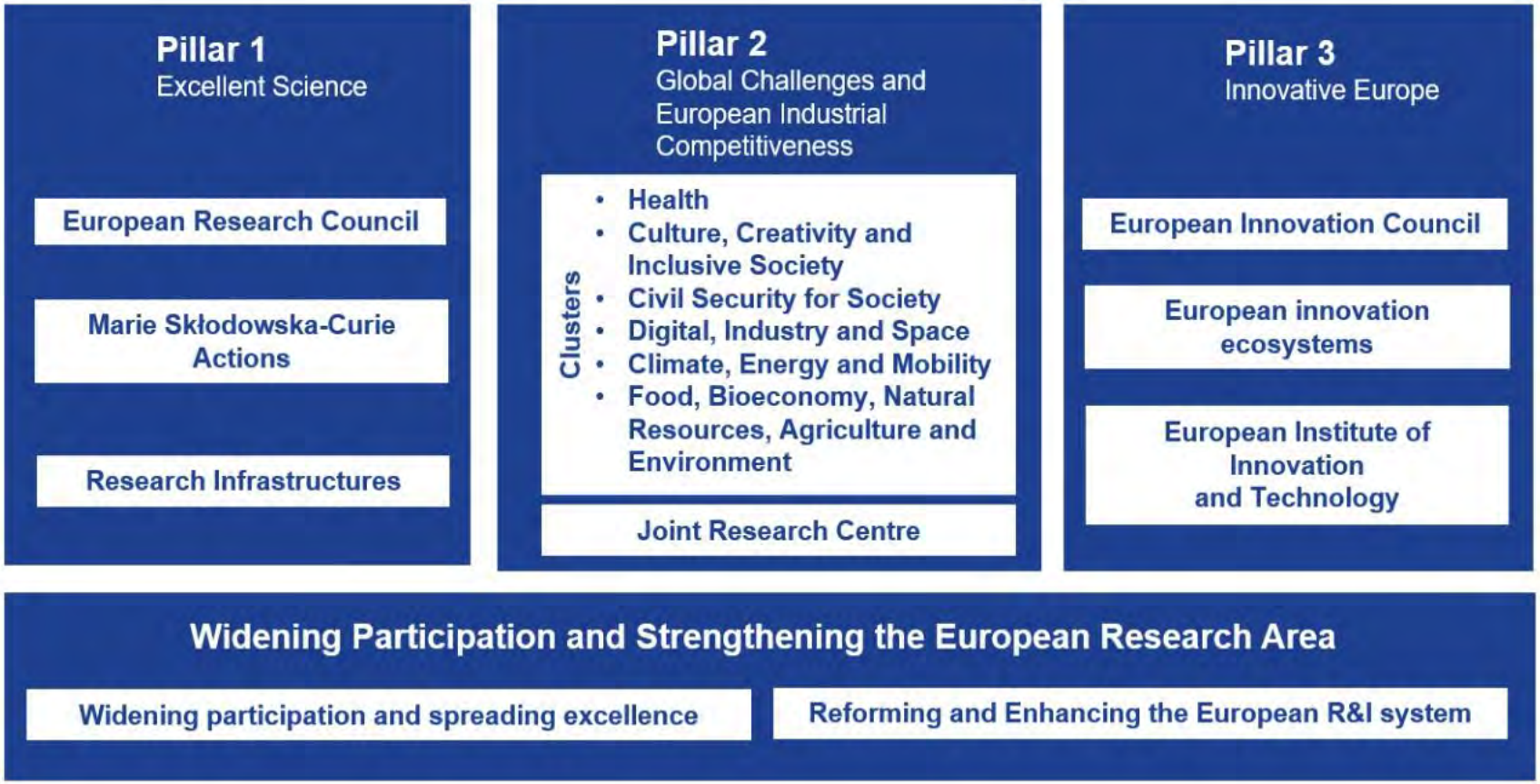
Durata

1 gennaio 2021- 31 dicembre 2027

Budget

95 miliardi di euro per il più ambizioso programma di ricerca e innovazione di sempre, finanziato dal tradizionale bilancio comune europeo e dal nuovo Recovery Instrument, Next Generation EU.

Programma HORIZON EUROPE



IL PROGRAMMA ERC

https://erc.europa.eu/

- ERC finanzia Principal Investigator di eccellenza di qualsiasi età e nazionalità che intendono svolgere attività di ricerca di frontiera presso una Host Institution situata in uno degli Stati membri dell'UE o dei Paesi associati;

- Gli schemi di finanziamento ERC supportano progetti di ricerca ground-breaking, innovativi, ad alto rischio e ad alto impatto scientifico;

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e servizi offerti da ARI

- Durata dei progetti: fino a 5 anni
- Ampia disponibilità finanziaria (elevato valore economico del grant e rimborso al 100% dei costi);
- Possibilità di creare o rafforzare il proprio team di ricerca;

Call ERC Starting Grant 2021
e servizi offerti da ARI

- Possono essere presentate proposte in tutti i settori e le aree scientifiche (approccio *curiosity driven* e *bottom-up*);

- Schemi di finanziamento:
  - Starting Grant
  - Consoldidator Grant
  - Advanced Grant
  - Proof of Concept
  - Synergy Grant

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e servizi offerti da ARI

Call	Requisiti dei PI	Finanziamento
Consolidator Grant	Talenti già affermati - tra i 7-12 anni dopo il PhD	€ 2.000.000,00
Advanced Grant	Ricercatori outstanding - eccellente track record ultimi 10 anni	€ 2.500.000,00

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e servizi offerti da ARI

Call	Data pubblicazione call	Data scadenza
Consolidator Grant	11 marzo 2021	20 aprile 2021
Advanced Grant	25 maggio 2021	31 agosto 2021

Profilo di un PI ERC Starting Grant

- Leader emergenti
- tra i 2-7 anni dopo il PhD
  (tra il 1 gennaio 2014 e il 31 dicembre 2018 incl.)

Ampliamento della finestra temporale

- Maternity: 18 months extension for each child born before or after the PhD award. If the applicant can document a longer maternity leave, the eligibility period will be extended by the documented amount of actual leave taken until the call deadline.
- Paternity: extension by the documented time of paternity leave taken until the call deadline for each child born before or after the PhD award.
- Long-term illness or national service: extension by the documented amount of leave taken by the Principal Investigator until the call deadline for each incident which occurred after the PhD award date.
- Clinical training: extension by the documented amount of clinical training received by the Principal Investigator after the award of the first eligible degree and until the call deadline, up to a maximum of 4 years.

Profilo di un PI ERC Starting Grant

A competitive Starting Grant Principal Investigator must have already shown the potential for **research independence** and **evidence of maturity**, for example by having produced **at least one important publication as main author or without the participation of their PhD supervisor**.

Applicant Principal Investigators should also be able to demonstrate **a promising track record** of early achievements appropriate to their research field and career stage, including significant publications (as main author) in major international peer-reviewed multidisciplinary scientific journals, or in the leading international peer-reviewed journals of their respective field.

They may also demonstrate a record of **invited presentations** in well-established international conferences, granted patents, awards, prizes, etc.

ERC Starting Grant 2021

- Data pubblicazione call: **25 febbraio 2021** (tbc)
- Data scadenza call: **8 aprile 2021**
- Budget totale call StG 2021: **619 mil euro**
- Numero stimato di grant finanziati: **413**

PRESENTAZIONE DI UNA PROPOSTA ERC StG 2021

https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/home

- Call description, con link a topics e submission service
- Call documents, tra cui il WP e la Guide for Applicants
- Get support (help-desk, NCP, Partner Search ecc..)

nb: ECAS account!!!

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e servizi offerti da ARI

- Parte A
  - Informazioni generali sul PI, dati amministrativi della Host Institution, Ethic issues, ecc..
  - Resources and Time Commitment: (max. 2 pagine)
- Parte B.1
  - Sinossi della proposta scientifica (max. 5 pagine)
  - Curriculum Vitae (max. 2 pagine)
  - Track record (max. 2 pagine)
- Parte B.2
  - Proposta scientifica (max. 14 pagine):

  Stato dell'arte e obiettivi

  Metodologia
- Documentazione di supporto
  - Host Institution Binding Statement of Support (a firma Direttore di Dipartimento)
  - Certificato di Dottorato
  - Certificati attestanti eventuali career break.

Extended Synopsis:

This should be a concise presentation of the full scientific proposal, with particular attention to the ground-breaking nature of the research project and the feasibility of the outlined scientific approach. At step 1 the full scientific proposal is not assessed so all essential information must be covered in the synopsis. The applicant will choose a primary evaluation panel and may also indicate a secondary evaluation panel. The applicant should indicate when he or she believes that the proposal is of a crosspanel.

Curriculum Vitae:

The CV should include the standard academic and research record as well as a succinct "funding ID" which must specify any current research grants and their subject, and any on-going application for work related to the proposal. Any research career gaps and/or unconventional paths should be clearly explained so that they can be fairly assessed by the evaluation panels.

Track Record:

Each of the Principal Investigator must provide a list of achievements reflecting their track record. The type of achievements expected for Starting Grant applicant Principal Investigators are:

1. Up to five publications in major international peer-reviewed multi-disciplinary scientific journals and/or in the leading international peer-reviewed journals, peer-reviewed conferences proceedings and/or monographs of their respective research fields, highlighting those as main author or without the presence as co-author of their PhD supervisor (properly referenced, field relevant bibliometric indicators may also be included); preprints may be included, if freely available from a preprint server (preprints should be properly referenced and either a link to the preprint or a DOI should be provided);
2. Research monographs and any translations thereof;
3. Granted patent(s);
4. Invited presentations to internationally established conferences and/or international advanced schools;
5. Prizes, awards, academy memberships.

Scientific Proposal:

Description of the scientific and technical aspects of the project, demonstrating the groundbreaking nature of the research, its potential impact and research methodology.

Resources and Time Commitment:

The proposal should also clearly specify the percentage of the applicant's working time that will be spent in the EU or an Associated Country and the percentage of the applicant’s working time that will be devoted to the project, as well as a full estimation of the real project cost, including a breakdown of personnel costs, whenever possible by team members category

Budget massimo: € 1.500.000,00 per 5 anni

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Cost Category			Total in Euro
Direct Costs[1]	**Personnel**	PI[1]	
		Senior Staff	
		Postdocs	
		Students	
		Other	
	i. Total Direct Costs for Personnel (in Euro)		
	Travel		
	Equipment		
	Other goods and services	Consumables	
		Publications (including Open Access fees), etc.	
		Other (please specify)	
	ii. Total Other Direct Costs (in Euro)		
A – Total Direct Costs (i + ii) (in Euro)			
B – Indirect Costs (overheads) 25% of Direct Costs[1] (in Euro)			
C1 – Subcontracting Costs (no overheads) (in Euro)			
C2 – Other Direct Costs with no overheads[1] (in Euro)			
Total Estimated Eligible Costs (A + B + C) (in Euro)[1]			
Total Requested EU Contribution (in Euro)[6]			

Minimum percentage of the working time of a Principal Investigator that must be spent

- On the ERC project: **50%**
- In an EU Member State or Associated Country: **50%**

LA VALUTAZIONE

- Unico criterio di valutazione: eccellenza

- La procedura di valutazione è affidata a 25 panel di valutazione articolati in 3 principali aree scientifiche di ricerca:
  - Life Sciences - LS
  - Physical Sciences and Engineering – PE
  - Social Sciences and Humanities – SH

- Budget ripartito proporzionalmente tra i Panel sulla base delle domande proposte

At step 1, the extended synopsis and the Principal Investigator's track record and CV will be assessed (and not the full scientific proposal).

26 Agosto 2021

At step 2, the complete version of the retained proposals will be assessed (including the full scientific proposal).

The allocation of the proposals to the various panels will be based on the expressed preference of the applicant Principal Investigator.

Proposals may be allocated to a different panel with the agreement of both Panel Chairs concerned.

The panel to which a proposal is allocated may request additional reviews by appropriate members of other panel(s) or additional remote evaluators.

IMPORTANZA DELLA SCELTA DEL PANEL!!!

Principal Investigators whose proposals are retained for step 2 of the evaluation will be invited for an **interview** to present their proposal to the evaluation panel meeting.

SAPIENZA FINANZIA LA PARTECIPAZIONE A TRAINING COURSES PER LA SPECIFICA PREPARAZIONE DELL'INTERVIEW

20 dicembre 2021

SCORES

At the end of **step 1** of the evaluation the proposal will receive one of the following scores:

- **A**. is of sufficient quality to pass to step 2 of the evaluation
- **B**. is of high quality but not sufficient to pass to step 2 of the evaluation
- **C**. is not of sufficient quality to pass to step 2 of the evaluation

At the end of **step 2** of the evaluation the proposal will receive one of the following scores:

- **A.** fully meets the ERC's excellence criterion and is recommended for funding if sufficient funds are available
- **B.** meets some but not all elements of the ERC's excellence criterion and will not be funded

Limiti alla risottomissione delle proposal

- ***Restrictions on applications will apply to the 2021 calls based on the outcome of the evaluation of previous calls***

B *allo step 1 -> non eligible alla call successive*

C *allo step 1 -> non eligible alle call dei due anni successivi*

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1. Research Project

Ground-breaking nature, ambition and feasibility

Starting, Consolidator and Advanced

Ground-breaking nature and potential impact of the research project

To what extent does the proposed research address important challenges?

To what extent are the objectives ambitious and beyond the state of the art (e.g. novel concepts and approaches or development between or across disciplines)?

To what extent is the proposed research high risk/high gain?

Scientific Approach

To what extent is the outlined scientific approach feasible bearing in mind the extent that the proposed research is high risk/high gain (based on the Extended Synopsis)?

To what extent is the proposed research methodology appropriate to achieve the goals of the project (based on the full Scientific Proposal)?

To what extent does the proposal involve the development of novel methodology (based on the full Scientific Proposal)?

To what extent are the proposed timescales and resources necessary and properly justified (based on the full Scientific Proposal)?

2. Principal Investigator

Intellectual capacity, creativity and commitment

Starting and Consolidator

Intellectual capacity and creativity

To what extent has the PI demonstrated the ability to propose and conduct ground-breaking research?

To what extent does the PI provide evidence of creative independent thinking?

To what extent have the achievements of the PI typically gone beyond the state of the art?

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- Read carefully the Guide for Applicants!!!
- Start writing your proposal early enough to submit it to external opinions;
- Make your application easy to read;
  - Identify your aims and hypotheses right at the beginning.
  - Use tables and diagrams (legible in black and white).
  - Emphasise particularly important sentences using appropriate formatting and highlighting
- Be ambitious, but avoid sounding unrealistic;
- Follow the formatting rules and page limits;

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- Make yourself familiar with the Electronic Proposal Submission Service.
- Find out, if possible, who has recently received funding in your field;
- Choose a memorable acronym;
- Provide a clear, concise work plan, giving details of intermediate goals. Use, if applicable, Work Package approach;
- Provide alternative strategies to mitigate risks;
- Clearly explain how you will manage your project and disseminate the results;
- Include a Gantt chart to illustrate the project schedule

SAPIENZA'S

SUPPORT SERVICES

SERVIZI PRE-AWARD

INFORMAZIONI

DISSEMINAZIONE BANDI

- Sito Web Istituzionale
- Mailing List
- Newsletter Scientifica F1RST

INFODAYS e WORKSHOP

- Organizzati in collaborazione con APRE (National Contact Point)
- Programmazione annuale
- Testimonianze di PI, fellows e valutatori

SERVIZI PRE-AWARD

KIT PER APPLICANTS ERC-STG

Manuale ERC-Sapienza
Un guida dettagliata alla presentazione di proposte ERC

Linee Guida per la predisposizione del budget ERC
Un document a supporto della compilazione del budget di un progetto ERC

Template Budget ERC
Una foglio di lavoro pre-impostato per calcolare il budget di un progetto ERC

Esempi di sezioni del formulario
Una serie di esempi per compilare alcune sezioni della proposta (management, Gantt Chart, tabella dei rischi..)

Hints & Tips
Una raccolta di consigli e suggerimenti per formulare una proposta ERC di successo

Common Weaknesses
Una raccolta dei punti di debolezza più frequentemente riscontrati dai valutatori di proposte ERC

SERVIZI POST-AWARD

ADMINISTRATIVE SUPPORT

GRANT AGREEMENT

Assistenza durante le fasi di negoziazione e firma del GA

Supporto per il corretto utilizzo del portale Funding & Tenders

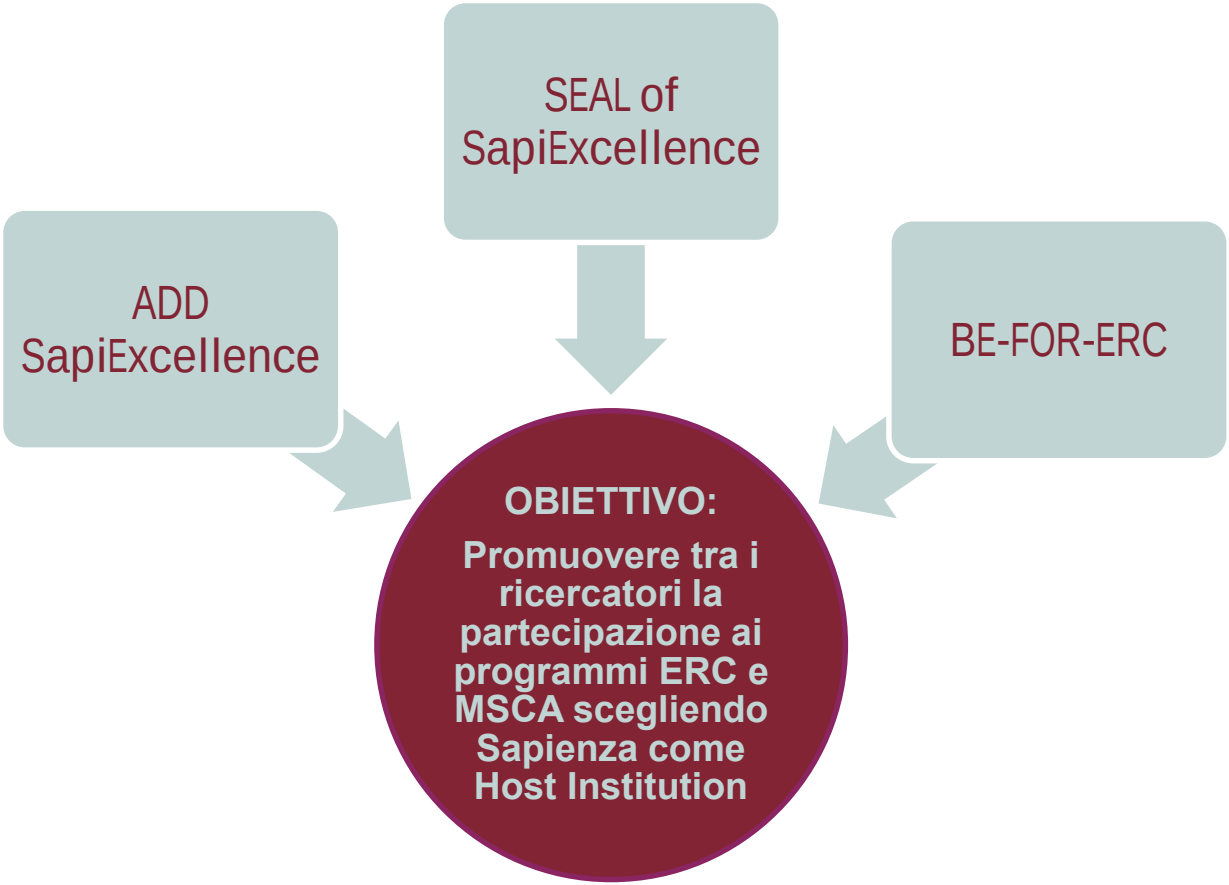
Supporto nella comunicazione con i Project Officers

GESTIONE INTERNA (FINANZIARIA E AMMINISTRATIVA)

Supporto ai dipartimenti nella gestione e rendicontazione dei progetti

Assistenza a ricercatori, docenti e staff amministrativo durante la fase di eventuale audit

IL PROGRAMMA «SAPIEXCELLENCE»



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IL PROGRAMMA «SAPIEXCELLENCE»

NUOVA AZIONE SEED-ERC

*Nei prossimi mesi Sapienza implementerà una nuova azione del programma Sapiexcellence, denominata **SEED-ERC**, che prevede l'erogazione di un finanziamento ad hoc per chi presenti, nell'ambito delle call ERC 2021 una proposal di eccellenza scientifica non finanziata per limiti di budget.*

MARIE SKŁODOWSKA-CURIE

May

In occasione dell'uscita dei nuovi bandi, Sapienza organizzerà un intero **MESE** dedicato al programma Marie Sklowdoska-Curie

INFODAY MSCA

Una giornata informativa di presentazione dei bandi Doctoral Networks, Post-doctoral Fellowships e Staff Exchange

WORKSHOP MSCA-PF

Un workshop di approfondimento del nuovo bando Post-doctoral Fellowship, articolato su due giorni, dove verranno presentate le caratteristiche principali del programma e il formulario di presentazione di una proposta MSCA-PF

MSCA-PF - GRANT WRITING WORKSHOP

Dedicato ai ricercatori che stanno predisponendo una proposta MSCA Post-doctoral Fellowship. Durante il workshop verranno analizzate in dettaglio le singole sezioni del formulario e verranno fornite indicazioni e suggerimenti per scrivere una proposta di successo.

SAPIENZA
UNIVERSITÀ DI ROMA

Call ERC Starting Grant 2021
e servizi offerti da ARI

- Per registrarsi: http://first.aster.it/_unirm_/registrazione
- Per consultare le call aperte: http://first.aster.it/_unirm_/bandi

GRAZIE PER L'ATTENZIONE!

Giuditta Carabella

Settore Mobilità dei ricercatori e programmi europei
Area per l'Internazionalizzazione
tel. 06 49910416 (int. 20416)
Giuditta.carabella@uniroma1.it

ERC Starting Grant

Alcune lezioni che ho imparato

Emanuele Rodolà

Dipartimento di Informatica

SAPIENZA
UNIVERSITÀ DI ROMA

SCUOLA SUPERIORE
DI STUDI AVANZATI

I dettagli sono importanti

- ERC Starting Grant 2018
- Panel PE6 (Informatica)

- **Area**: Computer Vision, Graphics, Multimedia

~50 articoli in queste aree ⇨ la comunità mi conosce

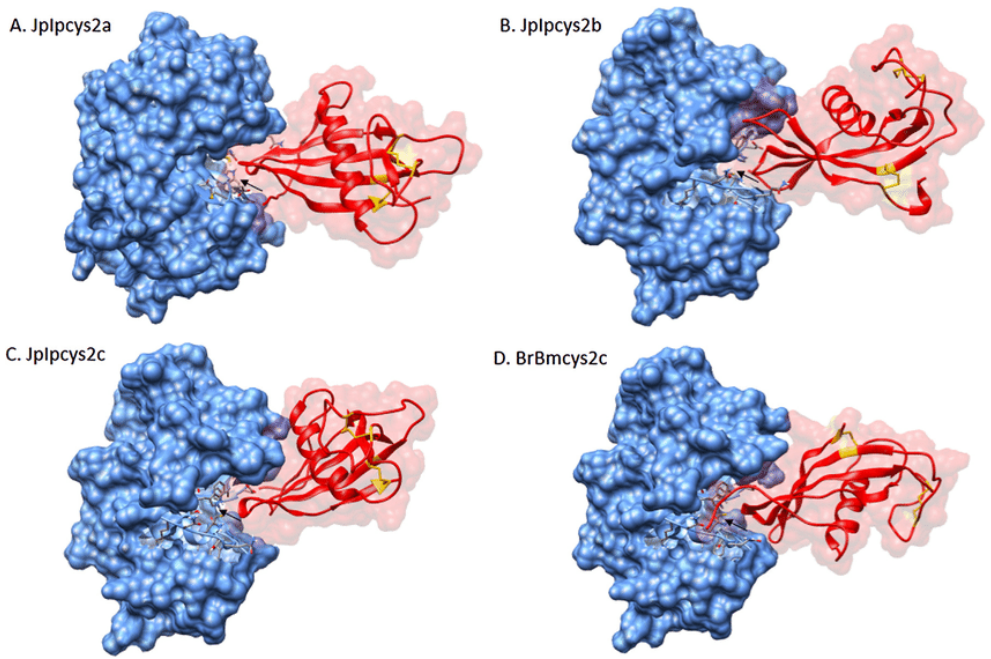
idea nuova ≠ comunità diversa

Il mio progetto di ricerca

Metodi spettrali computazionali **applicati** a dati geometrici **reali**.

Ricostruzione di geometria dal suono

Docking proteico

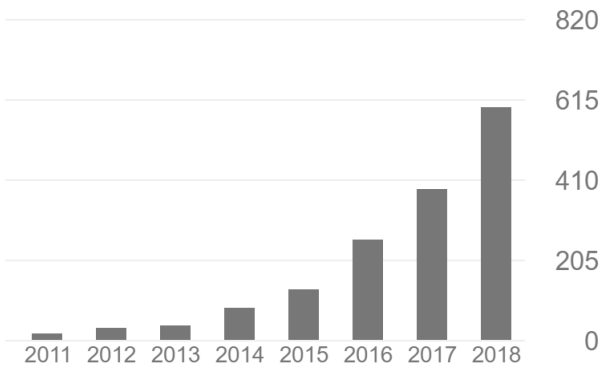


Ho le carte in regola?

- Consigliato da vincitori ERC
- Momento riflessivo
- Attenzione alla sindrome dell’impostore
- Auto-analisi oggettiva: posizionamento nella stessa fascia di età

日本学術振興会
Japan Society for the Promotion of Science

Alexander von Humboldt
Stiftung/Foundation



I miei punti di forza

- Competenze cross-dominio poco comuni nella mia area
- Fellowship e premi selettivi
- H-index sopra la media
- ~50 invited talk e tutorial
- Collaborazioni attive con key players
- Esperienza nell’industria

I miei punti deboli

- Molti articoli, ma pochi come main o senior author
- Nessun progetto già vinto
- Poca esposizione nei mass media
- Ambito di ricerca un po’ di nicchia

Ne vale la pena?

99% **progetto**
1% ricerca e altre attività

Obiettivo: Capolavoro di **eccellenza scientifica** e di **comunicazione**

Se non va a buon fine, rimane un'opportunità!

Una proposta rigettata non è detto che non sia valida.

9 No e **1 Sì** vuol dire **Sì**

Scrittura

Prima di scrivere la proposal:

1. Idea
2. Pitch

Obiettivo: **convincere, sorprendere**.
La mia prima versione è stata completamente buttata via.

- Dritti al punto.
- Facile da leggere.
- Studiare proposal vincenti. Siamo all'altezza?
- Evitare direzioni generiche senza una proposta di metodologia.
- Evitare lavoro incrementale. **Plus:** risultati preliminari.
- Rimanere plausibili, dare una struttura, spiegare i rischi, descrivere l'impatto.

ERC Starting Grant 2018
Research proposal [Part B1]

Spectral geometric methods in practice

SPECGEO

Cover Page:
- Name of the Principal Investigator (PI) : **Emanuele Rodolà**
- Name of the PI's host institution for the project : Sapienza University of Rome
- Proposal duration in months : 60

Spectral geometry concerns the study of the geometric properties of data domains, such as surfaces or graphs, via the spectral decomposition of linear operators defined upon them. Due to their valuable properties analogous to Fourier theory, such methods find widespread use in several branches of computer science, ranging from computer vision to machine learning and network analysis.

Despite their pervasive presence, very little efforts have been devoted to the design and application of spectral techniques that deal with corrupted, missing, high-dimensional or abstract data undergoing complex transformations. This lack of focus is mainly motivated by the widespread acceptance, supported in part by theoretical results, that an ε-perturbation to the geometry of the data (as small as the removal of a single point) can induce arbitrary changes in the operator's eigendecomposition – leading to a limited adoption of spectral models in real-world applications. This project challenges this view, contending that such presumption of instability is primarily due to a suboptimal choice of the analytical tools that are currently being employed, and which only provide part of the picture. In fact, strong evidence largely contradicts the expected behavior on real geometric data. The reason behind this apparent inconsistency lies in the different focus of current methods, which provide crude bounds and are directed toward other kinds of perturbation than those observed in real settings.

The ambitious goal of this project is to develop a novel theoretical and computational framework that will fundamentally change the way spectral techniques are constructed, interpreted, and applied. These tools will enable a range of currently infeasible uses of spectral methods on real data. They will deal with strong incompleteness, corruption and cross-modality, and they will be applied to outstanding problems in geometry processing, computer vision, machine learning, and computational biology.

Section a: Extended Synopsis of the scientific proposal

Spectral methods are the subject of an immense literature, crossing the borders of practically all applied disciplines dealing with geometric data – where geometry is understood broadly as shape, connectivity or proximity in possibly very high-dimensional spaces. Techniques from this family assume different forms depending on the particular class of problems they are intended to address. In geometry processing and graph analysis, spectral methods are realized as the study of the eigendecomposition of elliptic operators acting on functions defined on some geometric domain, be it a manifold, a graph, or a simplicial complex [1,2]. In statistical data analysis and machine learning, the core problem is to compute a low-rank approximation to a positive-semidefinite kernel [3]. In variational analysis and image processing, the focus is on determining an invertible data-dependent decomposition of the input, accompanied by a notion of scale to selectively capture local to global image features [4]. These apparently different perspectives are grounded in the same underlying idea: to define a dual, "frequency"-based representation for the input data where operations such as approximation, filtering, interpolation and inference can be performed more robustly and easily. Mathematically, these approaches require the computation of the eigenvectors and eigenvalues of a positive-semidefinite operator (its *spectral decomposition*) constructed from the data – importantly, by assuming a diagonal form, the application of such operators becomes efficient once the decomposition is created.

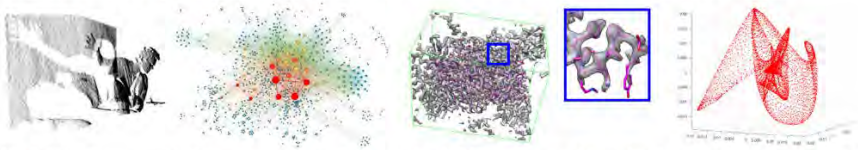


Fig 1. Complex geometric data are everywhere. Left-to-right: A 2.5D range map obtained with a depth sensor, represented as a triangular mesh with missing parts and topological artefacts; a social network with dynamic topology, where each node represents a user and undirected edges denote user relationships; isosurface representation for the electron density map of an enzyme, superposed to its graph-based atomic model (visible in the framed close-up); point cloud sampling of a high-dimensional manifold obtained from a collection of 5,000 photos, here each mn-dimensional point represents the brightness values of a $m \times n$ image (only 3 coordinates are shown for illustration purposes).

The prototypical embodiment of a spectral technique, Fourier analysis, puts the emphasis on the study of general functions defined on some *fixed* domain (e.g., the real plane). In many important applications, however, it is often the case that the data constitute pure geometry – the main subject of study being no longer a given class of functions, but rather revolving around the intrinsic properties of the *domain* itself. Such cases are characteristic of situations where the *relations* between individual data points carry more information than that contained in the data points themselves. Settings of this kind arise in several applications (Fig.1): In computer graphics, geometric data are often represented as Riemannian manifolds embedded in 3D space (surfaces); in machine learning, the data have a canonical representation as point clouds in a high-dimensional Euclidean space; in complex network and graph analysis, the data are purely topological objects which may not even admit a simple embedding.

Despite the considerable success of existing spectral methods under controlled conditions, their efficacy and generality are questioned whenever the data being analyzed are heavily corrupted. Fourier methods have been the driving force of engineering and applied sciences for over a century, but problems arise when the data domain is perturbed – a situation not commonly encountered in classical settings (e.g., signal processing), but which is crucial for the emerging applications targeted by this project. In principle, even the simple removal of a single data point might lead to arbitrary disruption of the spectral properties of the data, rendering existing algorithms useless in realistic scenarios. Complete failure can be mitigated by means of ad-hoc heuristics and careful pre-processing; yet, the effect of data corruption on the eigenvectors, and in turn, on the applicability of algorithms operating with these quantities, has not been rigorously studied. Results are few and interspersed across the literature. They are limited to specific settings, and the need for a unifying direction is clear. A dedicated effort is required to fundamentally rethink the design and analysis of spectral methods for practical settings, and to consider realistic assumptions that are relevant for the target applications.

The project aims at developing a new generation of spectral methods for the analysis of highly incomplete or corrupted data such as surface geometry, graphs, high-dimensional point clouds and manifolds, or products thereof. We will apply these methods to outstanding and challenging problems in computer vision, graphics, machine learning, and computational biology. We hope to pioneer a qualitative breakthrough in real-world spectral geometry akin to that attained by Fourier analysis in classical signal processing, paving the way to previously impossible applications in these fields.

Previous work

The central principle of spectral geometry lies in translating the direct analysis of geometric data to the study of *linear operators* acting upon such data. In this view, the data are interpreted as a discrete sampling drawn from a generally unknown and possibly continuous domain, and the general aim is to derive properties of the "true" underlying space via the given sampling alone. By shifting the focus from the data samples themselves to the *vector spaces* arising from the operator's spectral decomposition, the key strength of spectral approaches is their inherent ability to treat *nonlinear* structure in the data – a case where classical methods fail [5]. The basic differential operator in Euclidean analysis, the Laplace operator, can be defined invariantly on a general Riemannian manifold, a graph, a mesh, or other non-Euclidean structures. Physical processes such as heat and wave propagation, whose behavior is governed by the Laplacian and are directly influenced by its spectrum, are therefore naturally extended to more general spaces: The heat and wave equations are "born out of pure geometry", since the construction of the Laplacian depends only on the geometric structure of the underlying domain. But how does the spectrum evolve as the domain geometry is altered? In the applied world, this question received surprisingly limited attention during the years. In machine learning and statistical signal processing, the bulk of the work falls into the construction of approximation schemes for the *recovery* of the underlying low-dimensional subspace (or a union thereof [6]) from large data repositories under the influence of noisy measurements. The presence of outliers, partial data or non-uniform noise have been recently addressed with success [7], although limited to the setting in which the missing samples are sparse and bear little structure [8,9]. Importantly, while such methods find applicability in a variety of applied fields, they concentrate on the search for some unknown subspace from noisy or incomplete data, rather than understanding how the spectral properties of the involved operators are affected by data corruption.

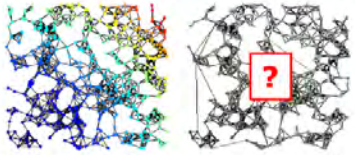


Fig 2. Can we reliably model the *change* in the spectral properties of geometric data (in this example, the Laplacian eigenfunctions of a graph) under structured perturbations, like missing data or topology changes? This project will attempt to provide answers to this long-standing question, for general, high-dimensional data in different representations and under strong corruption.

This subtle but crucial difference has had a tremendous impact on how spectral methods are nowadays conceived and applied in real-world settings. The recovery-centered standpoint of current spectral methods is reinforced by a certain "common wisdom" in spectral data analysis, according to which small domain perturbations (as small as puncturing a plane) can induce arbitrary changes in the Laplacian eigenfunctions [10]. The supposed instability of such constructions, advocated by calibers such as Terence Tao and Peter Jones, has persisted in the applied community, leading to a tendency to avoid using the eigendecomposition of the Laplace operator directly. Classical perturbation results due to Weyl [11], Kato [12], and further extensions invariably lead to similar conclusions, providing loose predictions and therefore yielding limited insights for real applications. Today, some of these problems are sidestepped by resorting to alternative constructions like heat and biharmonic kernels [13,14], while the core question of how the eigenfunctions and eigenvalues of the Laplacian and related operators change under realistic perturbations remains unanswered (Fig. 2).

Overall, existing spectral methods from different fields dealing with geometric data have major **limitations**, which we summarize in the following three points:

1. Current spectral methods have limited applicability. Due to their different focus, the spectral methods adopted in applied fields like statistical signal processing and machine learning are limited in the types of noise and applications they can target. A range of important problems like data comparison, alignment, characterization, and map inference under various forms of corruption and across multiple modalities are out of reach for such methods, while any attempt at addressing them with the language of perturbation analysis has clashed with (to date, undisputed) claims of instability.

2. Current domain perturbation models are insufficient. The deficiency of current methods comes first and foremost from the limitations of the adopted perturbation models. On the one hand, there is tendency for these approaches to operate almost exclusively at an algebraic level, i.e., by treating the operators as ordinary matrices with no geometric meaning attached to them [50]. We propose a substantial paradigm shift, placing back the geometric nature of the data in the crosshairs. On the other hand, perturbation theory is extremely successful in modeling small deformations of a system [12], while realistic transformations such as data removal are typically discontinuous, hence do not directly belong to this scenario.

3. The effect of real-world domain perturbations on spectral properties is not well understood. This lack of understanding is partly motivated by the overall scarcity of geometric data that plagued applied data scientists

till the last decade. In our new epoch of "big data", we can no longer rely on careful expert-based pre-processing, while the new applications that leverage data abundance (e.g., via deep learning) must cope with all kinds of artifacts. We need to ensure that the observations at hand are still useful and enlightening, and develop the supporting theory to give guarantees that we may use geometric data with confidence. Our primary goal will be to deal in a principled way with all forms of real-world perturbations that hinder current methods, and understand how the spectral properties of the data change as a result of corruption.

Main Goals of the Project

The ambition of this project is to develop a new framework for spectral geometric data analysis and processing, going all the way from a theoretical model to an efficient implementation. The project will deal with theoretical foundations, computational methods, and applications.

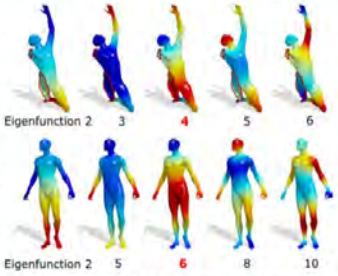


Fig 3. The manifold Laplacian eigenfunctions (here color-coded and increasingly ordered by their associated eigenvalue) undergo a "shift" along the spectrum as a consequence of part removal. Note, e.g., that eigenfunction number **4** in the top row corresponds to number **6** in the bottom row, while in the unperturbed case, indices would be consistently ordered. Apart from a preliminary algebraic explanation proposed by the PI [15], this behavior has not so far been fully understood.

Theoretical foundations. The main theoretical goal will be to understand and quantify the effect of real-world perturbations on the spectral properties of geometric data in their multiple manifestations. Our point of departure will rely on preliminary results obtained by the PI in a simplified setting dealing with 3D surfaces [15]. In this preliminary study, it was observed that removal of parts from a two-dimensional manifold does not strongly affect its Laplacian eigenfunctions, but rather (under Neumann boundary conditions) it *shifts* them to different positions along the spectrum (see Fig. 3). This surprising property seems to hold for any random choice of parts, largely contradicting the widely accepted belief that part removal may lead to arbitrary changes in the spectral decomposition of the Laplacian. Understanding this behavior under different kinds of perturbation, for general manifolds and other more abstract domains, will be one of our key goals. The theoretical pillar of this project revolves around the understanding that perturbations cannot and should not be treated *solely* from an algebraic perspective. We are facing a more fundamental geometric property, understanding which might lead to groundbreaking consequences in spectral geometry. The key to developing our framework lies in the formalization of this phenomenon by approaching it in the *continuous* setting using the tools of differential geometry and mathematical physics, following a similar formalism to recent localization theory [16]. This theory allows to predict *localized* behavior of Laplacian eigenfunctions (that is observed in real physical systems and has a fundamental importance in some applications, e.g., in quantum mechanics) from the analysis of the domain geometry. Our analysis will provide a different and complementary view, in that the latter theory allows the modeling of specific parts of the domain, while our observations show that arbitrary parts can be removed.

The connection between geometric and spectral perturbations will also be explored for inverse problems, where the main goal is to reconstruct the geometric features of a domain from a partial measurement of its (Laplacian) spectrum. Positive results in this direction will have profound consequences in real-world applications, potentially leading to novel sensing technologies and enabling new ways to approach large scale problems, such as designing systems with specific vibrational properties (on the scales from macro to nano) via non-destructive assays. Finally, dedicated efforts will be applied to the study of maps and the search for correspondences between large, incomplete and corrupted data domains, within and across different modalities and dimensions. Such problems are all-pervasive in computer science, with applications in protein design [20], performance capture [17], and large scale taxonomy mapping [18] to name but a few. Aside from ad-hoc solutions in controlled conditions, very few approaches in these domains are able to deal with even mild forms of data corruption. We will use the *functional map* formalism [19], where data perturbation is manifested directly in the matrix representation of the map [15] when the latter is expressed in the Laplacian eigenbasis.

Computational methods. In the computational pillar of the project we will develop novel methods and tools for spectral geometric data analysis and processing. The main task will be to design scalable algorithms that make direct use of the knowledge gained from the theoretical work for practically relevant tasks. In particular, a key computational goal will be the efficient and robust discretization of the continuous tools formulated in the theoretical part of the project. The main challenge here will be to devise a discretization scheme that is as universal as possible, and then specialize it to the different data representations. Domain alignment and mapping problems will be formulated using joint diagonalization [24] and matrix manifold optimization

Interview

https://erc.europa.eu/document-category/evaluation-panels

https://cordis.europa.eu/projects/en

Siamo tra i migliori selezionati, **ma**:
Alcuni non si preparano, o non ci credono veramente, o non sono autocritici, …

Fase 1 e Fase 2 sono completamente distinte!

- Nel mio caso: fallimento probabile se non mi fossi confrontato (12 versioni).
- Early feedback è cruciale.
- Parlate a una platea di non-esperti.
- Siate **memorabili**!
- Corsi di preparazione per l'interview

SPECGEO

Spectral geometric methods in practice

Emanuele Rodolà

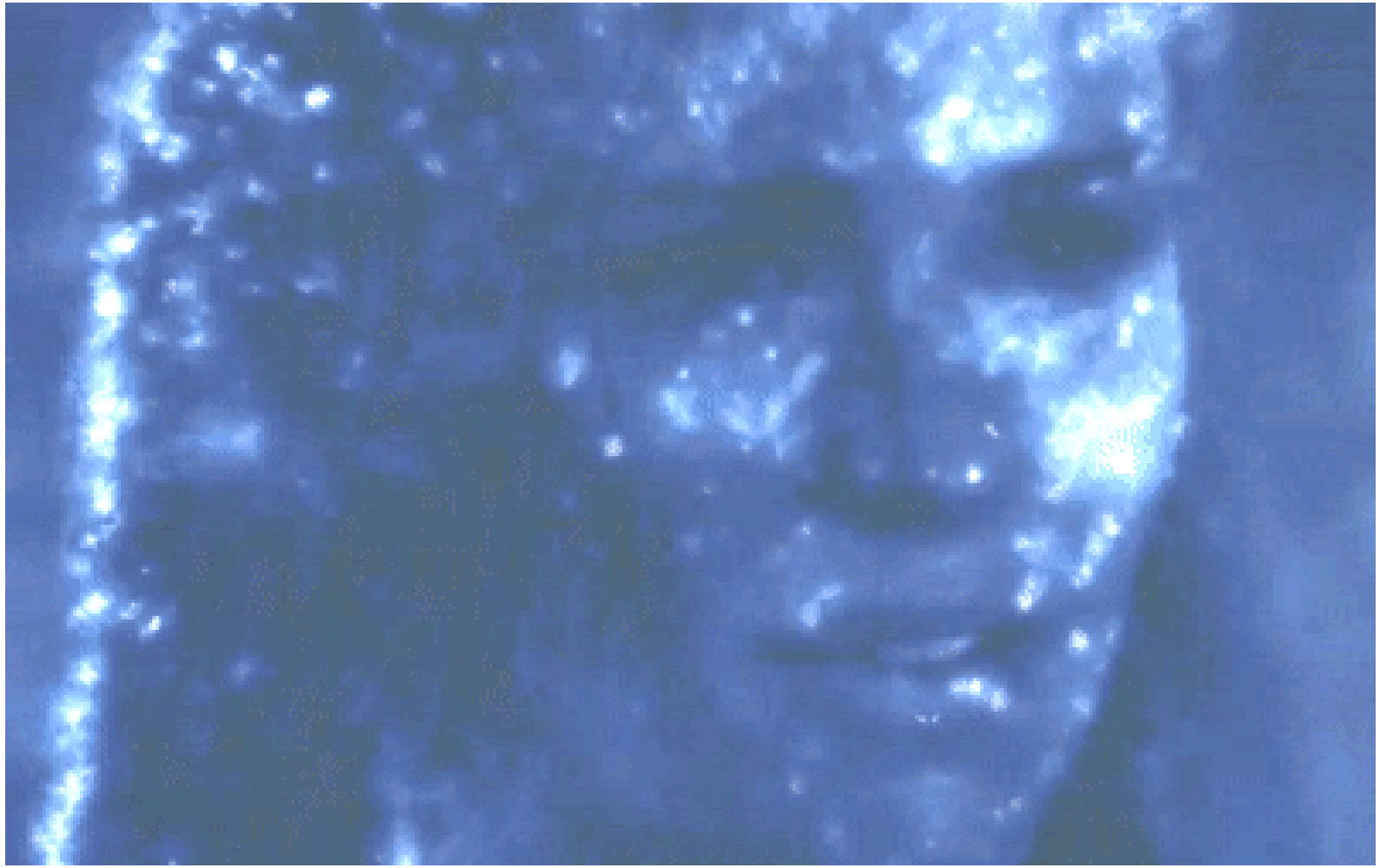
Brussels, 07/06/2018

Department of Computer Science

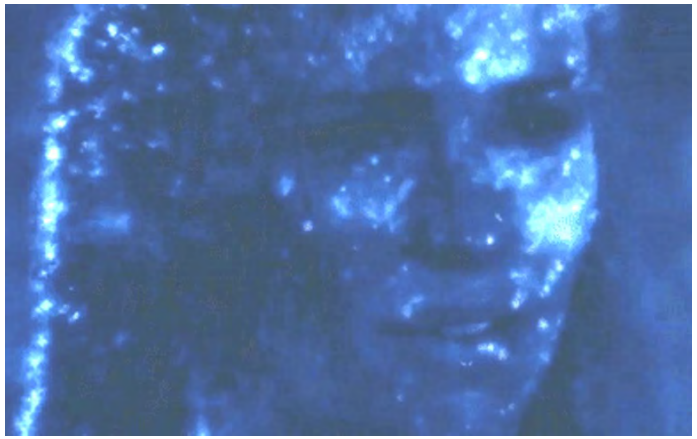
SAPIENZA
UNIVERSITÀ DI ROMA

Can you hear shape?

L. Green, 1960

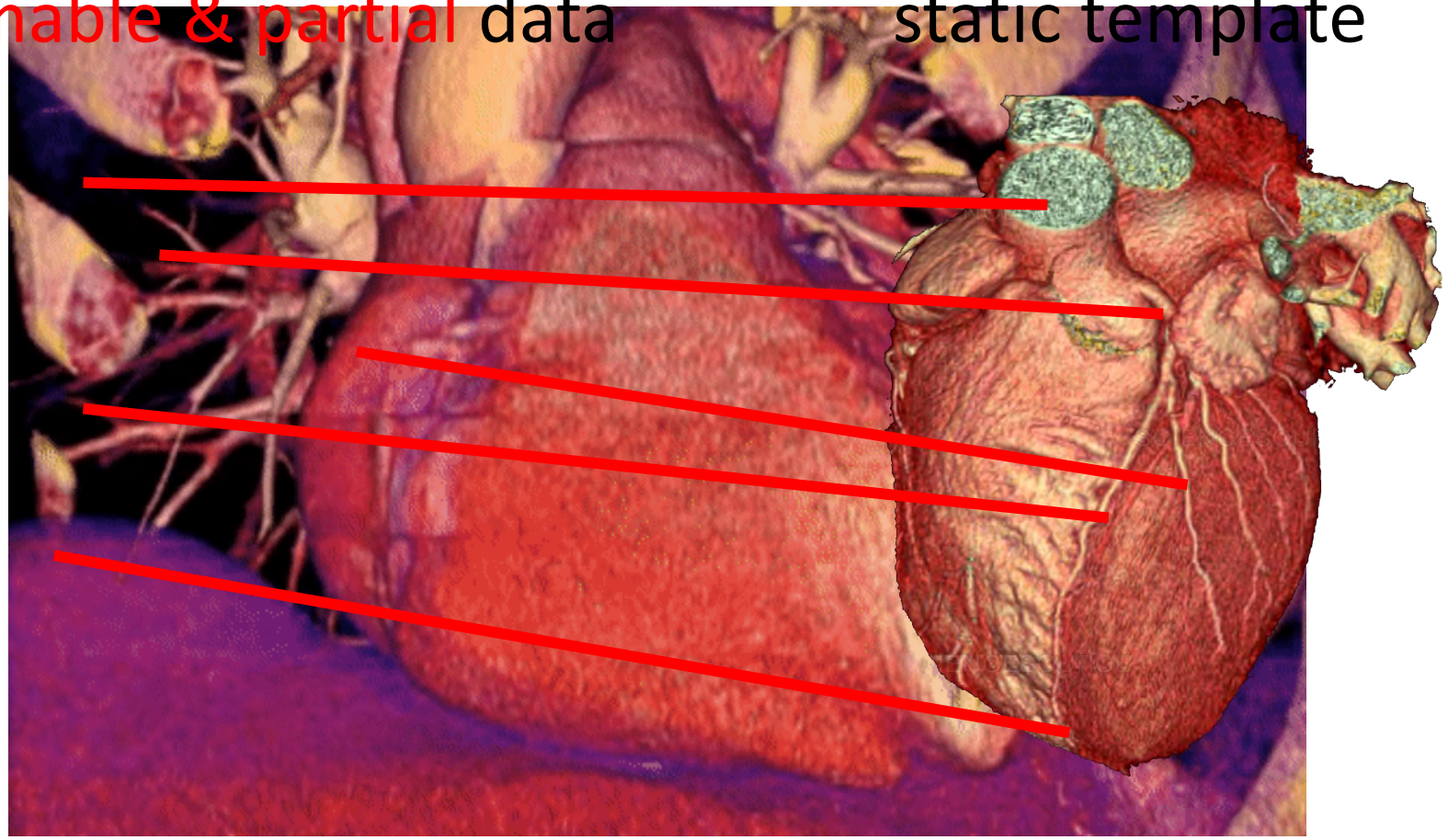


Problem A: Shape-from-sound

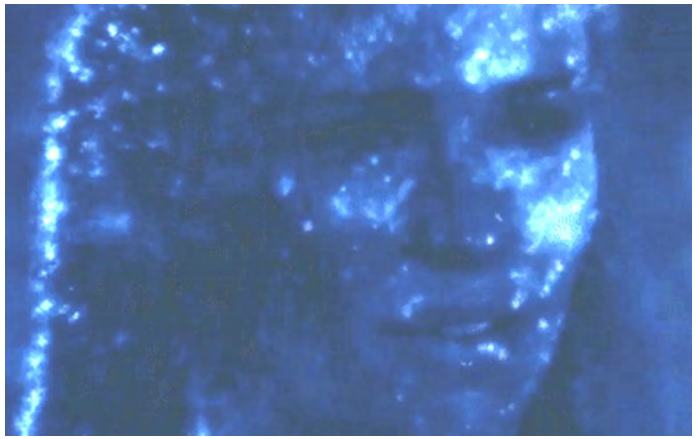


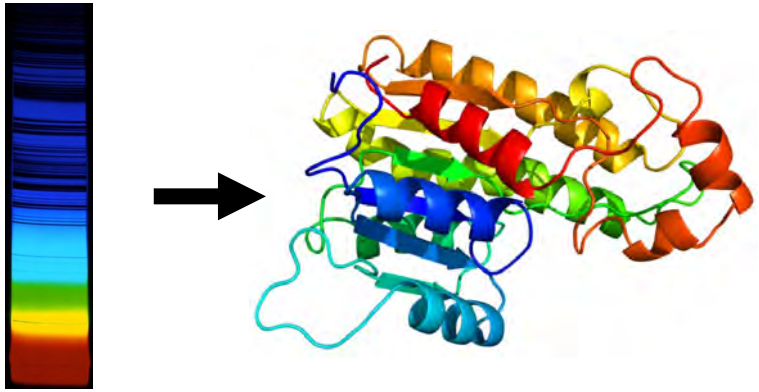
Is it healthy?

deformable & partial data static template



Problem A: Shape-from-vibration

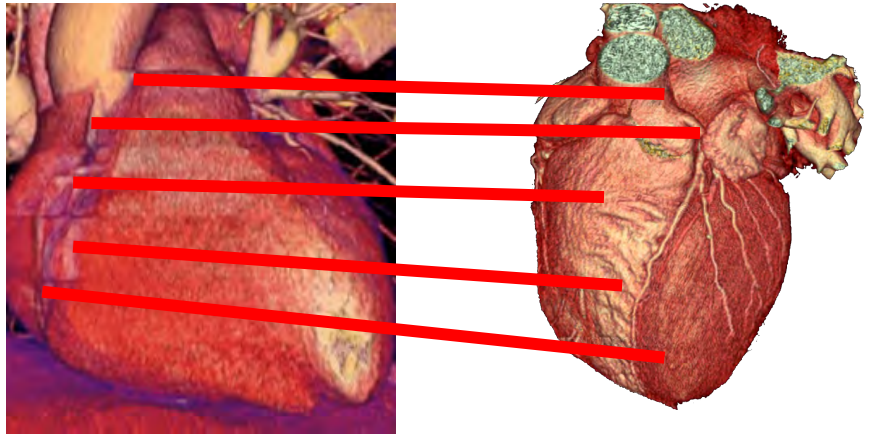


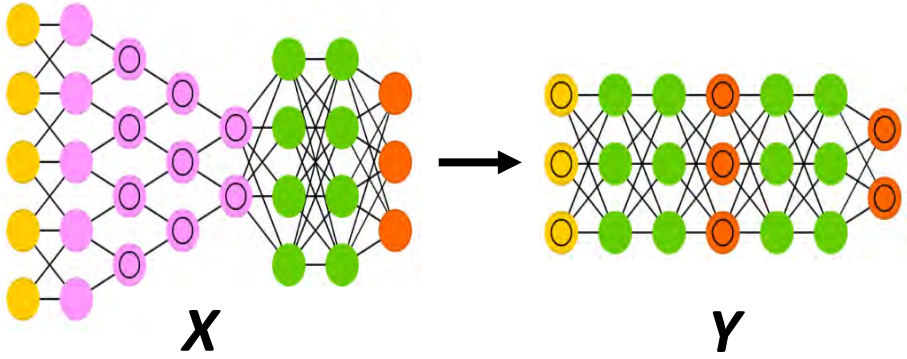


Spectrum **Molecular geometry**

Find an object ***X*** such that
$\lambda(X) = \lambda_{input}$

Problem B: Shape correspondence

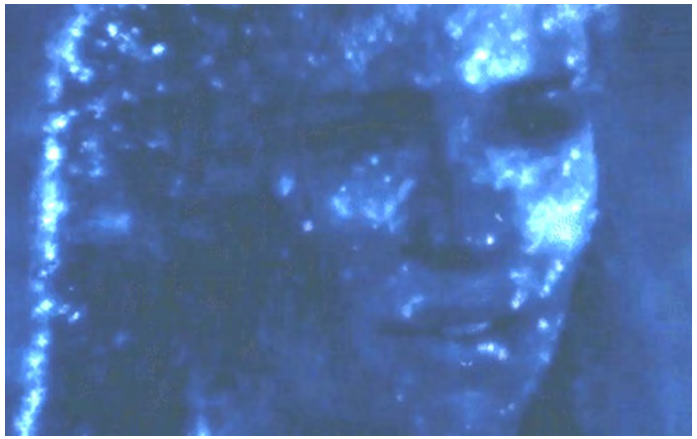




Knowledge transfer

Find a map $f : X \longrightarrow Y$
with low distortion

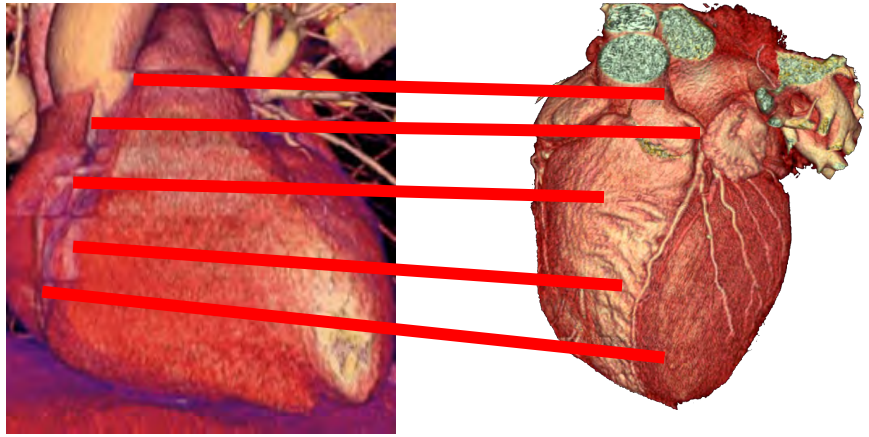
Problem A: Shape-from-vibration



"One cannot hear the shape of the drum"

Mark Kac, 1966

Problem B: Shape correspondence



Deformations **Cross-modal**
High-dimensional **Partiality**

Goal: Solve A and B
How: Spectral Geometry

Storyboard

Good morning!

>>> CAN YOU HEAR SHAPE?
Consider the following. This is a scene from a movie in which the main character is blind, but he can actually see people from the sound of raindrops hitting their face. This may sound like science fiction, but is in fact a well-known problem in physics.

>>>
And this will be my problem A.

Titolo slide →

>>> IS IT HEALTHY?
Consider now this other problem. This is the 3D video of a beating human heart, and the task is to SUPPORT clinical decision if this is healthy or not.

>>>
Now one promising way to address it is to correspond or fit this observation to a 3D template of a heart. And this is especially challenging since the shape is changing over time.

Timer →

--- 00:40

>>> MORE EXAMPLES
Now A and B are representative examples of more general classes of problems.

>>>
Problem A is not restricted to sound. Vibrations are everywhere in nature. For example, one can compute the geometric structure of a molecule from the energy

*** Why is now a good time?**

- We had these conceptual problems before, but they didn't correspond to the real world, and we know this now because we now have the data at our disposal. This allows attacking this problem in two modes:

1) we can now understand in what typical way data is corrupted, and thus carry out an analysis wrt realistic perturbations as observed on such data

2) we can learn something about the geometric priors that can be used to regularize the shape-from-sound problem

*** Where do I see the future in my field?**

- In the integration of data-driven techniques with axiomatic modeling. I think a very promising paradigm is to model what can be modeled, and learn the rest. And this is very timely, since today we have the data which can help both in defining accurate axiomatic models that leverage realistic assumptions on the data, as well as learning-based approaches.

*** What's the difference with what you've been doing?**

- I only explored one particular application (partial 3d shape correspondence), and a geometric justification is currently missing. I did use perturbation theory and found that it is insufficient to motivate what we observe. This was actually part of the motivation behind this project. Shape-from-eigenvalues is even more recent, in fact the preliminary results that I showed are not even published yet.

*** What do you mean that perturbation theory is algebraic? How does geometry enter the picture?**

Interview: feedback e imprevisti

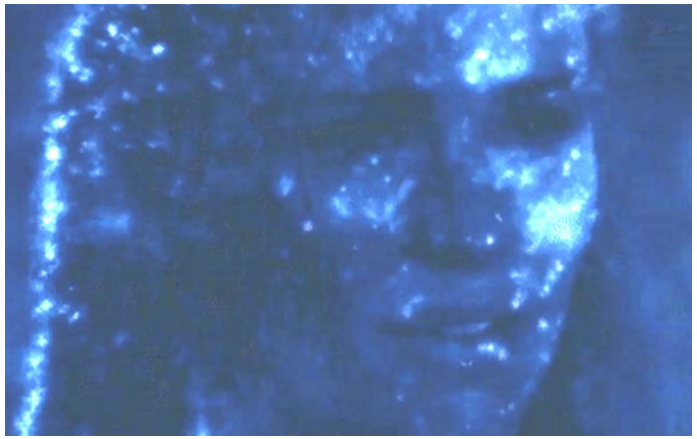
Pochissimo feedback dalla commissione.

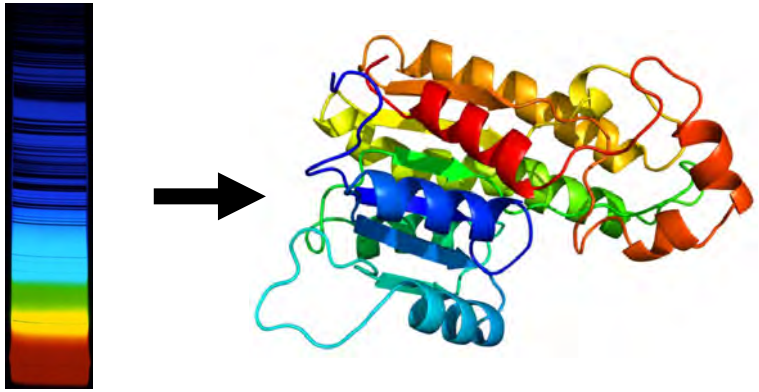
Feedback diretto: «we could really see your enthusiasm».

Feedback indiretto: La mia ultima frase è stata una battuta (involontaria).

- **Storia dell’orrore #1:** font sbagliati in powerpoint.

Problem A: Shape-from-vibration





Spectrum **Molecular geometry**

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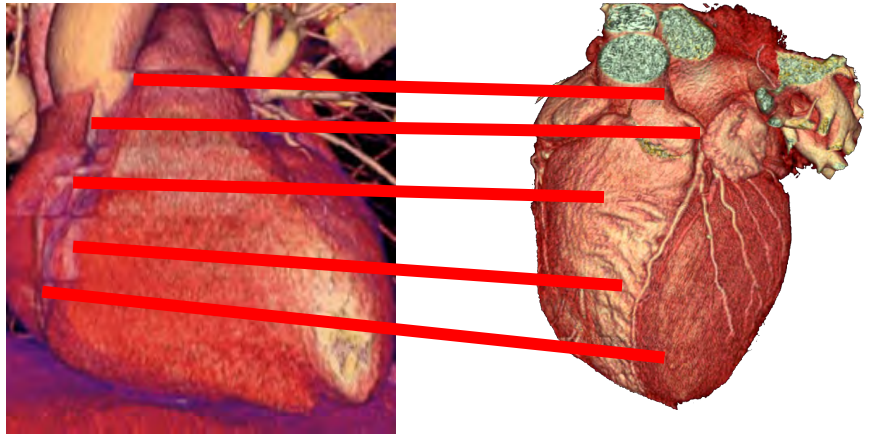
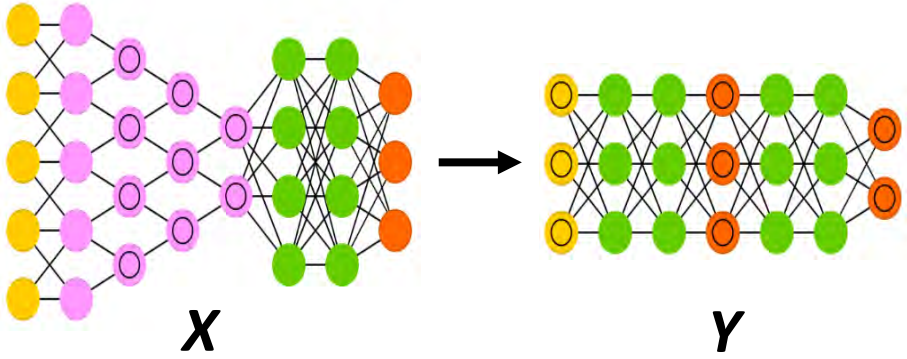
$\lambda(X) = \lambda_{input}$

Problem B: Shape correspondence

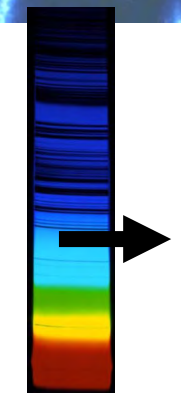




Knowledge transfer

Find a map $f : X \longrightarrow Y$
with low distortion

Problem A: Shape-from-



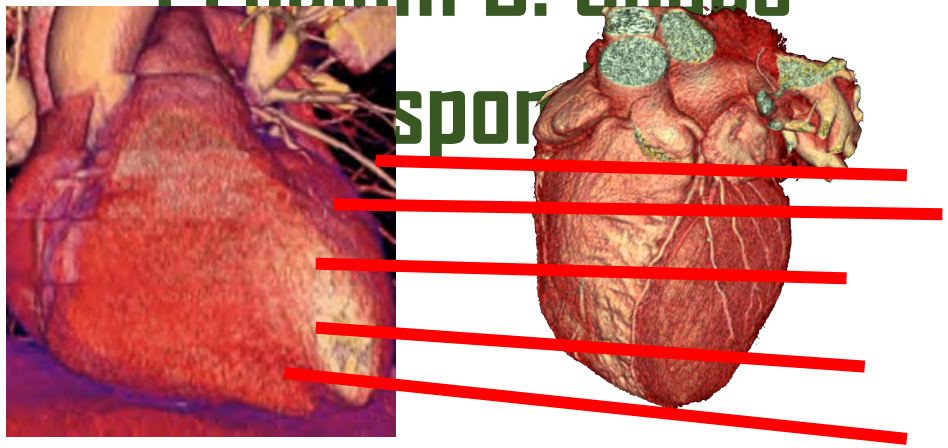
Spectrum

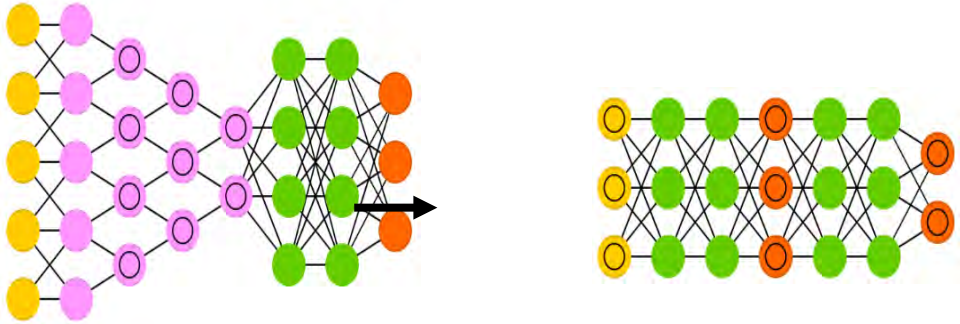
Molecular geometry

Find an object X such that

$$\lambda(X) = \lambda\text{input}$$

Problem B: Shape





X Knowledge transfer Y

Find a map $f : X \rightarrow Y$

with low distortion

Interview: feedback e imprevisti

Pochissimo feedback dalla commissione.

Feedback diretto: «we could really see your enthusiasm».

Feedback indiretto: La mia ultima frase è stata una battuta (involontaria).

- **Storia dell'orrore #1:** font sbagliati in powerpoint.
- **Storia dell'orrore #2:** allarme anti-incendio.

FIRE
ALARM

Col senno di poi

- Non promettere troppo
- Buona pianificazione del budget

“A main risk is the necessity of **hiring 7 skilled collaborators**”

“The part on inverse problems is a bit more **loosely motivated**”

“The proposal’s **structure and clarity is a bit lacking**”

“The proposal contains disparate objectives; its aims are **too broad**, perhaps too much so”

Impatto sulla carriera

- Fellowship (SSAS, YAE, ELLIS, etc.)
- Comitati di importanza strategica
- Punto di riferimento della comunità
- Keynote in conferenze top del settore
- Altri grant

- Possibilità di lavorare sulle proprie idee senza compromessi
- Possibilità di diversificare le attività di ricerca
- Possibilità di attrarre i talenti migliori

Non sottovalutatevi!

"As our island of knowledge grows, so does the shore of our ignorance."
– John Archibald Wheeler (Scientific American Vol 267, 1992)

Unveiling the Dark Universe with Gravitational Waves:

Black holes and compact stars as laboratories for fundamental physics

DarkGRA

Cover slide of my ERC StG interview (2017) PE-2 panel

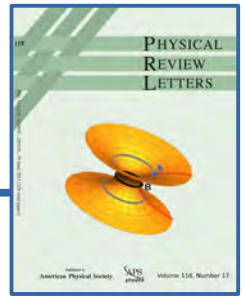
Paolo Pani
Sapienza University of Rome
www.roma1.infn.it/~pani

SAPIENZA UNIVERSITÀ DI ROMA

Last slide, ERC interview 2017

Outreach, media & highlights

http://paolopani.weebly.com/press--outreach.html



The gravity room

thegravityroom.blogspot.com

Echoes of a black hole

aeon

New Scientist — Hairy black hole could show gaps in Einstein's theory

Le Monde.fr

APS physics — Synopsis: Did Black Hole "Mimickers" Produce LIGO Signal? — Physics

The Mystery of Dark Matter Clarified—a Little

What is dark matter? Well, we know what it's probably not: black holes. — TIME

HUFF POST SCIENCE — Black Holes May Have 'Hair' That Poses Challenge To Key Theory Of Gravity, Physicists Say

APS physics — Synopsis: Black Holes Weigh the Possibility of a Massive Photon — Physics

Black hole bombs: Are they dark matter in disguise? — New Scientist

physicsworld.com — Sun puts relativity to the test

NATURE | NEWS — Search for primordial black holes called off

Mass constraints show that black holes are unlikely to explain dark matter.

New Scientist — Heavy photons are too light to be behind dark matter

Rai Scienze

Popular-science

Public codes

Interviews & visits to schools

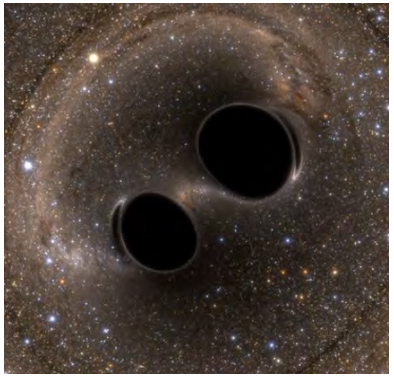
PI's short CV [2017]

- Twice Marie-Curie Individual Fellow
- Portuguese FCT StG (€200K)
- 1 book, 75+ papers (7 PRL in 5 yr)
- 2000+ nonself cites, h=34
- 30+ invited talks @ int. workshops
- APS Outstanding Referee Award
- SIGRAV Prize 2016
- Topic Leader, COST Action CA16104

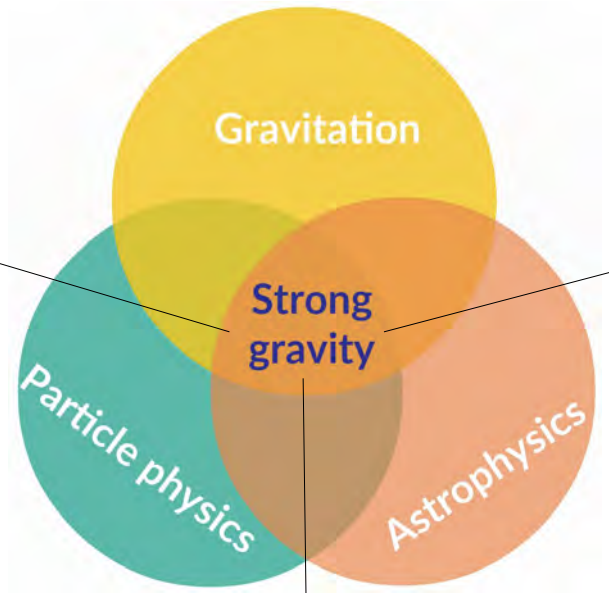
Career path

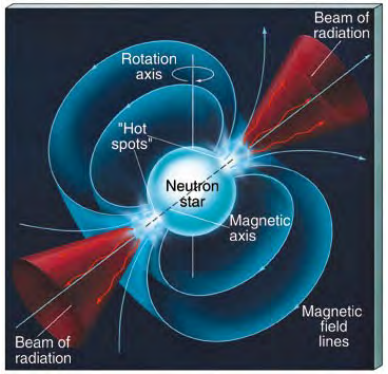
- My own experience
  - 2008-2011: PhD @ Cagliari U. (Italy)
  - 2011: postdoc @ Instituto Superior Tecnico (IST, Lisbon)
  - 2012: Marie Curie IEF @ IST (2013: IST → Harvard U.)
  - 2014: 5-year FCT Starting Grant @ IST
  - 2015: Marie Curie IEF @ Sapienza
  - 2015 – 2018: Tenure-track Assistant Professor (RTDb) @ Sapienza
  - 2017 – 2022 → 2023: **ERC StG "DarkGRA"**
  - 2018 – now: Associate Professor @ Sapienza

A new era in fundamental physics

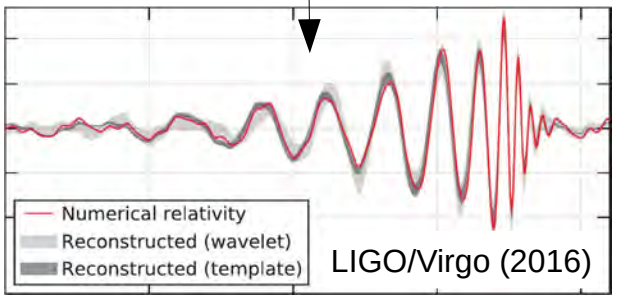


Black holes (BHs)





Neutron stars (NSs)



Gravitational waves (GWs)

Second slide of my ERC StG interview (2017)

- Breakthrough: unexplored strong-gravity regime *finally accessible*
- Compact objects are unique labs to answer fundamental questions

The Nature of Compact Objects

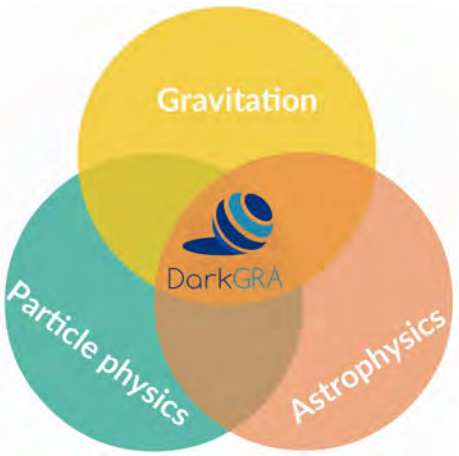
- Do black holes form in nature?
  - BH paradigm is very economical *but*: interior, singularities, predictability, …
  - Quantum effects *not* under control: information loss, unitarity, thermodynamics…
- Quantum Gravity at the horizon scale?
  - Quantum effects can halt collapse [Mathur, Mazur & Mottola, Polchinski+, Giddings, Dvali+, ...]
  - Speculative models (*fuzzballs, gravastars, firewalls,...*) can be finally scrutinized
- Beyond Standard-Model physics @ strong gravity?
  - Novel exotic sources? Extensions of General Relativity?
  - GW signatures of ultralight dark matter

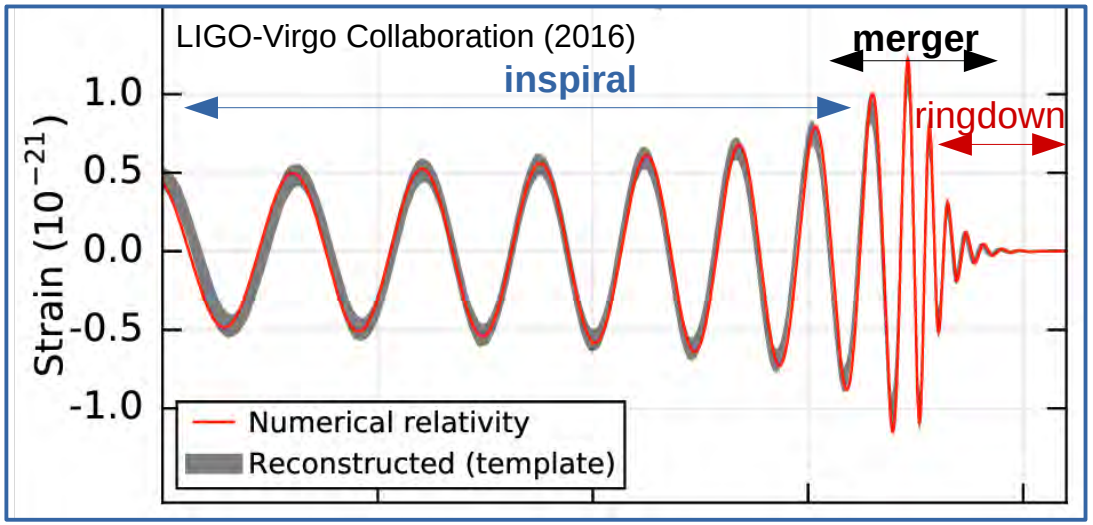
It's just the right time!

- Confrontation with experiments (aLIGO/aVirgo, LISA, KAGRA, DECIGO, ET...)
- Beyond astrophysics: New opportunities for basic science

The DarkGRA project

- From astrophysics to fundamental physics
- Searches for new physics in the strong-gravity regime
- Strong gravity as a *precision discipline* (e.g. cosmology)





Scientific challenges:

- Flexible theoretical framework: Smoking-gun effects *and* precision GW physics
- New detection strategies: theoretical models are *crucial* to extract the signal
- Interdisciplinary: (astro)physics of compact objects, near-horizon & GW modeling

Why do I need an ERC StG?

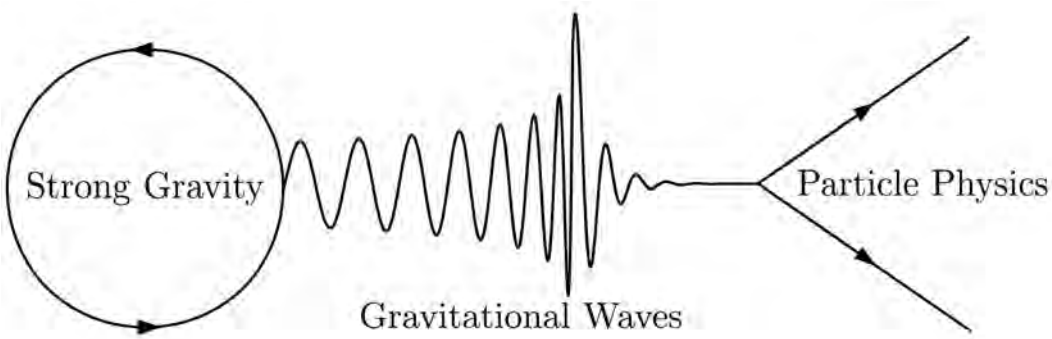
- **Goal:** build a groundbreaking team with cross-cutting expertise
- New frontier: competition on a global scale
- Timely opportunity to boost strong gravity within Europe

(along the lines of Harvard's BH Initiative [$7M], Perimeter Institute [$8M], …)

- Current resources are limited (now supervising 1 PhD student + master students)
- Brainpower (hire experienced postdocs, grad students)
- Attract best team (diverse expertise; compete with leading institutions worldwide)
- DarkGRA matches ERC profile *(high-risk/high-gain, innovative, timely)*
- DarkGRA fits in European vision for fundamental science (e.g. ESA Cosmic Vision)

DarkGRA's scientific reach

Beyond Standard Model physics @ Extreme Gravity



V. Cardoso, P. Pani – CERN Courier (2017)

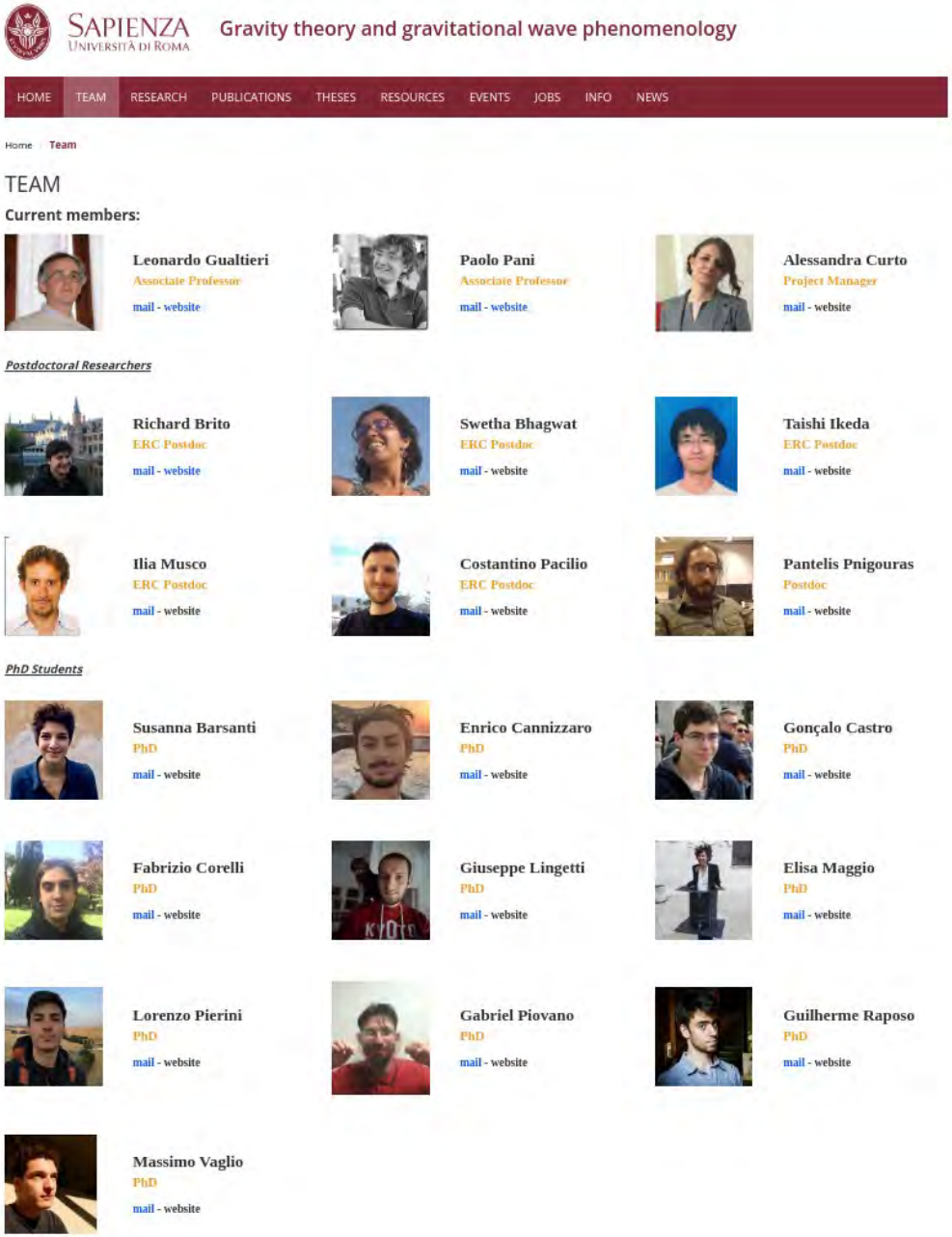
- Do black holes exists?
- Quantum gravity at the horizon?
- GW imprints of ultralight dark matter?
- Compact objects as particle labs?

- Solid present: new exciting physics *within* reach, promising preliminary results
- Exciting future: era of GW and BH (astro)physics (leading edge for the next 30 yr)

Strong Gravity Universe: expect the unexpected!

"Recording a GW […] has never been a big motivation for LIGO, the motivation has always been to open a new window to the Universe"
– Kip Thorne (BBC interview, 2016)

Our group: web.uniroma1.it/gmunu



- 9 ERC-funded postdocs
  (3 moved elsewhere with permanent positions)
- 1 Marie Curie Fellow
- 2 ERC-funded PhD fellowships
- Group attractive to students

(~25 people during each weekly group meeting)

More info about the project/group:

- www.darkgra.org
- https://web.uniroma1.it/gmunu/

DarkGRA main outcomes

- Establishing a leading gravity-theory group at international level
- 2 books and 50+ papers in major journals, including 1 Living Review in Relativity and 6 papers in Physical Review Letters:
  - First constraints on ultralight spin-2 particles through black-hole superradiance [PRL 2017, PRL 2020]
  - First study of the phenomenology of quantum-gravity “fuzzballs” with gravitational waves [PRL 2020]
  - Novel theoretical interpretations for puzzling gravitational-wave events like GW190521 [PRL 2021]
  - Novel tests of the nature of black holes with current and future experiments [PRL 2018]
- New collaborations started with leading groups worldwide
- New coordinating roles for the PI:
  - Keynote speaker at GR22 (largest conference in the field), Valencia 2019
  - LISA Consortium: Coordinator of the Work Package SI7: "Testing the Nature of Black Holes"
  - 3G Science Team: Theorist Responsible for subgroup ``Exotic Compact Objects''
  - Member of the Scientific Editorial Board of “Asimmetrie” (INFN outreach magazine)
  - Junior Fellow at Sapienza’s School for Advanced Studies (SSAS)
  - Member of Steering Committee of Sapienza’s Amaldi Research Center

ERC proposal and personal tips

Disclaimer: just my personal opinions!

- My 2 cents on the ERC proposal:
  - Start very well in advance, **panel is crucial**, ask for feedback from peers
  - Bad news: 2-step evaluation but 1-step submission: **B1 must be perfect… and so must B2!**
  - Good (?) news: IMHO much is decided *before* the interview (hard to revert the reports?)
  - However, get prepared for the interview at best (**read B2 critically** after some time and wonder about the questions you would never want to get)
  - **Mock interview**: prepare typical answers also to standard questions
  - Panelists are scientists→ interview mostly about science (but be able to justify the budget!)

ERC proposal and personal tips

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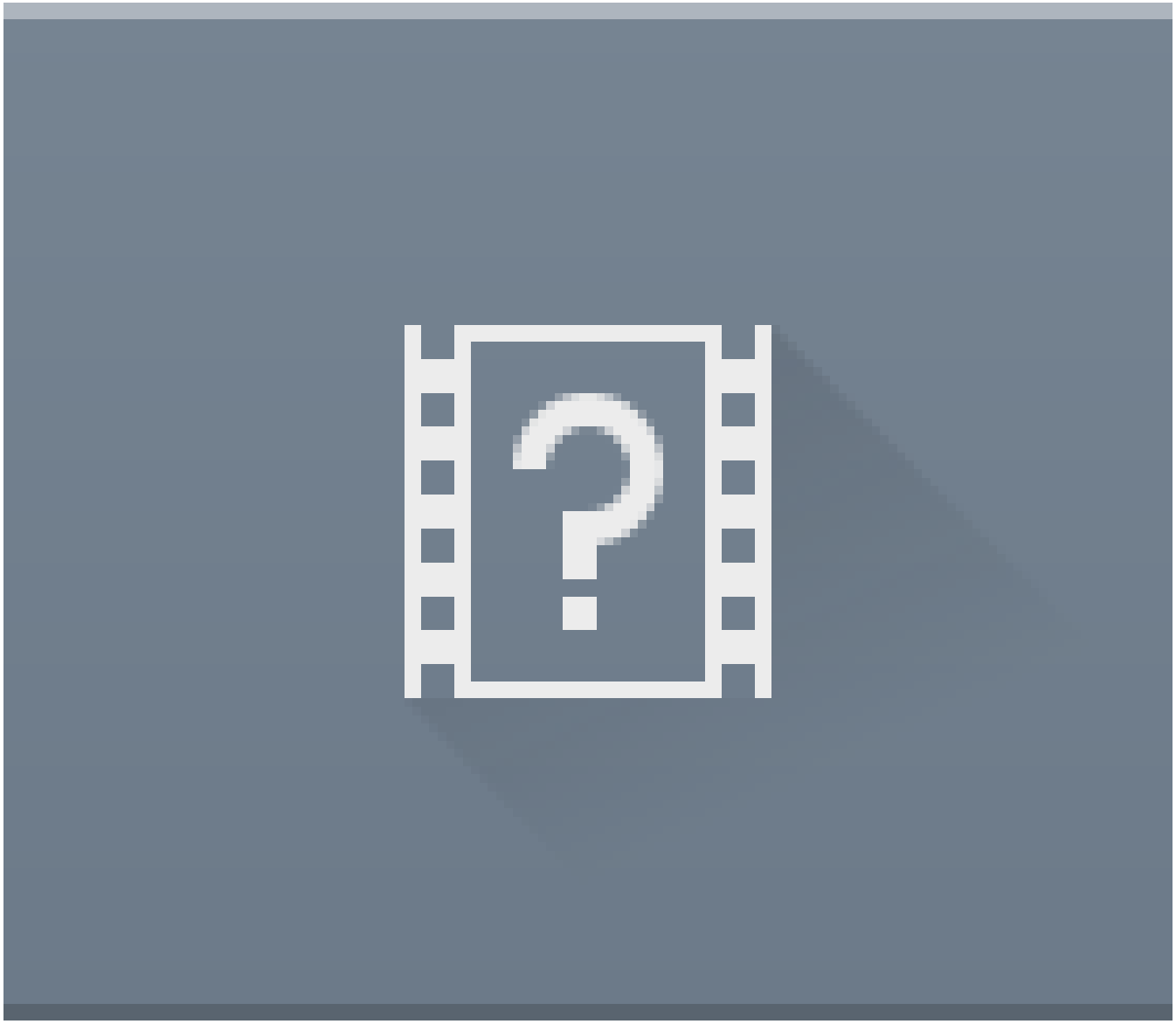
  - **Mock interview**: prepare typical answers also to standard questions
  - Panelists are scientists → interview mostly about science (but be able to justify the budget!)
- If you get it:
  - Think about the budget very carefully, plan in advance, study internal arrangements at HI
  - Sapienza's International Office can help you a lot, also during the writing of the proposal
  - It's a lot of money, don't be shy and **spend it**!
  - **Postdoc recruiting takes time**, take it into account
  - You didn't get 1M+ EURO to do paperwork → **hire "project/outreach manager"** (at least with the overheads) – focus on science and coordination
- For any question, don't hesitate to contact me: **paolo.pani@uniroma1.it**

Thanks for the attention!



Gravitational waves emitted by a black hole in quantum gravity Simulations done by postdoc Taishi Ikeda using the national INFN and CINECA “Marconi” cluster

APRE
Agenzia per la Promozione della Ricerca Europea

IL NUOVO PROGRAMMA HORIZON EUROPE E I BANDI ERC 2021: STARTING E CONSOLIDATOR GRANT

22 febbraio 2021, Sapienza Università di Roma

Marco Ferraro

Excellence Science

- **European Research Council**
  Frontier research by the best individual teams (ERA)
- **Future and Emerging Technologies**
  Collaborative research to open new fields of innovation
- **Marie Sklodowska Curie Actions**
  Opportunities for training and carrer development
- **Research Infrastructures (Including e-infrastructure)**
  Ensuring access to world-class facilities

Industrial Leadership

Leadership in enabling and industrial technologies

- ICT
- Nanotechnologies materials, biotechnologies, manifacturing
- Space

- **Access to risk finance**
  Leveraging private finance and venture capital for research and innovation
- **Innovation in SMEs**
  Fostering all forms of innovationin all types of SMEs

Societal Challange

- Health, demographic change and wellbeing
- Food security, sustainable agriculture, marine and maritime research, and the bio-economy
- Secure, clean and efficient energy
- [illegible] integrated transport
- Climate action, resource efficiency and raw materials
- Europe in a changing world – inclusive, innovative, reflective societies
- Secure Societies

Pillar 1
Excellent Science

- European Research Council
- Marie Skłodowska-Curie Actions
- Research Infrastructures

Pillar 2
Global Challenges and European Industrial Competitiveness

Cluster

- Health
- Culture, Creativity and Inclusive Society
- Civil Security for Society
- Digital, Industry and Space
- Climate, Energy and Mobility
- Food, Bioeconomy, Natural Resources, Agriculture and Environment

Joint Research Centre

Pillar 3
Innovative Europe

- European Innovation Council
- European innovation ecosystems
- European Institute of Innovation and Technology

Widening Participation and Strengthening the European Research Area

- Widening participation and spreading excellence
- Reforming and Enhancing the European R&I system

The information in this presentation is still subject to change

APRE

OBIETTIVI

L ‘*ERC* incoraggia proposte che

- superino le ***tradizionali barriere*** tra le discipline
- trattino ***settori nuovi ed emergenti***
- ***high-risk, high-gain***
- siano presentate da ***ricercatori Eccellenti***

CARATTERISTICHE DEI FINANZIAMENTI ERC

- Finanziamenti assegnati a ricercatori **individuali**
- **1 Progetto, 1 ricercatore, 1 istituto, 1 criterio di valutazione**
- Unico criterio di selezione: ***eccellenza***
- Finanziamenti sostanziosi (1.5 mln € → 3.5 mln)
- Nessuna priorità tematica pre-definita ('su iniziativa dei ricercatori' – bottom-up);
- Aperto a **tutti i settori della scienza**
- No network ma TEAM
- Portabilità del finanziamento

ERC - DOMINI

Quali settori?

- ✓ Tutti gli argomenti

  Tranne energia nucleare e temi sensibili da un punto di vista etico

- ✓ Per motivi pratici divisi in:
  - Scienze naturali, fisiche e ingegneria (PE)
  - Scienze della vita (LS)
  - Scienze sociali ed umanistiche (SH)

Principali novità

1. Revisione della struttura dei panel ERC (a partire dallo Starting 2021), mantenendo l'approccio pre-esistente:

- *Garantire un carico di lavoro equilibrato tra i panel*
- *Coerenza disciplinare all'interno e tra i panel*
- Modernizzare per riflettere meglio la realtà scientifica

2. Introduzione delle interviste negli Advanced Grant per consentire ai ricercatori di difendere le loro proposte e di tenere uno scambio diretto con i membri del panel
3. Le organizzazioni internazionali (*Intergovernmental organisations with legal personality under international public law*) con sede nell'UE o nei paesi associati sono ora idonee a diventare istituzioni ospitanti (in precedenza solo 28 di tali organizzazioni erano ammissibili come "organizzazione internazionale di interesse europeo"): si prevedono circa 80 nuove organizzazioni ammissibili al finanziamento

Nuova struttura dei panel: https://bit.ly/2MW3GBX

Nuovi panel (track changes)

INDIPENDENZA, RICONOSCIMENTO E VISIBILITÀ

L'ERC offre:

- **Libera scelta** dell’area di ricerca,dell'istituzione ospitante e dei membri del team (europei e non)
- Mobilità dei ricercatori ovunque in Europa (**portability of grants**)
- Un "marchio di qualità" per **attrarre finanziamenti aggiuntivi e ottenere riconoscimento**
- Procedure semplici e burocrazia "leggera"

Cos’è la ricerca di frontiera?

Oggi la distinzione tra ricerca "di base" e "applicata" è minima, poiché le aree emergenti della scienza e della tecnologia spesso coprono elementi di entrambe.

Di conseguenza, il termine "ricerca di frontiera" è stato coniato per le attività ERC in quanto saranno dirette verso progressi fondamentali e oltre la "frontiera" della conoscenza.

Elementi chiave di un progetto ERC

Principal Investigator (PI)

- *Qualsiasi nazionalità, età, posto di lavoro/stato contrattuale*

Host Institution (HI)

- *Ente situato in un paese membro dell'Unione europea o paese associato a Horizon Europe*

Team di ricerca individuale

- *Il Principal Investigator ha libertà di scelta dei membri del suo team*

Host Institution

HOST INSTITUTION

- Ente di ricerca, Università ma anche Industria
- Situato in un Paese Membro o Associato
- Risponde al criterio dell'eccellenza (ambiente di ricerca, capacità di management, contatti, know-how,..etc)

- Formalmente è il contraente con la CE
- Dovrà prendere un impegno formale nel concedere al ricercatore (PI) indipendenza nella gestione dei fondi per tutta la durata del progetto
- Accetta la "portabilità" del Grant
- Firma la letter of commitment

HOST INSTITUTION

Condizioni di indipendenza del PI: cosa sono?

- ✓ Applicare per il finanziamento in modo autonomo
- ✓ Gestire la ricerca e il finanziamento del progetto e prendere decisioni sull'allocazione delle risorse
- ✓ Pubblicare come senior author in modo indipendente e invitare come co-authors solamente coloro che hanno contribuito al lavoro
- ✓ Supervisionare i team members
- ✓ Avere accesso a spazi e facilities adeguati per portare avanti la ricerca

Team di ricerca

RE

Team di ricerca: chi ne può far parte?

- Costituzione flessibile: post-doc, PhD students, senior researchers. No limiti di età, nazionalità e paese di residenza.

- Composizione nazionale o trans-nazionale: team members provenienti dal gruppo di ricerca del PI/stesso Ente, ma anche da altri Enti di differenti Paesi (additional participants -> eccezione)

ADDITIONAL PARTICIPANT

In casi particolari, possono essere coinvolti nel progetto **altri istituti:**

- ✓ Partecipazione **motivata e giustificata**
- ✓ Costituiscono un **chiaro valore aggiunto** al progetto

Team vs Network

I progetti ERC dovrebbero concentrarsi sulle competenze del PI e non fare affidamento sulla collaborazione per le parti centrali della ricerca.

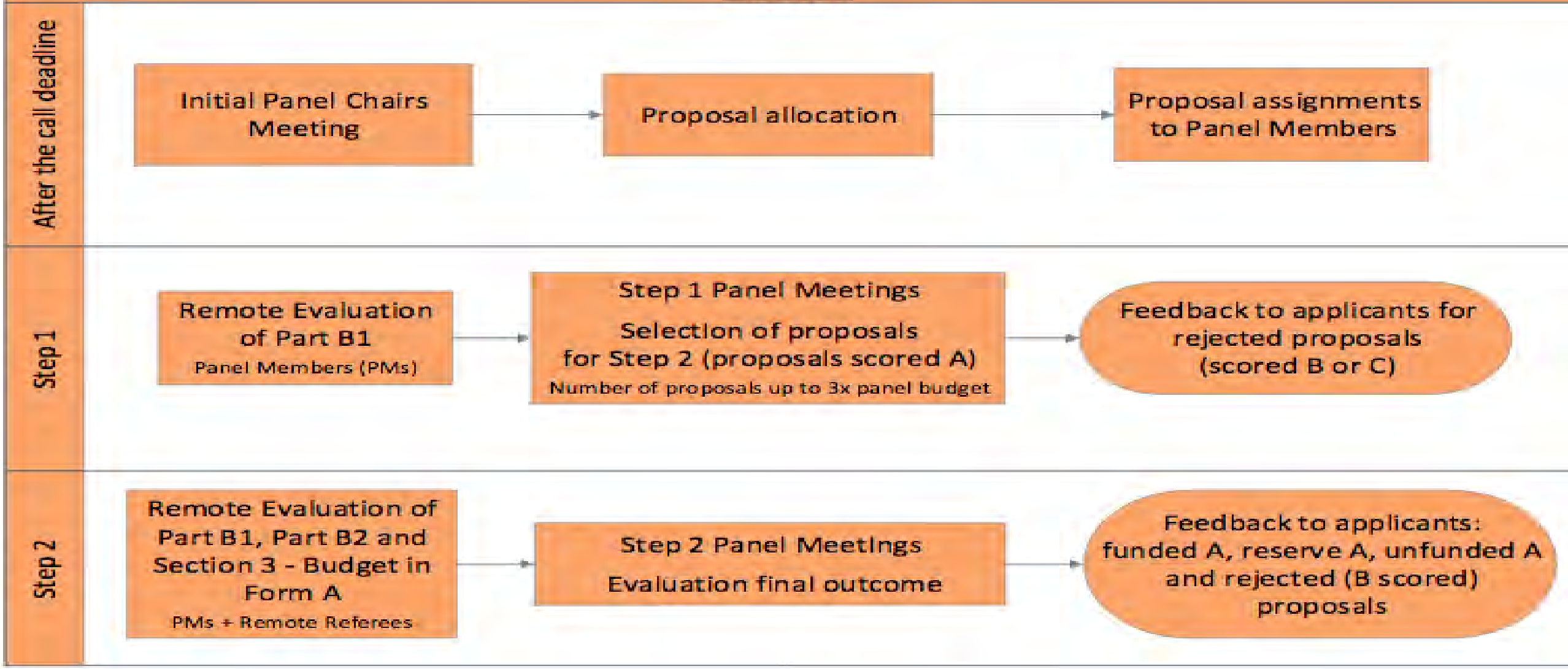
focus sul PI ⇨ no 'network' o 'consorzi'!
partecipazione di altri enti se necessario per fini scientifici

Quando possono essere rilevanti le collaborazioni in ERC?

Le collaborazioni sono consentite, a condizione che:

- portino competenze o capacità specifiche e uniche, diverse e/o complementari con quelle del PI;
- sono necessarie per un compito specifico e complementare (alla ricerca di base);
- non ostacolino la leadership scientifica del PI nel progetto in generale, e in particolare sulla ricerca di base.

Evaluation process



APRE

Limiti di partecipazione

Call to which the Principal Investigator applied under previous ERC Work Programmes and proposal evaluation outcome		2021 ERC calls to which a Principal Investigator is *not* eligible
2019 and 2020 Starting, Consolidator, Advanced Grant or Synergy Grant	Rejected on the grounds of a breach of research integrity	Starting, Consolidator and Advanced Grant
2019 Starting, Consolidator or Advanced Grant	C at Step 1	Starting, Consolidator and Advanced Grant
2020 Starting, Consolidator or Advanced Grant	A, or B at Step 2	No restriction
	B, or C at Step 1	Starting, Consolidator and Advanced Grant
2020 Synergy Grant	A, or B at Step 3	No restriction
	B at Step 2	No restriction
	C at Step 1	Advanced Grant

ERC Starting Grant 2021

StG: budget e durata

Quant'è grande un progetto?

- ✓ Durata fino a 5 anni
- ✓ Finanziamento fino a 1,5M€
- ✓ Max. 2,5M€ a progetto*

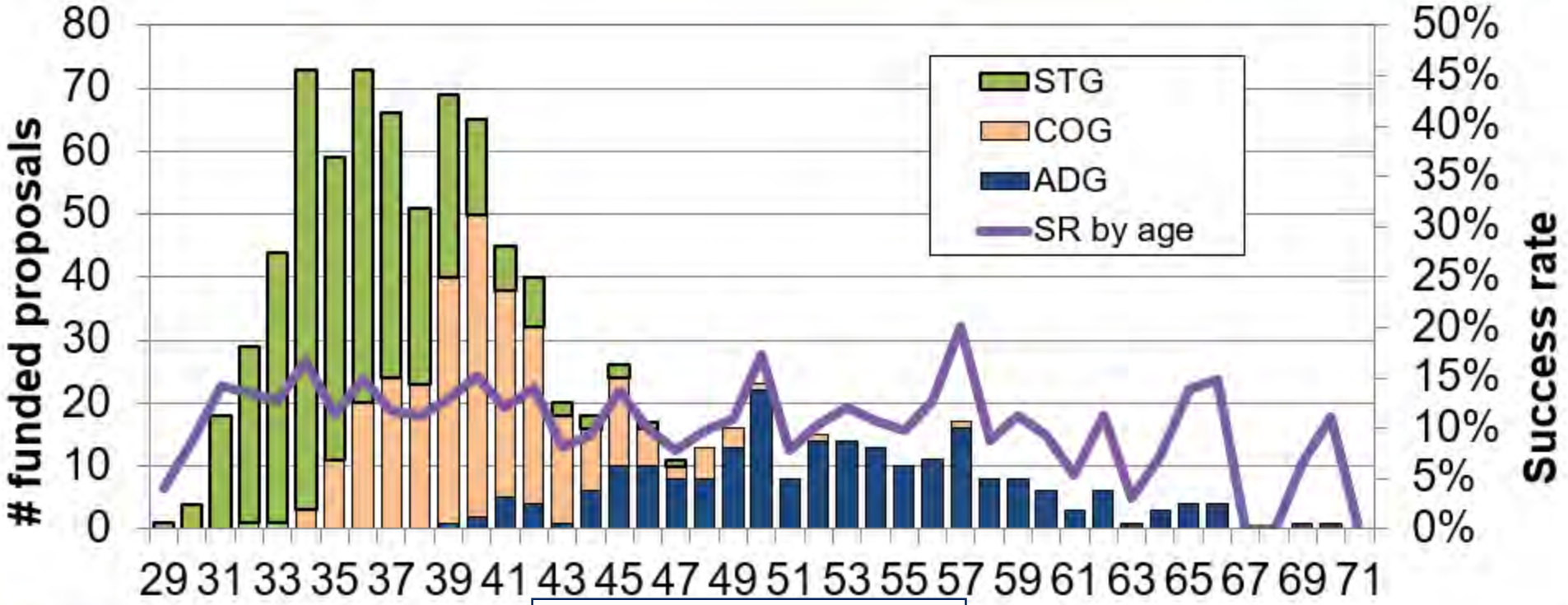
*In casi eccezionali e ben specificati: fino a 3,5 M€

- PI da Paese terzo
- Acquisto di importante attrezzatura di ricerca
- Accesso ad infrastrutture di ricerca

Principal Investigator

- ✓ Il PI non deve essere necessariamente "employed" o "strutturato" dall'Host Institution al momento della presentazione della proposta, ma impiegato/assunto ("engaged") dalla HI per tutta la durata del Grant
- ✓ Il PI deve dedicare al progetto una parte significativa del suo tempo: almeno il 50% del suo tempo lavorativo
- ✓ Unico responsabile del progetto, sia per l'attività scientifica che per il management

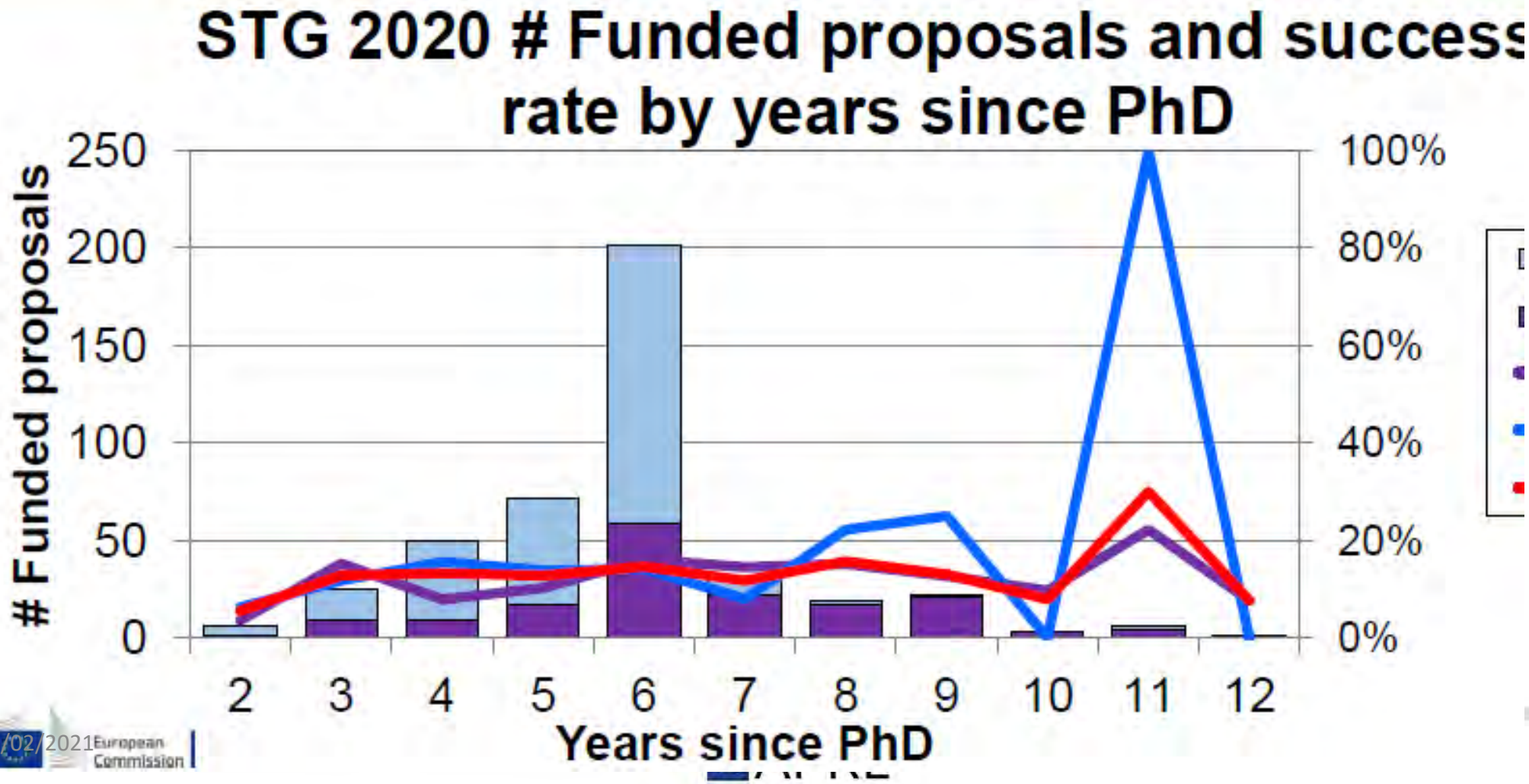
StG-CoG-AdG Calls
Age of Grantees



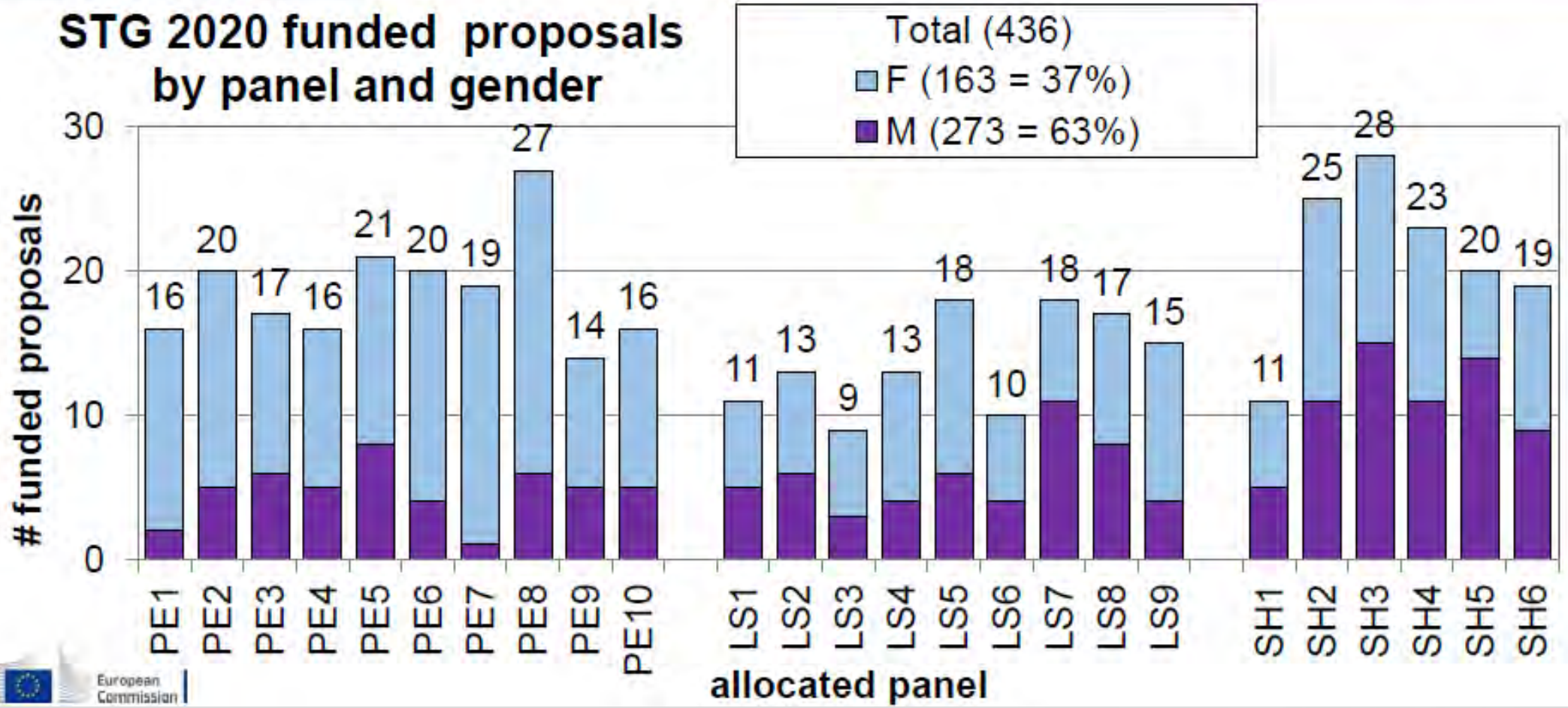
European Commission

| 7

STG 2020: Results by years since PhD



STG 2020: Gender Analysis
Results by panel



European Research Council
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European Commission

APRE

Principal Investigator: requisiti

- ✓ at least one important publication as main author or without the participation of their PhD supervisor.

Altri elementi di valutazione:

Early achievements track record

In the Track record (see "Proposal description") the applicant Principal Investigator should list (if applicable):

*1. **Up to five publications** in **major international peer-reviewed multi-disciplinary scientific journals** and/or in the **leading international peer-reviewed journals, peer-reviewed conferences proceedings and/or monographs** of their respective research fields, highlighting those as main author or without the presence as co-author of their PhD supervisor (properly referenced, field relevant bibliometric indicators may also be included); preprints may be included, if freely available from a preprint server (preprints should be properly referenced and either a link to the preprint or a DOI should be provided);*

*2. **Research monographs and any translations thereof**;*

*3. **Granted patent(s)**;*

*4. **Invited presentations to internationally established conferences and/or international advanced schools**;*

*5. **Prizes, awards, academy memberships**.*

Principal Investigator: requisiti

Starting Grant	Consolidator Grant	Advanced Grant
> 2 and ≤ 7 years prior to 1 January 2021 Cut-off dates: PhD awarded from 1 January 2014 to 31 December 2018 (inclusive)	> 7 and ≤ 12 years prior to 1 January 2021 Cut-off dates: PhD awarded from 1 January 2009 to 31 December 2013 (inclusive)	No specific criteria

ERC Consolidator Grant 2021

CoG: budget e durata

Quanto è grande un progetto?

- ✓ Durata fino a 5 anni
- ✓ Finanziamento fino a 2 M€
- ✓ Budget aggiuntivo 1M€ - Max. 3M€ a progetto*

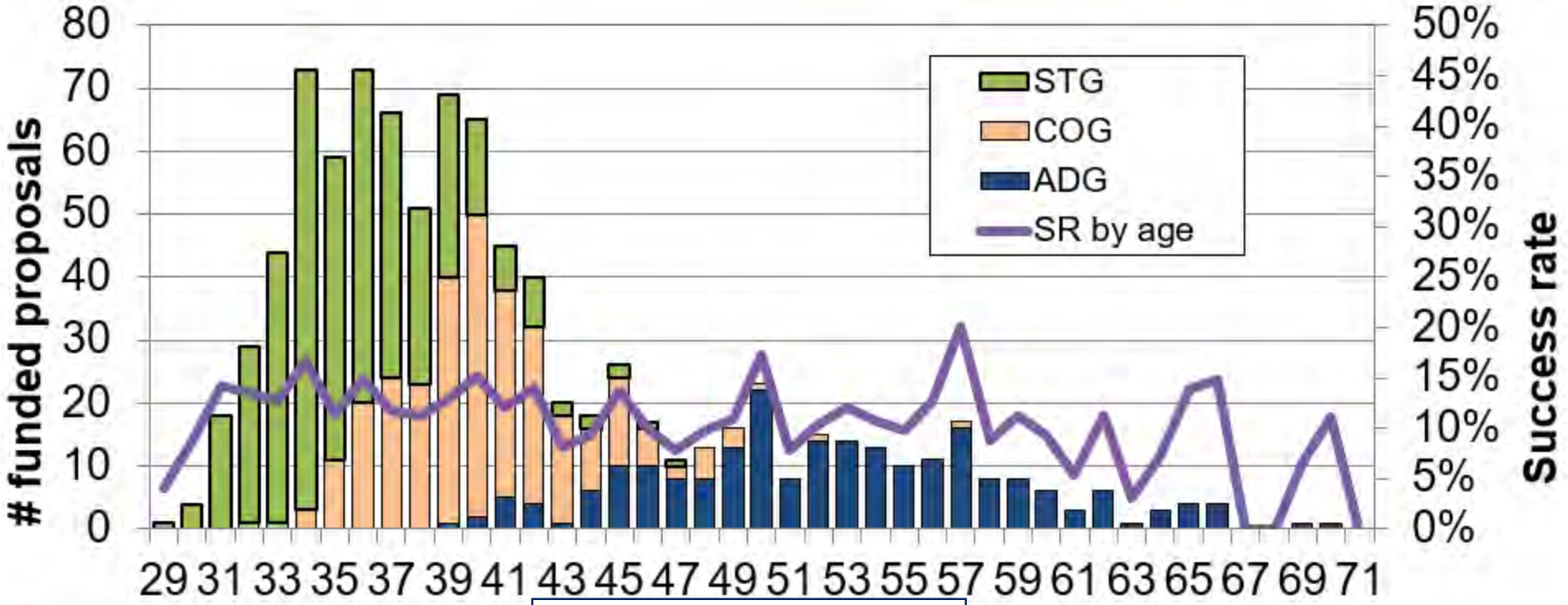
*In casi eccezionali e ben specificati: fino a 3 M€

- PI da Paese terzo
- Acquisto di importante attrezzatura di ricerca
- Accesso ad infrastrutture di ricerca

Principal Investigator

- ✓ Il PI non deve essere necessariamente "employed" o "strutturato" dall'Host Institution al momento della presentazione della proposta, ma impiegato/assunto ("engaged") dalla HI per tutta la durata del Grant
- ✓ Il PI deve dedicare al progetto una parte significativa del suo tempo: almeno il 40% del suo tempo lavorativo
- ✓ Unico responsabile del progetto, sia per l'attività scientifica che per il management

StG-CoG-AdG Calls
Age of Grantees



European Commission

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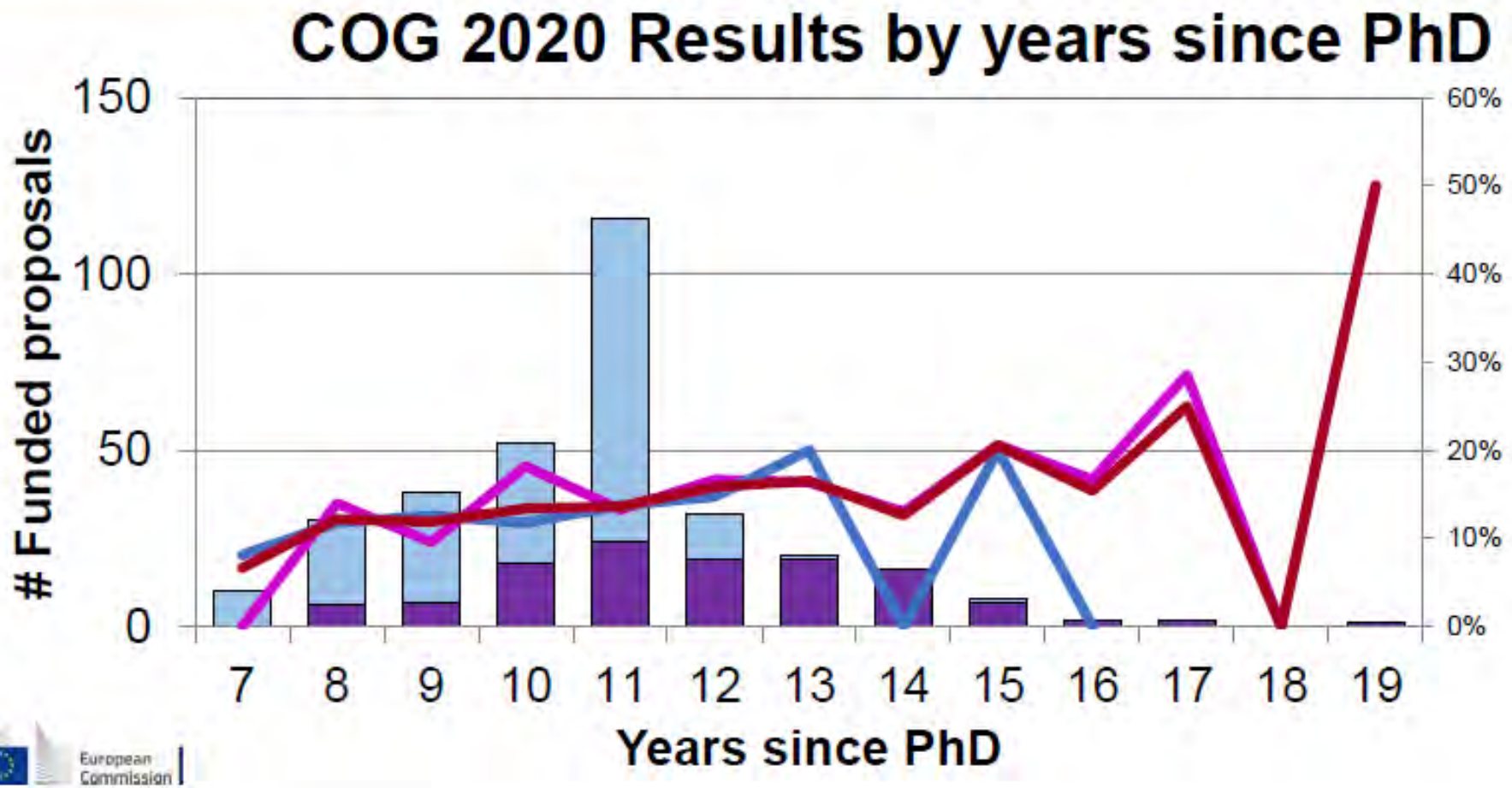
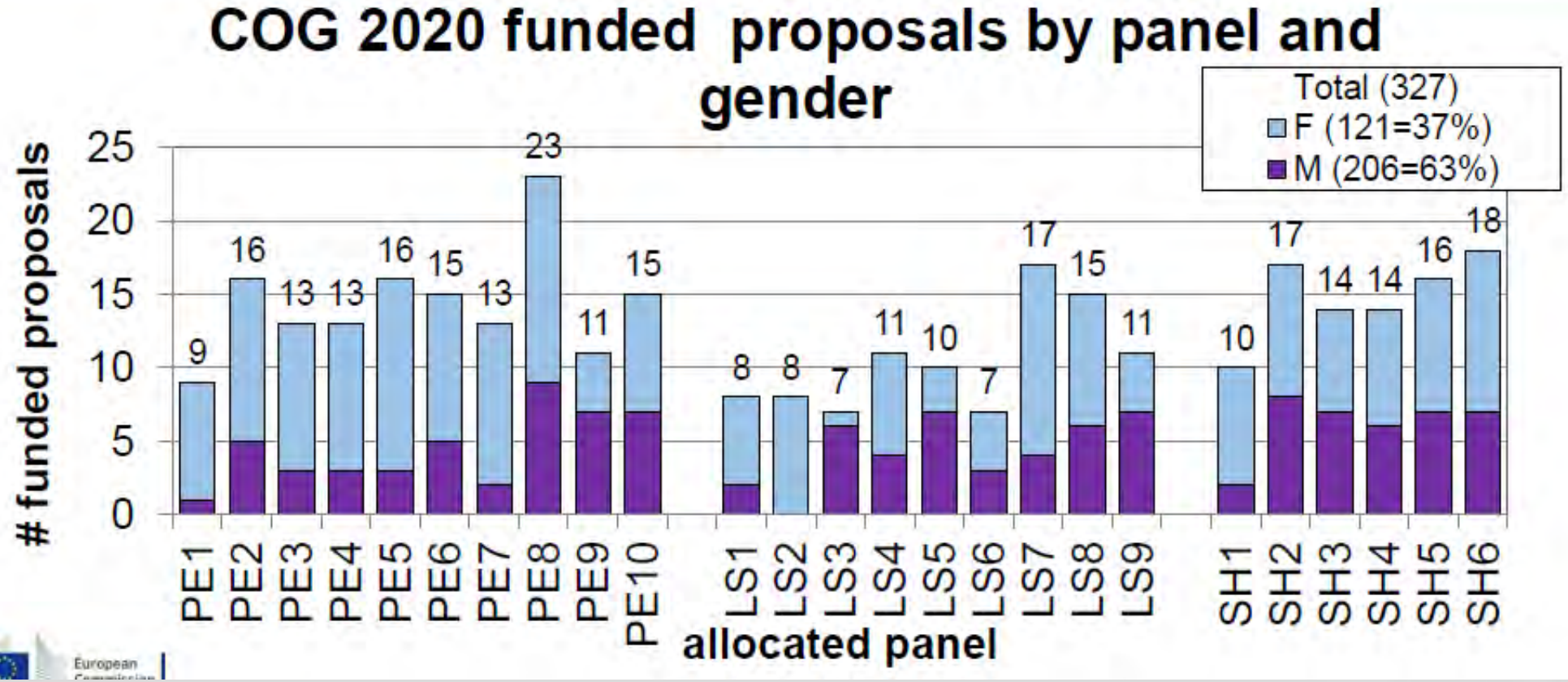
COG 2020: Results by years since PhD



COG 2020: Gender Analysis
Results by panel



Principal Investigator: requisiti

- ✓ A competitive Consolidator Grant Principal Investigator must have already shown **research independence** and evidence of maturity, for example by having produced **several important publications as main author or without the participation of their PhD supervisor**.

Altri elementi di valutazione:

Early achievements track record

In the Track Record (see "Proposal description") the applicant Principal Investigator should list (if applicable):

*1. **Up to ten publications** in **major international peer-reviewed multi-disciplinary scientific journals** and/or in the **leading international peer-reviewed journals, peer-reviewed conferences proceedings and/or monographs** of their respective research fields, highlighting those as main author or without the presence as co-author of their PhD supervisor (properly referenced, field relevant bibliometric indicators may also be included); preprints may be included, if freely available from a preprint server (preprints should be properly referenced and either a link to the preprint or a DOI should be provided);*

*2. **Research monographs and any translations thereof**;*

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*4. **Invited presentations to internationally established conferences** and/or **international advanced schools**;*

*5. **Prizes, awards, academy memberships.***

Principal Investigator: requisiti

Starting Grant	Consolidator Grant	Advanced Grant
> 2 and ≤ 7 years prior to 1 January 2021 Cut-off dates: PhD awarded from 1 January 2014 to 31 December 2018 (inclusive)	> 7 and ≤ 12 years prior to 1 January 2021 Cut-off dates: PhD awarded from 1 January 2009 to 31 December 2013 (inclusive)	No specific criteria

Ricercatori con laurea in medicina

A first degree in medicine will not be accepted by itself as equivalent to a PhD award. To be considered an eligible Principal Investigator, applicants holding a degree in medicine need to provide the certificates of both the medical degree and the PhD or proof of an appointment that requires doctoral equivalency (e.g. post-doctoral fellowship, professorship appointment), in order to further show the equivalence of their overall training to a PhD.

In these cases, the certified date of the medical degree completion plus two years (4-9 from MD for StG and 9-14 for CoG) is the reference date of the actual award used for the calculation of the eligibility period established for Starting and Consolidator Grants.

Breve guida per il calcolo della finestra di eleggibilità

•**If you have an MD degree but not a PhD**: you are eligible only if you held research positions (e.g. post-doctoral fellowship, professorship appointment) as well. In that case, your eligibility window will be 4 - 9 years, and 9 - 14 years past the MD award date for StG and CoG, respectively.

•**If you have both an MD and a PhD**:

- If the PhD is first - your eligibility window will be 2 - 7 years past the PhD award date for Starting Grant, and 7 - 12 years past the PhD award date for Consolidator Grant.
- If the MD is first – this will depend on whether you held research positions after your MD but before receiving your PhD. If so, the first eligible degree is the MD. In that case your eligibility window will be 4 - 9 years past the MD award date for the Starting Grant, and 9 - 14 years past the MD award date for the Consolidator Grant. However, if you have held no such positions between the MD and PhD, the MD will not be considered eligible and your first eligible degree will be your PhD. In that case, your eligibility window will be 2 - 7 years past the PhD award date for the Starting Grant, and 7 - 12 years for the Consolidator Grant

Principal Investigator: possibilità di estensione della finestra di eleggibilità

The date of the first PhD considered for the calculation of the eligibility period shall be the date of the actual award according to the national rules of the country where the degree was awarded.

The eligibility periods set out in the table above can be extended beyond 7 and 12 years for the Starting and Consolidator Grants respectively for the following properly documented circumstances[1], provided they started before the call deadline:

*- **Maternity**: 18 months extension for each child born before or after the PhD award. If the applicant can document a longer maternity leave, the eligibility period will be extended by the documented amount of actual leave taken until the call deadline.*

*- **Paternity**: extension by the documented time of paternity leave taken until the call deadline for each child born before or after the PhD award.*

*- **Long-term illness**[2] or **national service**: extension by the documented amount of leave taken by the Principal Investigator until the call deadline for each incident which occurred after the PhD award date.*

*- **Clinical training**: extension by the documented amount of clinical training received by the Principal Investigator **after** the award of the first eligible degree and until the call deadline, **up to a maximum of 4 years**.*

CALL CALENDAR 2021

TENTATIVE DATES

Starting Grants | ERC-2021-StG

Open: tbc

Deadline: 24-03-2021 (tbc)

Consolidator Grants | ERC-2021-CoG

Open: tbc

Deadline: 20-04-2021 (tbc)

Advanced Grants | ERC-2021-AdG

Open: tbc

Deadline: 31-08-2021 (tbc)

Please note that the dates are subject to the adoption of Horizon Europe and the ERC Work Programme 2021

- **Date indicative**
- **Da confermare**
- **Prossimamente saranno pubblicati i template in bozza: https://erc.europa.eu/**
- **23 febbraio, pubblicazione Work Programme 2021**

APRE
Agenzia per la Promozione della Ricerca Europea

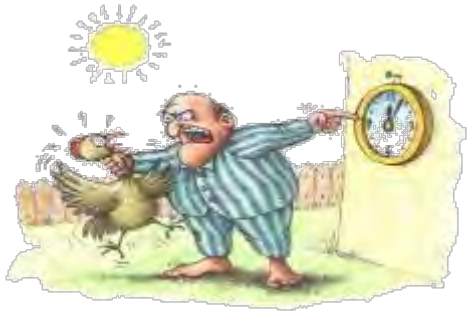
Consigli per la scrittura di un progetto: cosa è necessario sapere se vogliamo scrivere un ERC

erc

PER COMINCIARE… (1)

- **Calcolare bene i tempi**, cominciare il prima possibile, almeno due mesi prima
- Scaricare e studiare i **documenti** (WP, IfA)
- Utilizzare i **template ufficiali** (download da sito web ERC e funding and tender portal)
- Avviare procedure per **documenti di supporto** (H.I. letter, Annex Ethical Issues – se applicabile)
- Verificare che eventuali Additional Participant

abbiano il PIC



PER COMINCIARE… (2)

- Verificare i database di progetti finanziati, a livello ERC e internazionale

- http://erc.europa.eu, sezione “funded project” o «stories» o «publications»

- Verificare l’elenco dei valutatori: https://erc.europa.eu/document-category/evaluation-panels

PER COMINCIARE… (3)

È molto importante capire il valore della propria proposta e rispondere in maniera sincere alle seguenti domande:

1. **What is the problem that needs to be solved?**
2. **Why is it significant?**
3. **What makes my solution/approach to the problem grounbreaking?**

Ed inoltre è necessario descrivere chiaramente la natura groudbreaking del progetto:

4. **Why will my project a decisive difference?**

CONFEZIONAMENTO E RIFINITURE (1)

Opinione di un valutatore:

"Un proponente che non dedica abbastanza tempo alla redazione di una proposta chiara e piacevole, trasferisce tutto il lavoro ai valutatori, che devono lottare per scovarne l'essenza. Un PI che ha pensato a come far risparmiare tempo ai valutatori ha molte più chance"

CONFEZIONAMENTO E RIFINITURE (2)

Cosa significa?

In termini di **struttura:**

- Suddivisione del testo: titoli, paragrafi, ecc.
- Elenchi puntati e numerati
- Inserimento di grafici e tabelle
- Formattazione per evidenziare i punti salienti
- Testo leggero e semplice da leggere

CONFEZIONAMENTO E RIFINITURE (3)

Cosa significa?

In termini di **contenuto:**

- Idea, obiettivi e metodi chiaramente strutturati e identificabili
- Dare evidenza della fattibilità attraverso una chiara descrizione della metodologia e delle risorse
- Evitare ripetizioni
- Non dare per scontata la conoscenza di acronimi

Building the ERC project

- Grafici, immagini, diagrammi, dimensione dei fonts e **struttura grafica** del progetto vi aiutano a guidare il valutatore a trovare le risposte alle domande a cui deve rispondere per valutare il progetto.

TAKE AWAY

L'APPARENZA NON E' MENO IMPORTANTE DEL CONTENUTO

TAKE AWAY

UTILIZZATE LA STRUTTURA GRAFICA PER GUIDARE IL VALUTATORE ATTRAVERSO IL CONTENUTO E LA STRUTTURA DEL PROGETTO

Building the ERC project

- Per aiutare il valutatore l'intera proposta del progetto (B1 e B2) deve essere costruita come una ***storia*** interessante e coerente.

- La parola storia, **apparentemente lontana da una descrizione scientifica accurata**, è volutamente usata per chiarire che la scrittura deve essere semplice e chiara, il linguaggio fluente (evitiamo ripetizioni) e l'idea portante del progetto debitamente rimarcata.

Building the ERC project

- Ricordiamo che **i valutatori sono esperti del vostro campo di ricerca ma non necessariamente del vostro argomento**. Da qui la necessità (in particolare nel B1) di una formulazione chiara e puntuale con il “dettaglio” necessario ad una piena comprensione.

- Ricordatevi che il B2 vi permette di descrivere con ampio dettaglio le sfaccettature del progetto. Siate dunque più concisi nel B1 dove dovrete comunicare l’essenza dell’idea e la “roadmap” per la sua implementazione.

First Step: a ground-breaking project

- Dobbiamo aver chiaro il punto di partenza: ***la natura di un progetto ERC***
- L'idea è innovativa? Se la risposta è si, deve superare lo stato dell'arte non può essere solo un passo avanti nel campo di ricerca
- L'idea è inusuale? Adotta una metodologia proveniente da un altro settore e/o correla nuovi strumenti.
- L'idea è avanzata? Offre nuove soluzioni con nuovi strumenti.
- L'idea è rivoluzionaria? Propone un approccio nuovo alla soluzione di un problema.

TAKE AWAY

UN PROGETTO ERC DEVE POSSEDERE UNA NATURA GROUND-BREAKING

First Step: a ground-breaking project

- L'aspetto **innovativo** e **ambizioso** deve essere chiaro ed il proponente deve essere in grado di comunicare al valutatore l'essenza dell'idea.

- Il progetto deve avere caratteristiche di **high-risk-high-gain.** Il rischio è richiesto al fine di ottenere un guadagno in termini di avanzamento della conoscenza.

TAKE AWAY

CONSIGLIAMO DI NON PRESENTARE MAI L'INTERO PROGETTO COME **HIGH-GAIN LOW-RISK**. QUESTO NON SIGNIFICA CHE POSSONO ESSERCI PARTI DEL PROGETTO A BASSO RISCHIO. IL RISCHIO DEVE ESSERE OPPORTUNAMENTE MITIGATO DALL'ESPERIENZA E DALLE STRATEGIE MESSE IN CAMPO DEL **PI** (PRINCIPAL INVESTIGATOR, PROPONENTE) DEL PROGETTO

Second Step: the idea check

- Come secondo passo vi propongo, **solo come esempio e non come prassi consolidata**, di usare una Lean Canvas, un single-page template opportunamente riadattato per decostruire un'idea nelle sue assunzioni chiave.

- Il progetto ERC è articolato e complesso, prima di cominciare a scrivere può essere utile avere chiara in mente la struttura del progetto

LEAN CANVAS FOR RESEARCHER

Problems that you want to solve or investigate 1 + State of the art	**Proposed solutions or line of investigation** Key approach and goals 4 **Key metrics** Testing activities to evaluate achievement of milestones 8	**Unique value proposition** Why your idea is ground-breaking? Why your proposal is timely? Why your expertise is needed? 3	**Unfair advantage** Why you? Why cannot be done by others? 9 **Channels** Dissemination Conferences Deliverable to the community Collaborations 5	**Targeted problem solutions** What are the solutions ? Describe the way you tackle the problem to obtain a solution 2
Cost structures Host institution, People (PhD, PostDoc) tech supplies, Server, Salaries, Software,Conferences 7			**Added value to research** Deliverables (not only publications) impact in other research sector 6	

Analizziamo il percorso dell'idea check

I numeri indicano un percorso logico di costruzione (che potete modificare):

- **(1)+(2)**: descrizione del problema che si vuole risolvere descrivendo come l'idea proposta **supera lo stato dell'arte** permettendoci di affrontare il problema da una nuova prospettiva che ci offre la possibilità di arrivare ad una soluzione;

- **(3)** descrivete perchè la vostra idea è **ground-breaking**, perchè è il momento giusto per affrontare questo problema (e.g. disponibilità di nuovi strumenti), declinate quali sono le caratteristiche di rischio del progetto ed il beneficio per il vostro settore di ricerca (**high-risk-high gain**), spiegate come la vostra "expertise" sia fondamentale per il progetto;

- **(4)** tracciate la vostra "roadmap" con tutte le "milestones": fate vedere che avete una strategia chiara di come il progetto deve procedere sia nei tempi che nelle differenti attività da svolgere.

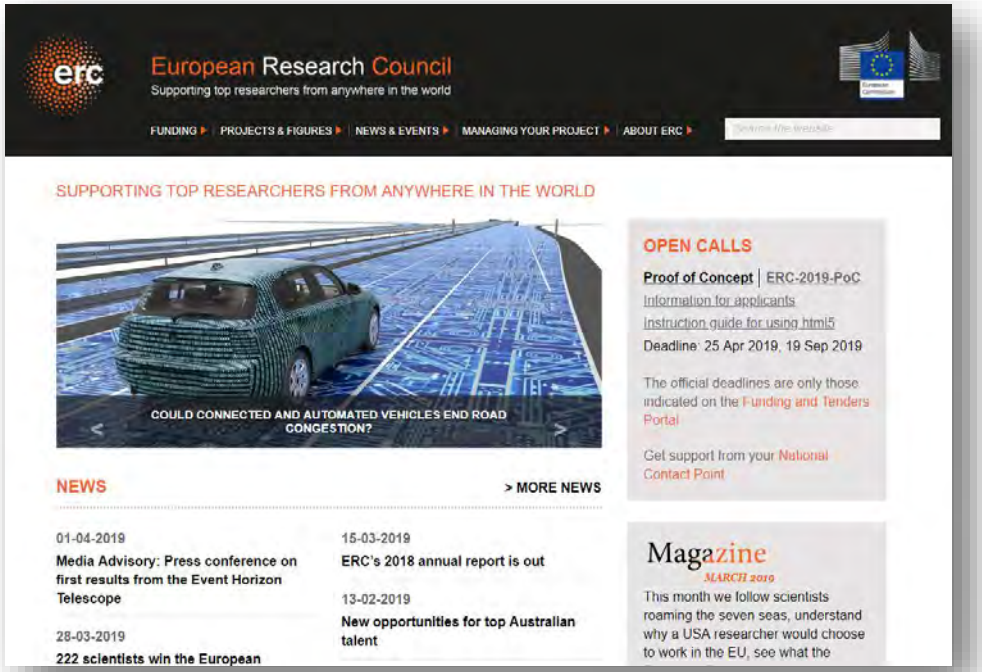
Analizziamo il percorso dell'idea check

- **(5)+(6)+(7)** sono dedicate alla descrizione di tutte le attività correlate al Progetto. Particolarmente importante è descrivere le "deliverables" del progetto ed il suo impatto in altri settori di ricerca (se previsto).

- **(8)** Questo è uno dei punti più importanti: descrivete le attività di monitoraggio del progetto che vi garantiranno, non solo lo svolgimento nei tempi previsti, ma anche tutte le azioni di mitigazione del rischio richieste se alcuni goal non fossero raggiunti (tenete conto che questo può avvenire per la natura del progetto, la cosa Importante è prevedere un piano B)

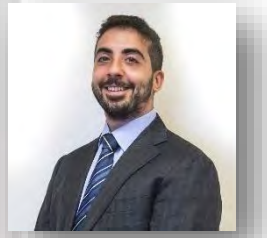
- **(9)** La Lean Canvas è un template pensato per descrivere un modello di business e l' unfair advantage può essere, ad esempio, un vantaggio industriale.
Nel caso della ricerca fondamentale potremmo pensare di declinare questo vantaggio come legato all' esperienza del proponente alle sue pregresse scoperte, alle sue collaborazioni. Provate a fare un esercizio per identificare quali sono le ragioni per cui siete la persona giusta per affrontare il progetto.
Vi aiuterà ad argomentare la strategia.

Link utili



https://erc.europa.eu/

ERC Team contacts – erc@apre.it



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APRE
Agenzia per la Promozione della Ricerca Europea

Sessione di domande

APRE

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Giuditta Carabella
Research and European Programs Area
Area per l'Internazionalizzazione
SAPIENZA Università di Roma

HORIZON EUROPE Programme

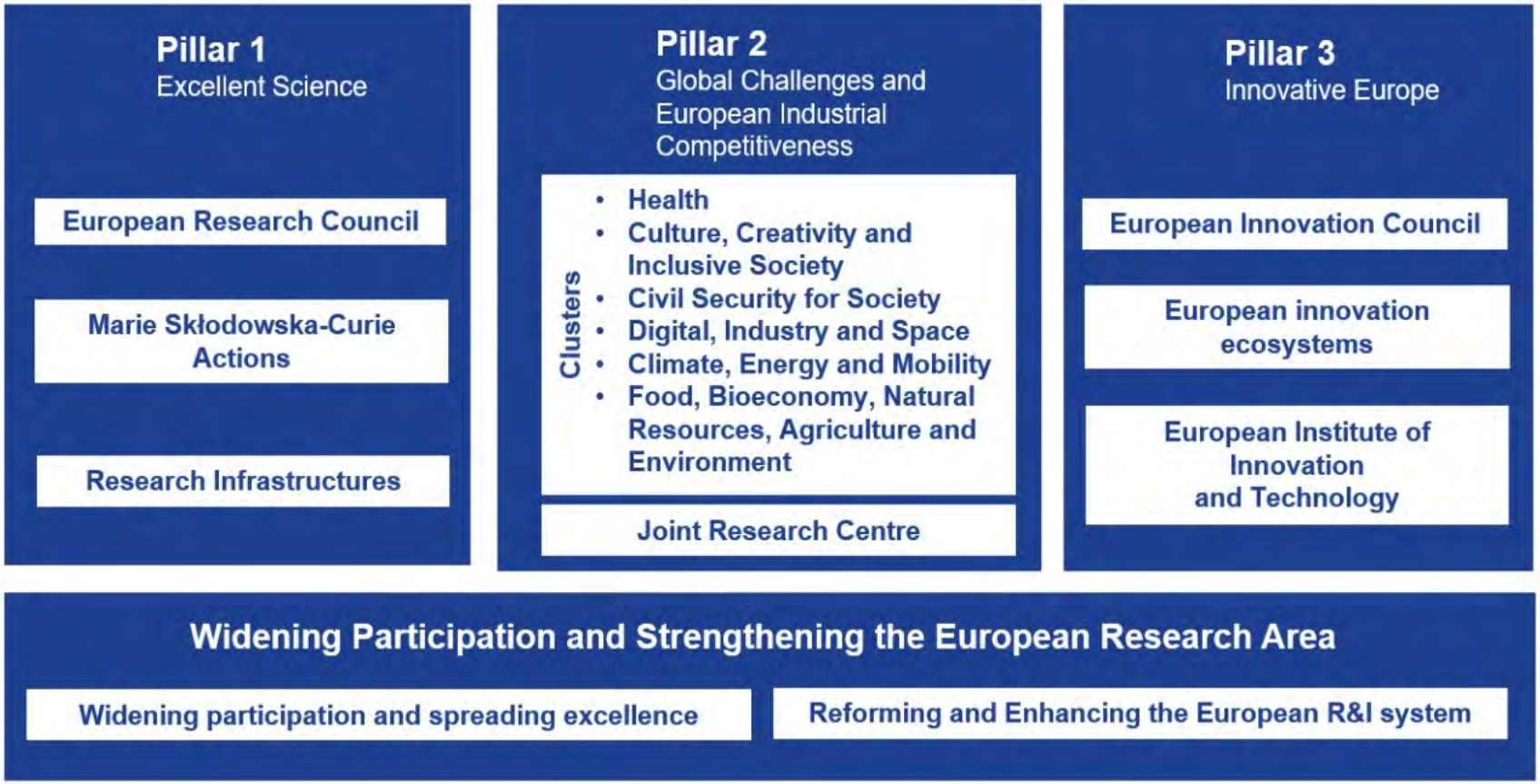
Period

January 1 2021- December 31 2027

Budget

95 billions of euro for the most ambitious research and innovation programme ever, funded by the traditional common European budget and by the new Recovery Instrument, Next Generation EU.

Programma HORIZON EUROPE



IL PROGRAMMA ERC

https://erc.europa.eu/

- ERC finances Principal Investigator of excellence of any age and any nationality that intend to conduct frontier research activities at an Host Institution located in a EU member State or an associated country.

- The ERC funding schemes ground-breaking research projects, innovative at high risk and high scientific impact;

Call ERC Starting Grant 2021
e servizi offerti da ARI

- Projects duration: up to 5 years
- Wide financial availability (high economic value of grant and 100% refund of costs);
- Possibility to create o reinforce your own research team;

Call ERC Starting Grant 2021
e servizi offerti da ARI

- It is allowed to submit proposes on all the field and scientific areas (approach *curiosity driven* and *bottom-up*);

- Funding schemes:
  - Starting Grant
  - Consolidator Grant
  - Advanced Grant
  - Proof of Concept
  - Synergy Grant

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Call	PI Requirements	Funding
Consolidator Grant	Confirmed talents – between 7-12 years after PhD	€ 2.000.000,00
Advanced Grant	Outstanding researchers – excellent track record last 10 years	€ 2.500.000,00

Call ERC Starting Grant 2021
e servizi offerti da ARI

Call	Published Date call	Expiration Date
Consolidator Grant	March 11 2021	April 20 2021
Advanced Grant	May 25 2021	August 31 2021

PI ERC Starting Grant Profile

- Emerging Leader
- Between 2-7 years after PhD
  (between January 1 2014 and December 31 2018 included)

Extension of the time window

- Maternity: 18 months extension for each child born before or after the PhD award. If the applicant can document a longer maternity leave, the eligibility period will be extended by the documented amount of actual leave taken until the call deadline.
- Paternity: extension by the documented time of paternity leave taken until the call deadline for each child born before or after the PhD award.
- Long-term illness or national service: extension by the documented amount of leave taken by the Principal Investigator until the call deadline for each incident which occurred after the PhD award date.
- Clinical training: extension by the documented amount of clinical training received by the Principal Investigator after the award of the first eligible degree and until the call deadline, up to a maximum of 4 years.

PI ERC Starting Grant Profile

A competitive Starting Grant Principal Investigator must have already shown the potential for **research independence** and **evidence of maturity**, for example by having produced **at least one important publication as main author or without the participation of their PhD supervisor**.

Applicant Principal Investigators should also be able to demonstrate **a promising track record** of early achievements appropriate to their research field and career stage, including significant publications (as main author) in major international peer-reviewed multidisciplinary scientific journals, or in the leading international peer-reviewed journals of their respective field.

They may also demonstrate a record of **invited presentations** in well-established international conferences, granted patents, awards, prizes, etc.

ERC Starting Grant 2021

- Published call date: **February 25 2021** (tbc)
- Expiration call date: **April 8 2021**
- Total Budget call StG 2021: **619 mil euro**
- Estimated number funding grant: **413**

ERC StG 2021 PROPOSAL PRESENTATION

https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/home

- Call description, with link to topics and submission service
- Call documents, among which the WP and the Guide for Applicants
- Get support (help-desk, NCP, Partner Search etc..)

nb: ECAS account!!!

Call ERC Starting Grant 2021
e servizi offerti da ARI

- Part A
  - General Information about PI, administrative Host Institution data, Ethic issues, etc..
  - Resources and Time Commitment: (max. 2 pages)
- Part B.1
  - Synopsis of the scientific proposal (max. 5 pages)
  - Curriculum Vitae (max. 2 pages)
  - Track record (max. 2 pages)
- Part B.2
  - Scientific Proposal (max. 14 pages):

  State of the art and goals

  Methodology
- Support Documentation
  - Host Institution Binding Statement of Support (to the signing of the Department Director)
  - PhD Certificate
  - Eventual career break certificate

Extended Synopsis:

This should be a concise presentation of the full scientific proposal, with particular attention to the ground-breaking nature of the research project and the feasibility of the outlined scientific approach. At step 1 the full scientific proposal is not assessed so all essential information must be covered in the synopsis. The applicant will choose a primary evaluation panel and may also indicate a secondary evaluation panel. The applicant should indicate when he or she believes that the proposal is of a crosspanel.

Curriculum Vitae:

The CV should include the standard academic and research record as well as a succinct "funding ID" which must specify any current research grants and their subject, and any on-going application for work related to the proposal. Any research career gaps and/or unconventional paths should be clearly explained so that they can be fairly assessed by the evaluation panels.

Track Record:

Each of the Principal Investigator must provide a list of achievements reflecting their track record. The type of achievements expected for Starting Grant applicant Principal Investigators are:

1. Up to five publications in major international peer-reviewed multi-disciplinary scientific journals and/or in the leading international peer-reviewed journals, peer-reviewed conferences proceedings and/or monographs of their respective research fields, highlighting those as main author or without the presence as co-author of their PhD supervisor (properly referenced, field relevant bibliometric indicators may also be included); preprints may be included, if freely available from a preprint server (preprints should be properly referenced and either a link to the preprint or a DOI should be provided);
2. Research monographs and any translations thereof;
3. Granted patent(s);
4. Invited presentations to internationally established conferences and/or international advanced schools;
5. Prizes, awards, academy memberships.

Scientific Proposal:

Description of the scientific and technical aspects of the project, demonstrating the groundbreaking nature of the research, its potential impact and research methodology.

Resources and Time Commitment:

The proposal should also clearly specify the percentage of the applicant's working time that will be spent in the EU or an Associated Country and the percentage of the applicant’s working time that will be devoted to the project, as well as a full estimation of the real project cost, including a breakdown of personnel costs, whenever possible by team members category

Maximum Budget : € 1.500.000,00 for 5 years

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Cost Category			Total in Euro
Direct Costs[1]	**Personnel**	PI[1]	
		Senior Staff	
		Postdocs	
		Students	
		Other	
	i. Total Direct Costs for Personnel (in Euro)		
	Travel		
	Equipment		
	Other goods and services	Consumables	
		Publications (including Open Access fees), etc.	
		Other (please specify)	
	ii. Total Other Direct Costs (in Euro)		
A – Total Direct Costs (i + ii) (in Euro)			
B – Indirect Costs (overheads) 25% of Direct Costs[1] (in Euro)			
C1 – Subcontracting Costs (no overheads) (in Euro)			
C2 – Other Direct Costs with no overheads[1] (in Euro)			
Total Estimated Eligible Costs (A + B + C) (in Euro)[1]			
Total Requested EU Contribution (in Euro)[6]			

Minimum percentage of the working time of a Principal Investigator that must be spent

- On the ERC project: **50%**
- In an EU Member State or Associated Country: **50%**

EVALUATION

- Only evaluation criteria: excellence

- The evaluation procedure is entrusted to 25 panel of evaluation structured in 3 principal scientific areas of research:
  - Life Sciences - LS
  - Physical Sciences and Engineering – PE
  - Social Sciences and Humanities – SH

- Budget proportionally allocated among the Panel basing on the proposals

At step 1, the extended synopsis and the Principal Investigator's track record and CV will be assessed (and not the full scientific proposal).

26 August 2021

At step 2, the complete version of the retained proposals will be assessed (including the full scientific proposal).

The allocation of the proposals to the various panels will be based on the expressed preference of the applicant Principal Investigator.

Proposals may be allocated to a different panel with the agreement of both Panel Chairs concerned.

The panel to which a proposal is allocated may request additional reviews by appropriate members of other panel(s) or additional remote evaluators.

IMPORTANCE OF THE PANEL CHOICE!!!

Principal Investigators whose proposals are retained for step 2 of the evaluation will be invited for an **interview** to present their proposal to the evaluation panel meeting.

SAPIENZA FUNDS THE PARTICIPATION TO TRAINING COURSES FOR THE SPECIFIC PREPARATION OF THE INTERVIEW

20 December 2021

SCORES

At the end of **step 1** of the evaluation the proposal will receive one of the following scores:

- **A**. is of sufficient quality to pass to step 2 of the evaluation
- **B**. is of high quality but not sufficient to pass to step 2 of the evaluation
- **C**. is not of sufficient quality to pass to step 2 of the evaluation

At the end of **step 2** of the evaluation the proposal will receive one of the following scores:

- **A.** fully meets the ERC's excellence criterion and is recommended for funding if sufficient funds are available
- **B.** meets some but not all elements of the ERC's excellence criterion and will not be funded

Limits to the proposals resubmission

- ***Restrictions on applications will apply to the 2021 calls based on the outcome of the evaluation of previous calls***

B *to step 1 -> no eligible to following call*

C *to step 1 -> no eligible to call of the two following years*

Call ERC Starting Grant 2021
e servizi offerti da ARI

1. Research Project

Ground-breaking nature, ambition and feasibility

Starting, Consolidator and Advanced

Ground-breaking nature and potential impact of the research project

To what extent does the proposed research address important challenges?

To what extent are the objectives ambitious and beyond the state of the art (e.g. novel concepts and approaches or development between or across disciplines)?

To what extent is the proposed research high risk/high gain?

Scientific Approach

To what extent is the outlined scientific approach feasible bearing in mind the extent that the proposed research is high risk/high gain (based on the Extended Synopsis)?

To what extent is the proposed research methodology appropriate to achieve the goals of the project (based on the full Scientific Proposal)?

To what extent does the proposal involve the development of novel methodology (based on the full Scientific Proposal)?

To what extent are the proposed timescales and resources necessary and properly justified (based on the full Scientific Proposal)?

2. Principal Investigator

Intellectual capacity, creativity and commitment

Starting and Consolidator

Intellectual capacity and creativity

To what extent has the PI demonstrated the ability to propose and conduct ground-breaking research?

To what extent does the PI provide evidence of creative independent thinking?

To what extent have the achievements of the PI typically gone beyond the state of the art?

Call ERC Starting Grant 2021
e servizi offerti da ARI

- Read carefully the Guide for Applicants!!!
- Start writing your proposal early enough to submit it to external opinions;
- Make your application easy to read;
  - Identify your aims and hypotheses right at the beginning.
  - Use tables and diagrams (legible in black and white).
  - Emphasise particularly important sentences using appropriate formatting and highlighting
- Be ambitious, but avoid sounding unrealistic;
- Follow the formatting rules and page limits;

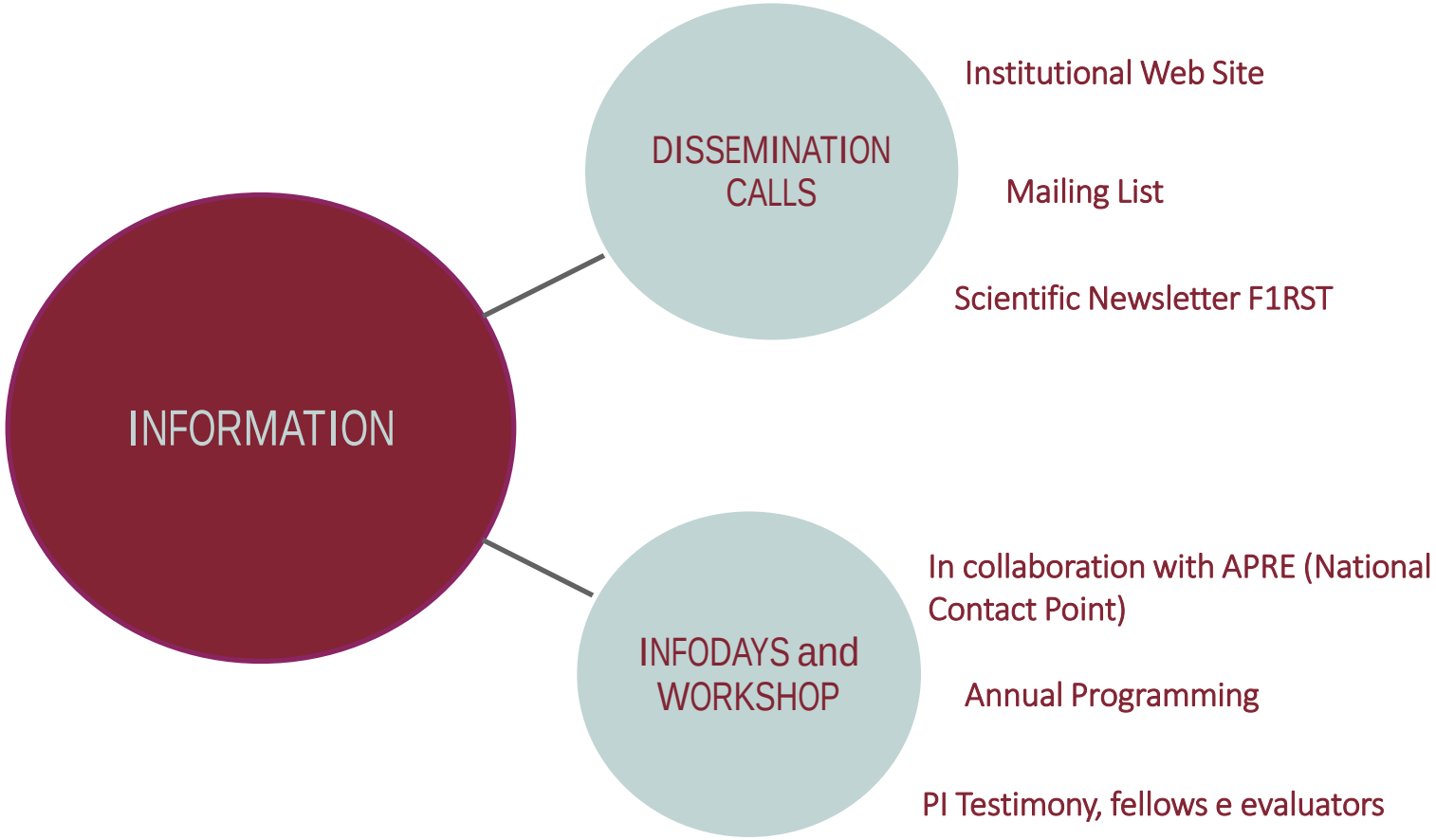
Call ERC Starting Grant 2021
e servizi offerti da ARI

- Make yourself familiar with the Electronic Proposal Submission Service.
- Find out, if possible, who has recently received funding in your field;
- Choose a memorable acronym;
- Provide a clear, concise work plan, giving details of intermediate goals. Use, if applicable, Work Package approach;
- Provide alternative strategies to mitigate risks;
- Clearly explain how you will manage your project and disseminate the results;
- Include a Gantt chart to illustrate the project schedule

SAPIENZA'S

SUPPORT SERVICES

PRE-AWARD SERVICES



Call ERC Starting Grant 2021
e servizi offerti da ARI

PRE-AWARD SERVICES

KIT FOR APPLICANTS ERC-STG

Manual ERC-Sapienza
A detailed guide to the ERC proposal presentation

Common Weaknesses
A collection of weak points most frequently encountered by the evaluators of ERC proposal

Guiding lines for the predisposition of the ERC budget A document to support the compilation of a ERC project budget

Hints & Tips
A collection of advices and suggestions to formulate a successful ERC proposal

Template Budget ERC
A pre-set work paper to calculate a ERC project budget

Section of forms examples
A serie of examples to fill some sections of the proposal (management, Gantt Chart, risks table..)

POST-AWARD SERVICES

ADMINISTRATIVE SUPPORT

GRANT AGREEMENT

Assistance during the negotiation phases and GA signing

Support for the correct utilization of Funding & Tenders website

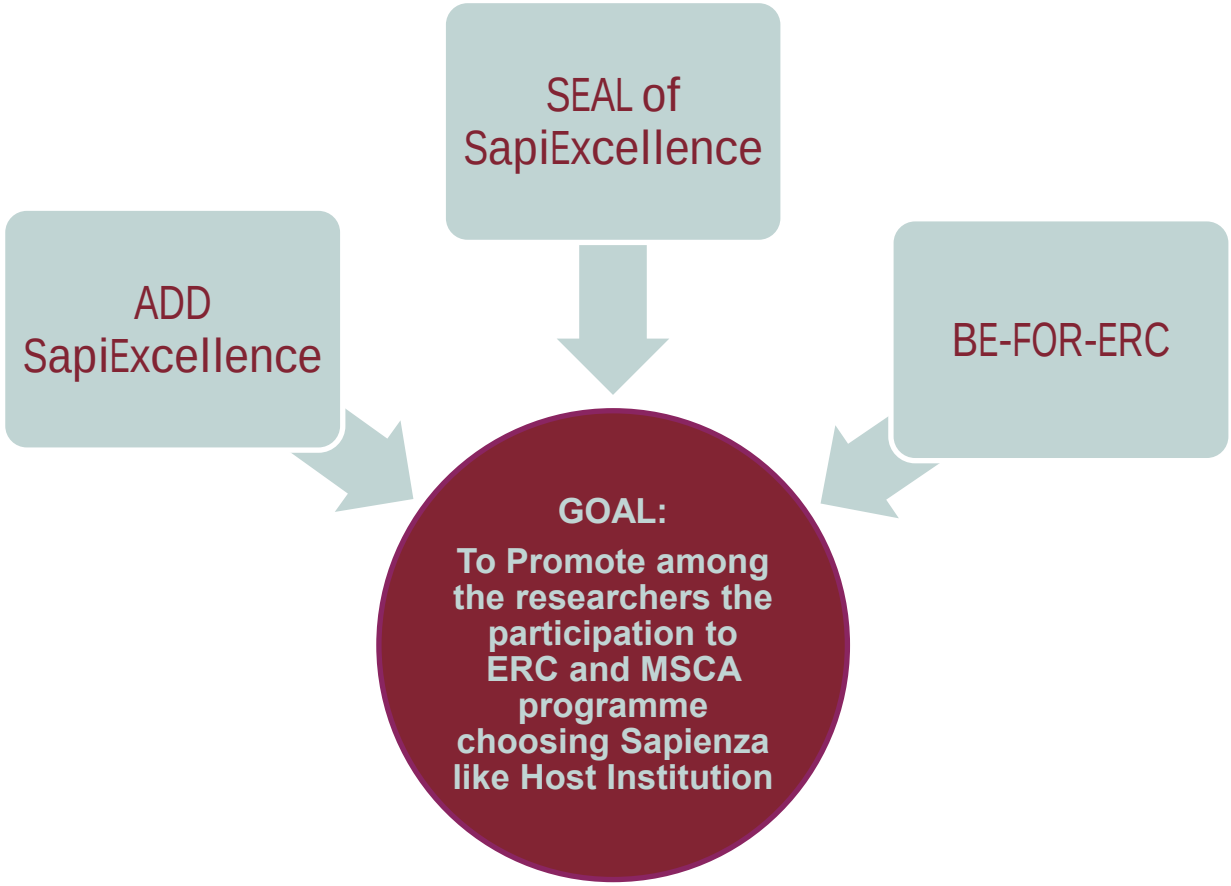
Support in the comunication with the Project Officers

INTERNAL MANAGMENT (FINANCIAL AND ADMINISTRATIVE)

Support to the departments in the management and accountability of projects

Assistance to researchers, professors and administrative staff during the eventual audit phase

«SAPIEXCELLENCE» PROGRAMME



Call ERC Starting Grant 2021
e servizi offerti da ARI

«SAPIEXCELLENCE» PROGRAMME

ADD SapiExcellence

Goal: to extend for one year the duration of the research activities of project of MSCA (IF o ITN) nearing completion

Annual Budget: € 100.000

Allocation: n. 2 fellowships of € 50.000 each one (€40.000 for salary + €10.000 for research costs)

Allocated to today
4 fellowships

3 fellows ITN hired as post-docand extention of the project of 1 fellow IF

SEAL of SapiExcellence

Goal: to fund the research of applicants MSCA-IF which have gotten Seal of Excellence (score>85)

Annual Budget: € 200.000

Allocation: n. 4 fellowships of € 50.000 each one (€40.000 for salary + €10.000 for research costs)

Allocated to today
5 fellowships

Given the opportunity to 5 applicants IF to realize their own research project

BE-FOR-ERC

Goal: to fund researchers of excellence without a permanent position in Sapienza to submit a ERC proposal with Sapienza as HI

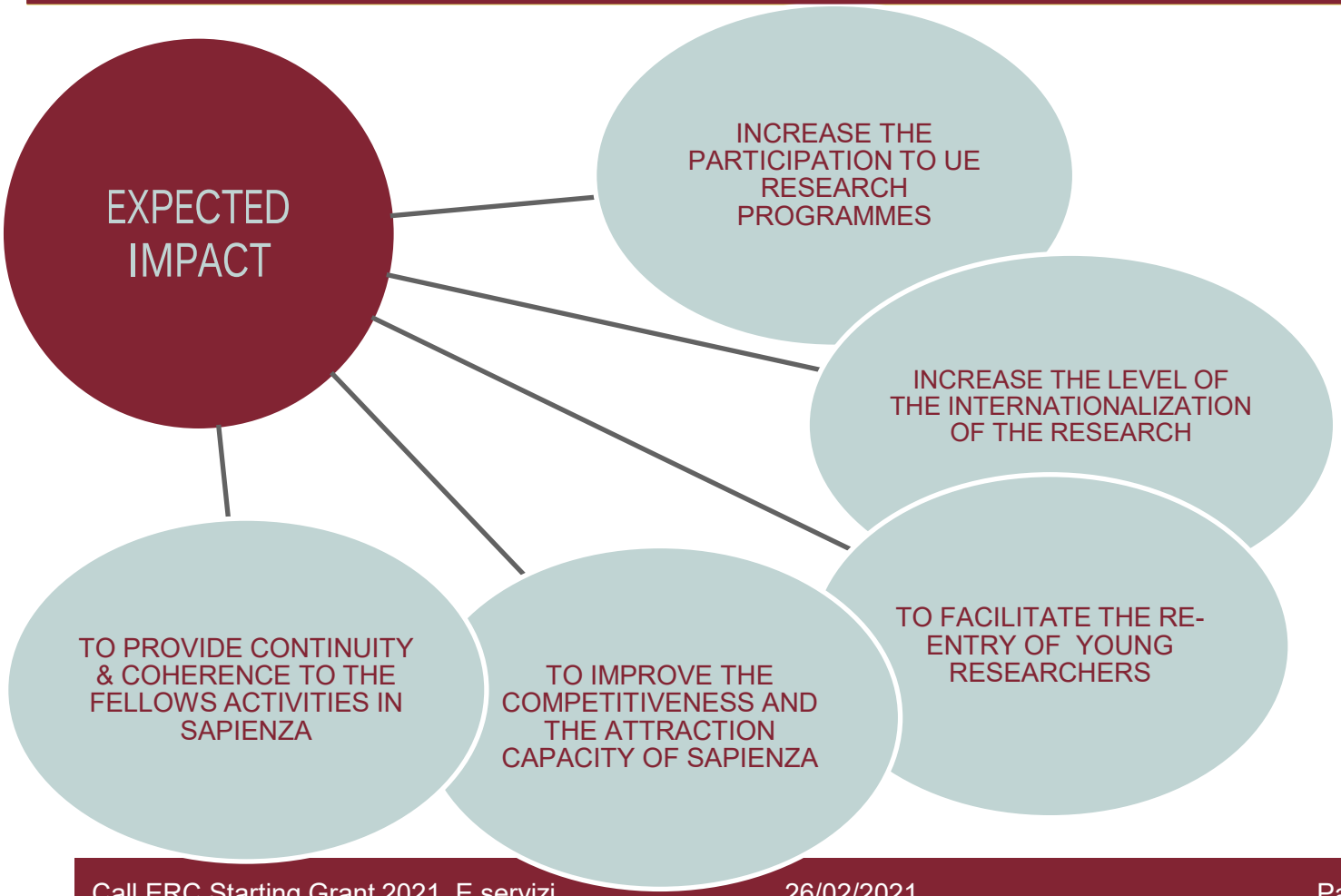
Annual Budget: € 200.000

Allocation: n. 4 fellowships of € 50.000 each one (€40.000 for salary + €10.000 for research costs)

Allocated to today
20 fellowships

To young researchers of talent

IL PROGRAMMA «SAPIEXCELLENCE»



NEW SEED-ERC ACTION

*In the following months Sapienza will implement a new action of the programme Sapiexcellence, named **SEED-ERC**, which provides the provision of a funding ad hoc for who presents, in the field of ERC call 2021 a proposal of scientific excellence not funded for budget limits.*

MARIE SKŁODOWSKA-CURIE

May

In occasione dell'uscita dei nuovi bandi, Sapienza organizzerà un intero **MESE** dedicato al programma Marie Sklowdoska-Curie

INFODAY MSCA

Una giornata informativa di presentazione dei bandi Doctoral Networks, Post-doctoral Fellowships e Staff Exchange

WORKSHOP MSCA-PF

Un workshop di approfondimento del nuovo bando Post-doctoral Fellowship, articolato su due giorni, dove verranno presentate le caratteristiche principali del programma e il formulario di presentazione di una proposta MSCA-PF

MSCA-PF - GRANT WRITING WORKSHOP

Dedicato ai ricercatori che stanno predisponendo una proposta MSCA Post-doctoral Fellowship. Durante il workshop verranno analizzate in dettaglio le singole sezioni del formulario e verranno fornite indicazioni e suggerimenti per scrivere una proposta di successo.

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UNIVERSITÀ DI ROMA

Call ERC Starting Grant 2021
e servizi offerti da ARI

- Per registrarsi: http://first.aster.it/_unirm_/registrazione
- Per consultare le call aperte: http://first.aster.it/_unirm_/bandi

GRAZIE PER L'ATTENZIONE!

Giuditta Carabella

Settore Mobilità dei ricercatori e programmi europei
Area per l'Internazionalizzazione
tel. 06 49910416 (int. 20416)
Giuditta.carabella@uniroma1.it

prof. Viviana Betti

Department of Psychology

ERC-Starting Grant

- Preparing an ERC research project
- Becoming an independent researcher

@Sapienza University: 2000-2005/2005-2008

Behavioral/Systems/Cognitive

Visually Induced Analgesia: Seeing the Body Reduces Pain

Matthew R. Longo,[1] Viviana Betti,[2,3] Salvatore M. Aglioti,[2,3] and Patrick Haggard[1]

[1]Institute of Cognitive Neuroscience, University College London, London WC1N 3AR, United Kingdom, [2]Dipartimento di Psicologia, Università degli studi di Roma "La Sapienza," I-00185 Rome, Italy, and [3]Instituto di Ricovero e Cura a Carattere Scientifico Fondazione Santa Lucia, I-00179 Rome, Italy

12384 • The Journal of Neuroscience, October 7, 2009 • 29(40):12384–12392

Behavioral/Systems/Cognitive

Synchronous with Your Feelings: Sensorimotor γ Band and Empathy for Pain

Viviana Betti,[1,2] Filippo Zappasodi,[3] Paolo Maria Rossini,[4,5] Salvatore Maria Aglioti,[2,6] and Franca Tecchio[4,5]

CORTEX 49 (2013) 446–462

Available online at www.sciencedirect.com

SciVerse ScienceDirect

ELSEVIER

Journal homepage: www.elsevier.com/locate/cortex

Special issue: Research report

Hypnotic modulation of pain perception and of brain activity triggered by nociceptive laser stimuli

Elia Valentini[a,b,], Viviana Betti[b,c], Li Hu[d,e] and Salvatore M. Aglioti[a,b]*

Contents lists available at ScienceDirect

Neuroscience and Biobehavioral Reviews

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

Review

Dynamic construction of the neural networks underpinning empathy for pain

Viviana Betti[a,b,c,*], Salvatore Maria Aglioti[b,d,*]

[a] *Department of Neuroscience, Imaging and Clinical Sciences, and Institute for Advanced Biomedical Technologies, University "G. D'Annunzio", Chieti-Pescara, Italy*
[b] *IRCCS Santa Lucia Foundation, Rome, Italy*
[c] *BrainTrends Ltd., Rome, Italy*
[d] *Department of Psychology, "La Sapienza" University of Rome, Italy*

Neuron
Article

Natural Scenes Viewing Alters the Dynamics of Functional Connectivity in the Human Brain

Viviana Betti,[1,2,*] Stefania Della Penna,[1,2] Francesco de Pasquale,[1,2] Dante Mantini,[3,4] Laura Marzetti,[1,2]
Gian Luca Romani,[1,2] and Maurizio Corbetta[1,2,5,*]

Behavioral/Cognitive

Topology of Functional Connectivity and Hub Dynamics in the Beta Band As Temporal Prior for Natural Vision in the Human Brain

Viviana Betti,[1,2] Maurizio Corbetta,[3,4] Francesco de Pasquale,[5] Vincent Wens,[6] and Stefania Della Penna[7]

Review

Spontaneous Beta Band Rhythms in the Predictive Coding of Natural Stimuli

Viviana Betti[1,2], Stefania Della Penna[3],
Francesco de Pasquale[4], and Maurizio Corbetta[5,6,7]

The Neuroscientist
1–18
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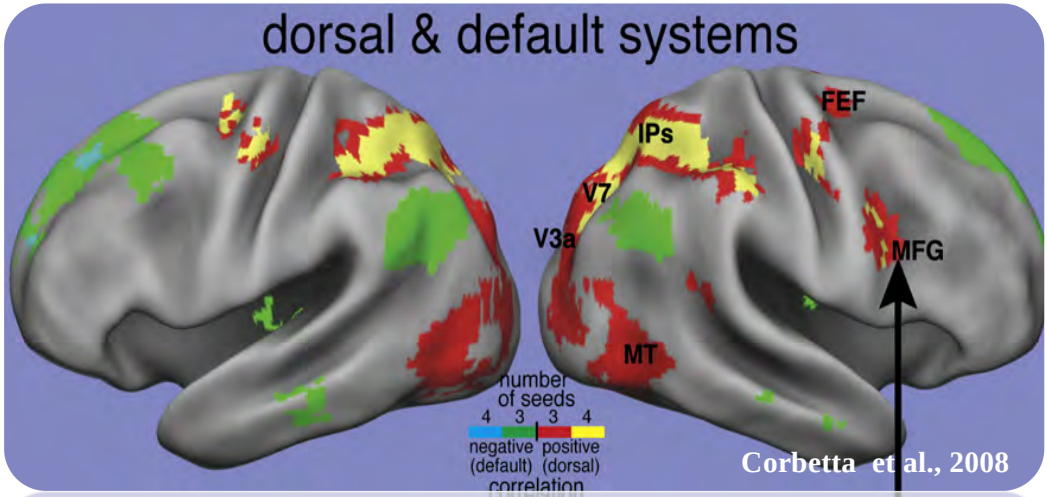
SAGE

My previous, present and future experience

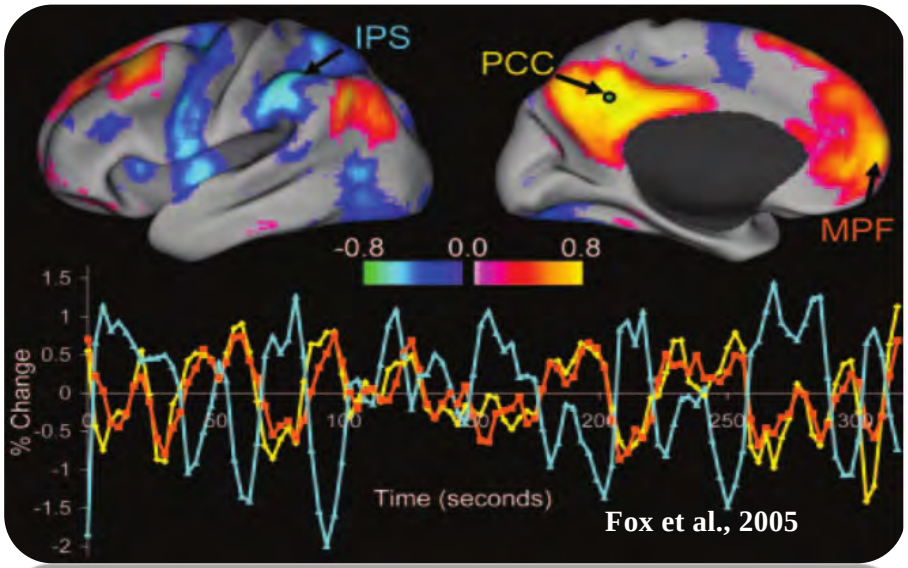
A PARADIGM SHIFT IN THE STUDY OF THE BRAIN

Task-related activity



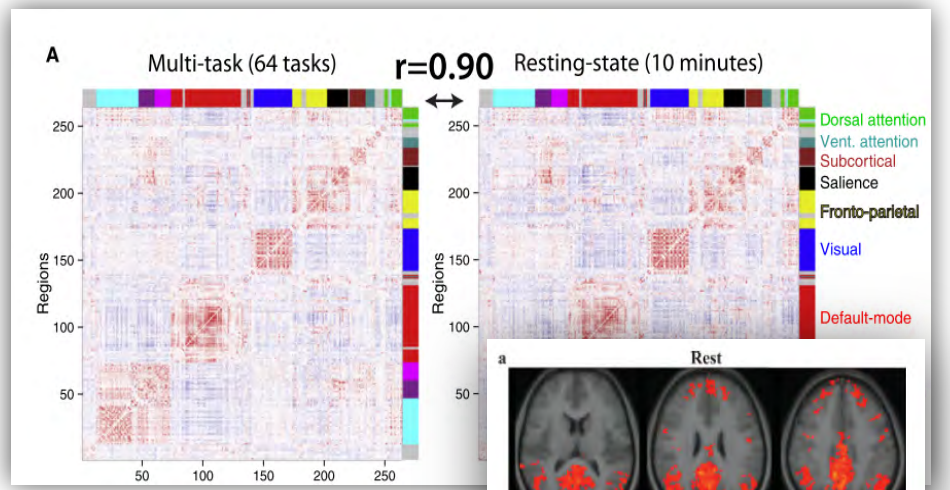
Corbetta et al., 2008

Intrinsic brain activity

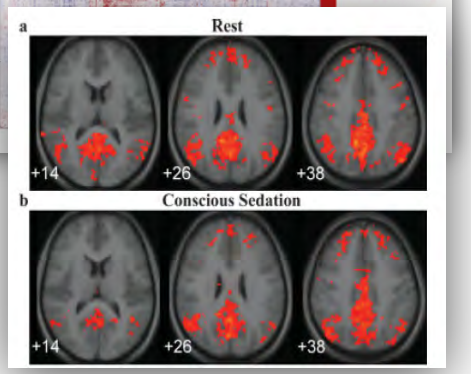


Fox et al., 2005

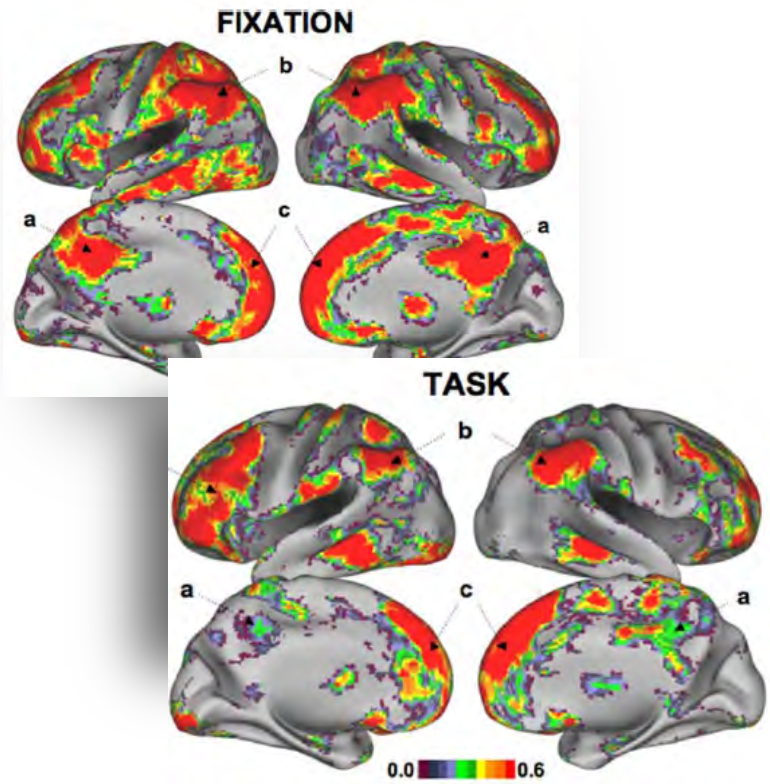
TASK-EVOKED BRAIN ACTIVITY:
MODULATION of STABLE INTRINSIC NETWORK STRUCTURE



Cole et al., 2014



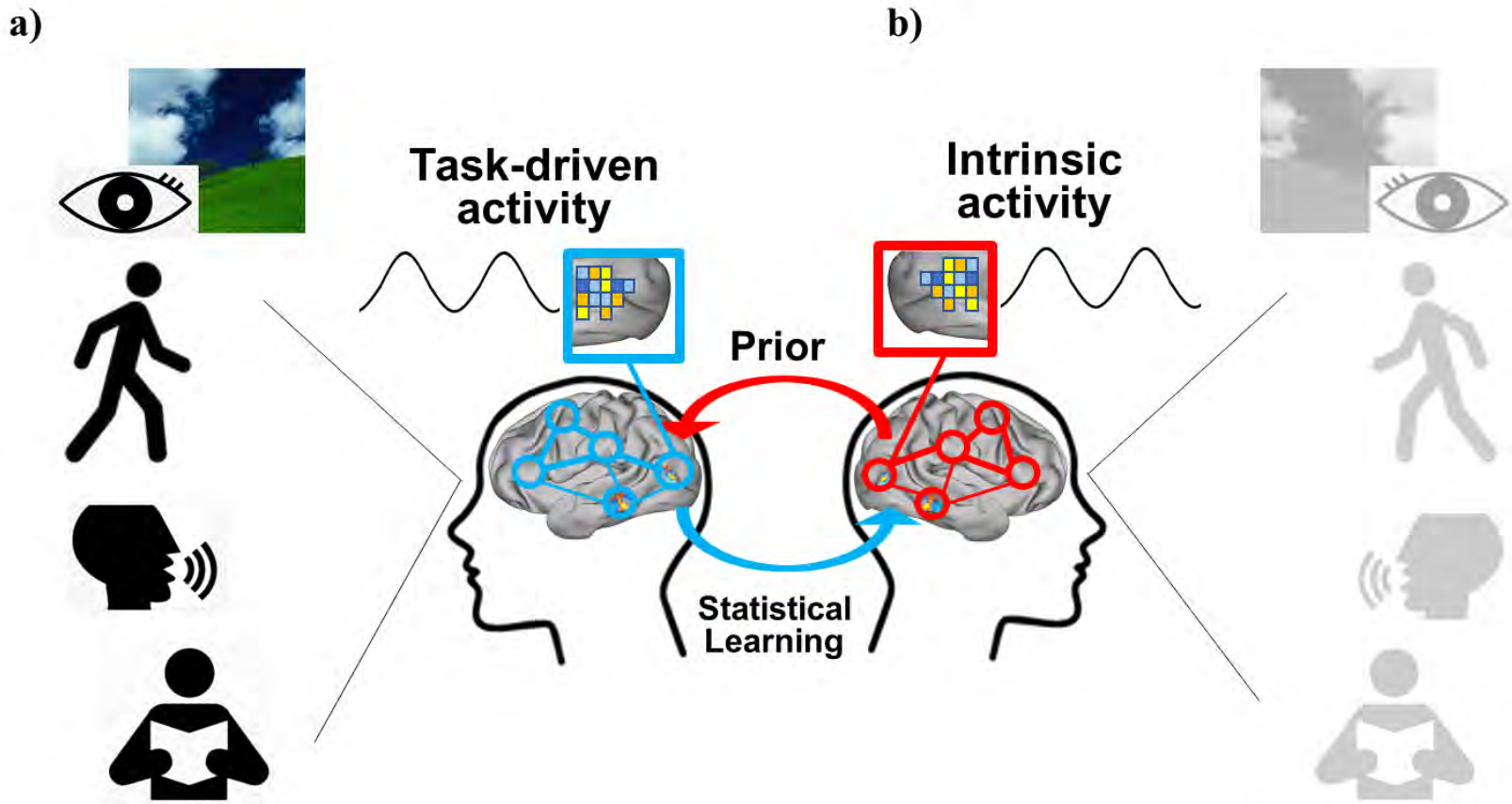
Greicius et al., 2008



Buckner et al., 2009

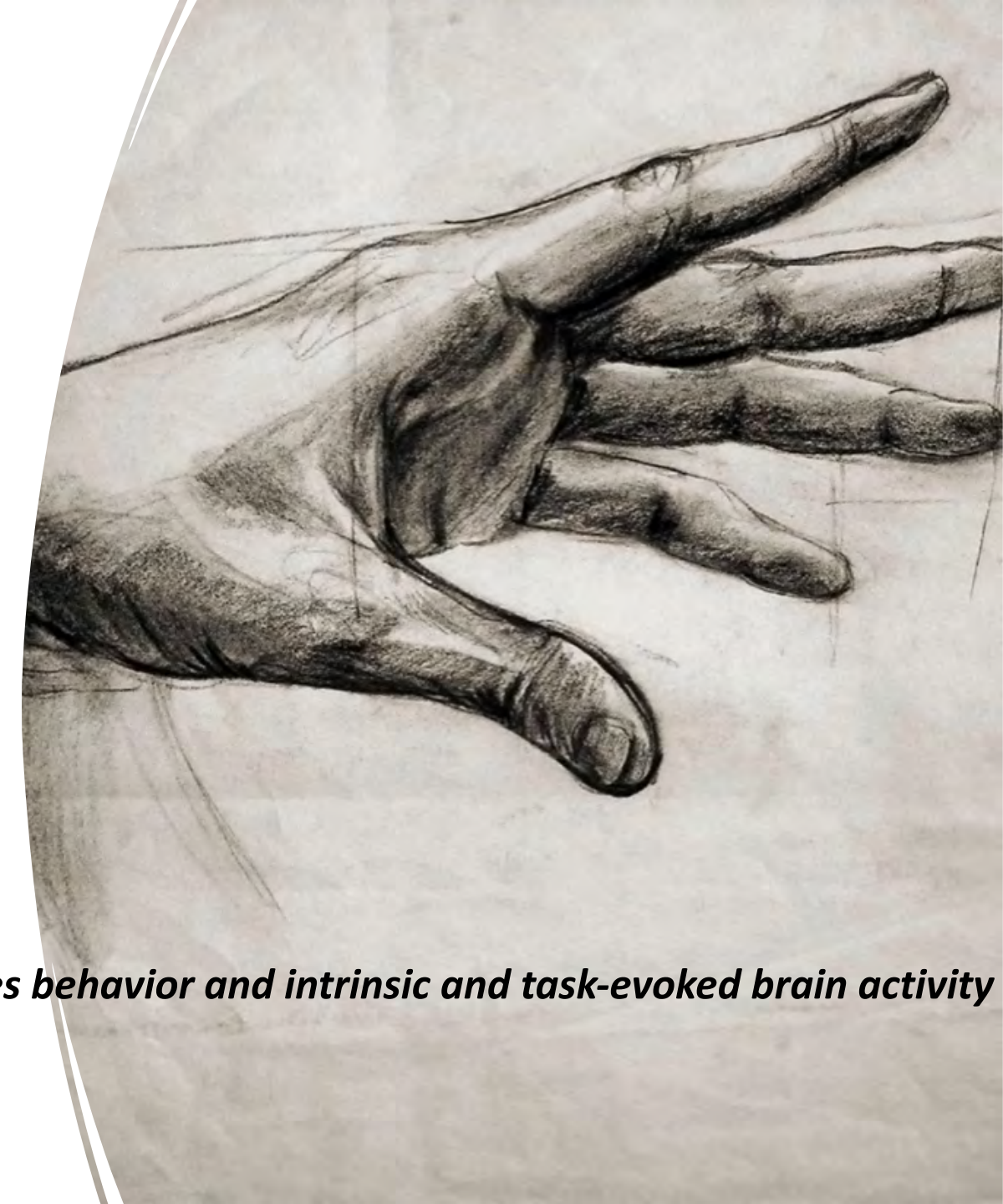
A big challenge: What is coded in the intrinsic activity?

A new theoretical framework



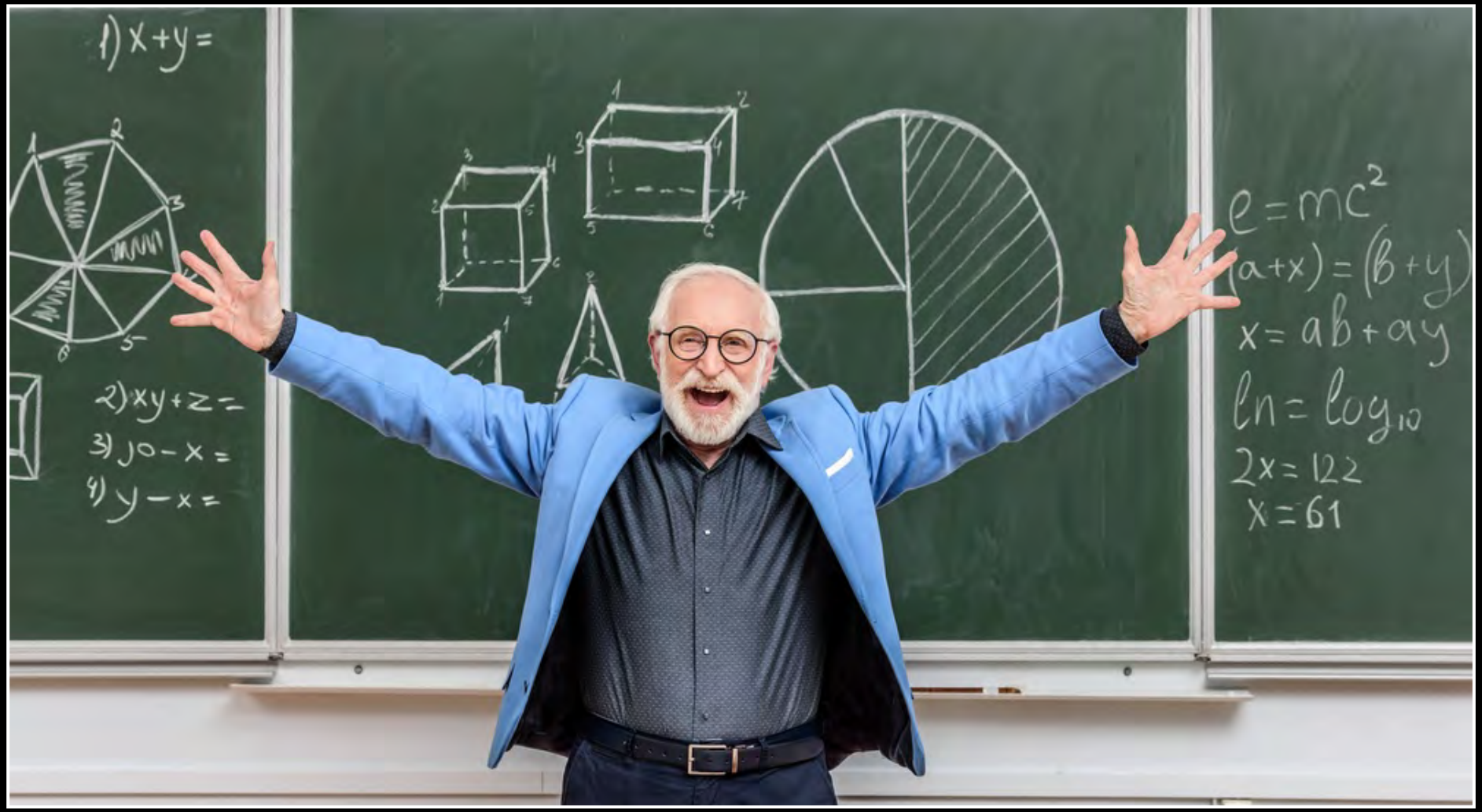
Betti et al., 2020

“*HAND*made”



How natural hand usage shapes behavior and intrinsic and task-evoked brain activity

Starting a new adventure



permanent faculty position

permanent faculty position

FACOLTÀ DI MEDICINA
E PSICOLOGIA
SAPIENZA
UNIVERSITÀ DI ROMA
URBIS

Networking

New scientific Collaborations ☺

New grant opportunities (e.g., POC)

Choose your department

Invited talks

Starting a new research lab

Cognitive and Systems
Neuroscience Laboratory

COsync Lab

Starting a new research lab

New (Institutional) Responsibilities/Opportunities

SCUOLA SUPERIORE
DI STUDI AVANZATI

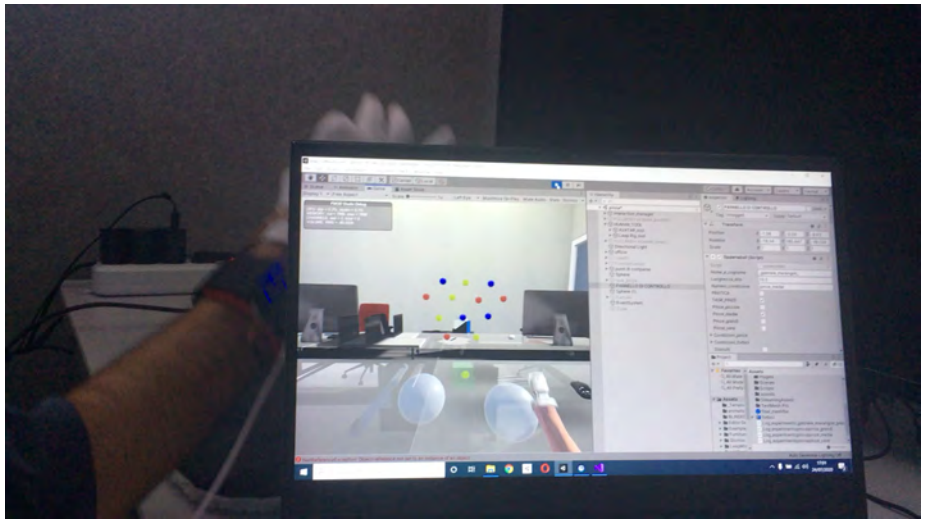
SAPIENZA
UNIVERSITÀ DI ROMA

→ **Be-for-ERC**

Inspiring (a group of) trainees

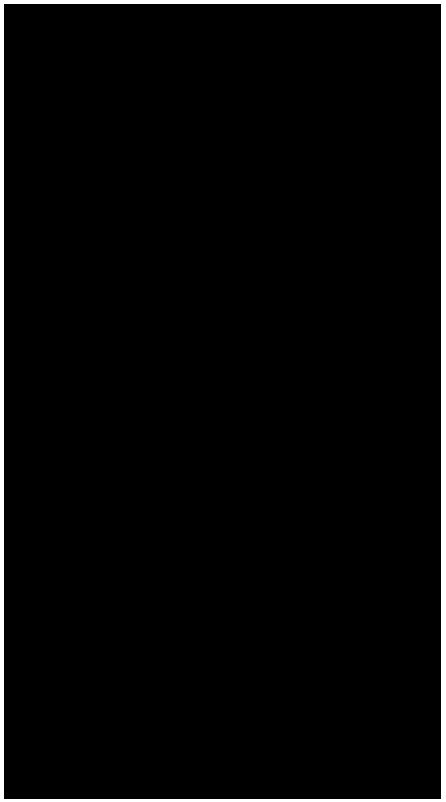
Pushing my research interests

High-density EEG



Virtual Reality

Kinematics



Experiments in amputees

fMRI

Thanks for your attention

viviana.betti@uniroma1.it;

https://vivianabetti.site.uniroma1.it

@Viviana_Betti

Ackwnoledgments

Giuditta Carabella

Emanuele Gennuso

Workshop ERC Starting grant

L'esperienza di un valutatore

Francesca Cutruzzolà
Dipartimento di Scienze Biochimiche "A.Rossi Fanelli"

SAPIENZA
UNIVERSITÀ DI ROMA

22 Febbraio 2021

Workshop ERC Starting grant

Strenghts and weaknesses

ERC Starting Grant 2014 -2020

Panel Life Sciences,
LS 6- Immunity and infection

LS6 STARTING GRANTS
2014-2016-2018-2020

Call	2014			2016			2018			2020		
	all	*ita*	*ita%*	*all*	*ita*	*ita%*	*all*	*ita*	*ita%*	*all*	*ita*	*ita%*
STEP1	93	11	12	83	5	6	72	7	10	73	4	5
STEP2	29	2	7	24	1**	5	24	1*	5	26	1§	4
FIN	11	1	9	8 (2)	0	0	8 (2)	0 (1*)	0	8 (2)	0	0

* problems with unclear declaration of PhD supervisor
** same applicant as in 2018
§ PI Russian/carrier in Italy

MAJOR CHANGE IN 2020! NO INTERVIEW TOOK PLACE…..

STEP 1 EVALUATION (both project and PI)

RESEARCH PROJECT (0-4):

Ground-breaking nature, novelty and potential impact
Scientific approach

PRINCIPAL INVESTIGATOR (PI) (0-4):

-propose and conduct ground-breaking research (before ERC application)
-independence:
-achievements beyond state-of-the-art

STEP 1 EVALUATION
(both project and PI)

Mainly by panel members
Each panel member evaluates about 30-40 proposals Step1
(B1 part-extended synopsis+ CV+track record)
in about 1,5 months

Expertise of Panel Members and proposals

PANELS COVER A WIDE RANGE OF TOPICS

ALSO *CROSS PANEL EVALUATIONS*

STEP 1- RESEARCH PROJECT:

Ground-breaking nature, novelty and potential impact

Scientific Approach

Extended Synopsis

Why this project?

Key (biological) question (no clinical)

Unexplored or poorly explored topic

High risk-high gain

Clear description of aims and experimental steps (list aims and sub-aims)

Feasibility

Preliminary results (include figures and/or tables)/expertise for each aim (possibly)

Expected milestones

Possible (international) collaborations

NOT EVALUATED: METHODOLOGY, TIMESCALE, RESOURCES (STEP2)

PRINCIPAL INVESTIGATOR (PI):

-propose and conduct ground-breaking research

-independence:

-achievements beyond state-of-the-art

CV and Early Achievements track record

Why this PI?

-propose and conduct ground-breaking research

First authorship (patents/other) in journals without phD supervisor (*):
high quality journals vs specialized, commentaries, invited talks

-independence:

Expertise needed for the project (and/or collaborations)
International mobility (quality of research groups)
Last authorship in research papers
Grants as PI (also competitive grants for previous PI salary)
Independent position (ongoing/new/future also to be funded by ERC)
Supervision of students (undergrad/grad)

PRINCIPAL INVESTIGATOR (PI):

-propose and conduct ground-breaking research

-independence:

-achievements beyond state-of-the-art

Why this PI?

CV and Early Achievements track record

-achievements beyond state-of-the-art

Novel ideas and novel concepts

ITALIAN PROJECTS/PI: MAJOR PROBLEMS

International mobility

Independence (papers, positions,grants)

STEP 1 EVALUATION RESULTS

Each panel member can see other evaluations only few days before panel meeting

PANEL MEETING DISCUSSION (COI excluded)

Each panel member leads discussion on selected proposals

RANKING OF PROJECTS

Admitted Step 2

Usually about 3x expected budget

Not admitted Step 2

B (cannot apply for next call)

C (cannot apply for next two calls)

STEP 2 EVALUATION

Before interview: Re-evaluation of the proposal

(more details are available-Part B2)

RESEARCH PROJECT:

Ground-breaking nature, novelty and potential impact

Scientific approach

PRINCIPAL INVESTIGATOR (PI):

-propose and conduct ground-breaking research (before ERC application)

-independence:

-achievements beyond state-of-the-art

- Time allocated (min 50%)

STEP 2 EVALUATION

Before interview: Re-evaluation of the proposal
(more details are available-Part B2)

Panel members+external experts (avg 5/7).

Panel members *indicate external experts*
IN 2020 THIS CHOICE WAS MADE ALSO USING A ERC PROGRAM
(most relevant experts in the field)

Panel members evaluate about 5-7 proposals Step2 (B2 part)
External experts usually 1

STEP 2 EVALUATION

Interview:

10 (15) minutes + 10 discussion

Focus clearly on the project
What you want to do
How you plan to do it
Why you are the right person to do it
Answer to panel questions clearly and directly

ITALIAN PROJECTS/PI: MAJOR PROBLEMS

Management of research groups

STEP 2 EVALUATION RESULTS

RANKING OF PROJECTS

A Funded

A not funded

B not funded (can apply next call)

PANEL MEETING DISCUSSION (COI excluded)
Each panel member leads discussion on 1-2 Proposals

After ranking, extra Budget requests are evaluated
GENDER BALANCE

GOOD LUCK!

SAPIENZA ERC DAYS

22-23 FEBBRAIO 2021

SAPIENZA UNIVERSITÀ DI ROMA

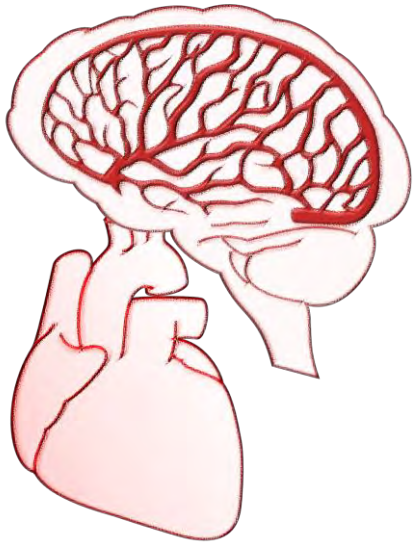
NEUROMED I.R.C.C.S. ISTITUTO NEUROLOGICO MEDITERRANEO

erc European Research Council

NeuroImmune Interactions in Hypertension "SymPAtHY"

Daniela Carnevale

Full Professor of Applied Medical Technologies
Department of Molecular Medicine
Sapienza University of Rome
UOR Neuro and Cardiovascular Pathophysiology - IRCCS Neuromed



SETTORE MOBILITÀ DEI RICERCATORI E PROGRAMMI EUROPEI IN AMBITO SOCIO-CULTURALE

SAPIENZA
UNIVERSITÀ DI ROMA

Personal Experience with the ERC Starting Grant

Roadmap of today presentation

1. My Background
2. My Research Activity
3. Why I applied - ERC Grants from a Researcher's Perspective
4. My ERC Experience

SAPIENZA
UNIVERSITÀ DI ROMA

My Background

2005 – 2007

Research Fellow
Neuroimmunology
and
Neuroinflammation

2007 – 2010

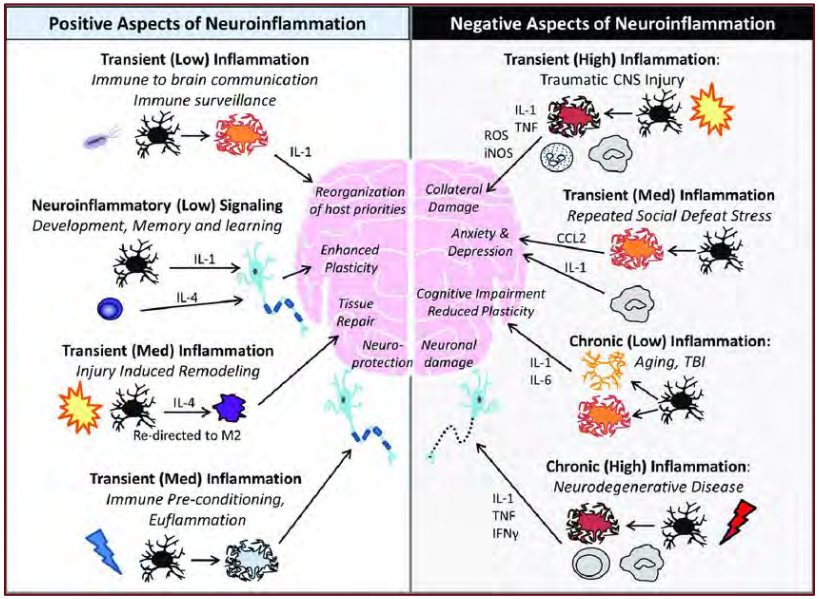
PhD School
Neuroscience

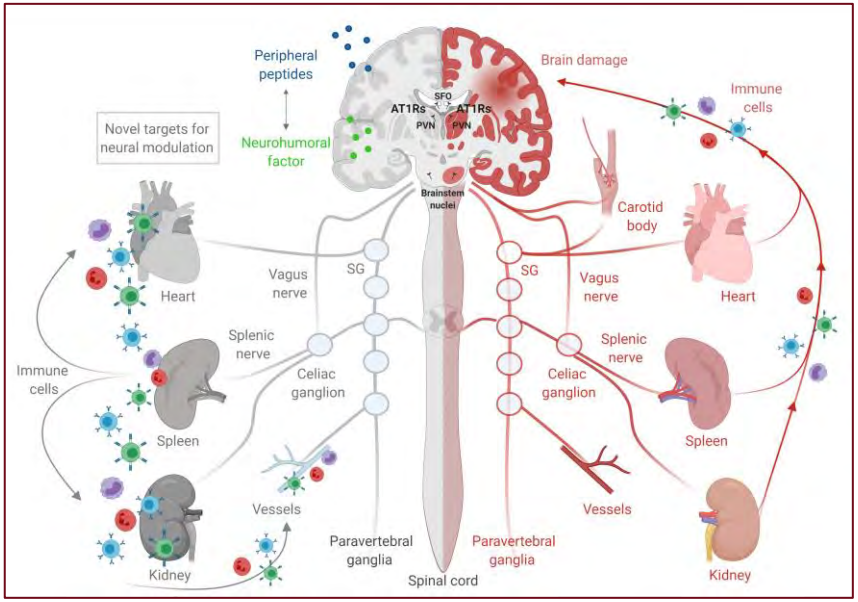
2010 – 2012

PostDoc at the Department of
Angiocardioneurology and
Translational Medicine
Prof G. Lembo

2012 – 2017

Assistant Professor
Department
of Molecular Medicine





Undergraduate and postgraduate formation

2003 – 2005

Undergraduate Student
Neuroimmunology and
Neuroinflammation

2005 – 2007

Research Fellow
Neuroimmunology and
Neuroinflammation

Journal of Neuroinflammation BioMed Central

Research **Open Access**

Activation of α7 nicotinic acetylcholine receptor by nicotine selectively up-regulates cyclooxygenase-2 and prostaglandin E_2 in rat microglial cultures

Roberta De Simone*, Maria Antonietta Ajmone-Cat, Daniela Carnevale and Luisa Minghetti

Address: Department of Cell Biology and Neurosciences, Section of Degenerative and Inflammatory Neurological Diseases, Istituto Superiore di Sanità, Rome, Italy

Email: Roberta De Simone* - desimone@iss.it; Maria Antonietta Ajmone-Cat - ajcat@iss.it; Daniela Carnevale - carneval@iss.it; Luisa Minghetti - minghett@iss.it

* Corresponding author

Published: 25 January 2005
Journal of Neuroinflammation 2005, 2:4 doi:10.1186/1742-2094-2-4

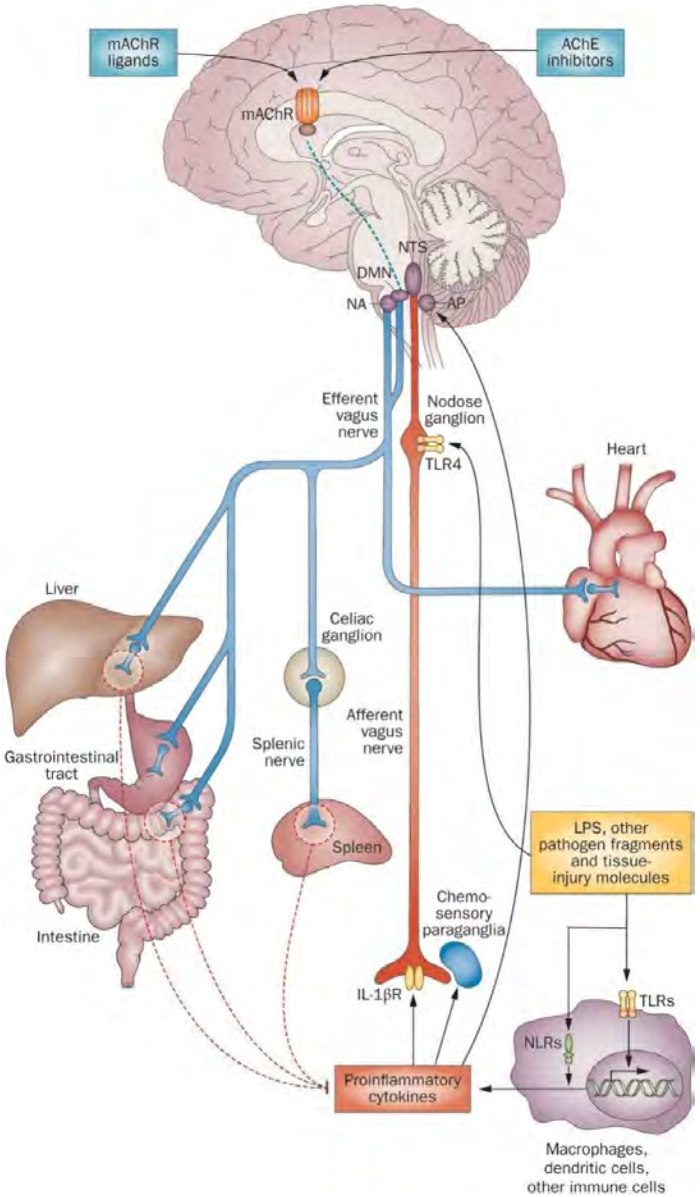
Received: 14 December 2004
Accepted: 25 January 2005

388 *CNS & Neurological Disorders - Drug Targets*, 2007, 6, 388-397

Microglia-Neuron Interaction in Inflammatory and Degenerative Diseases: Role of Cholinergic and Noradrenergic Systems

D. Carnevale, R. De Simone and L. Minghetti*

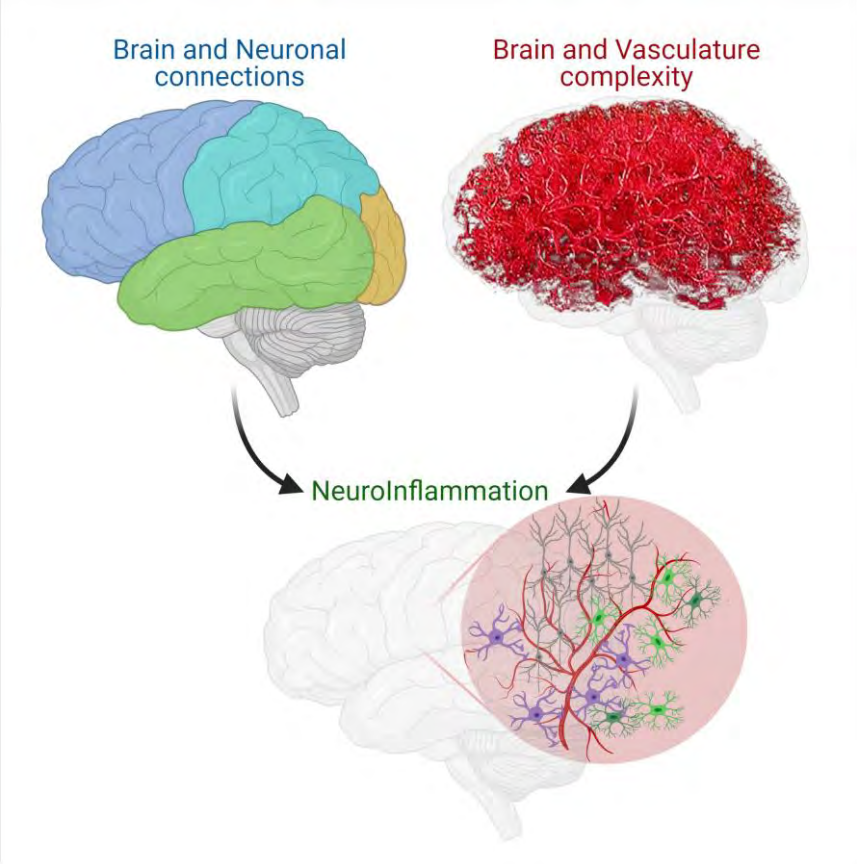
The autonomic nervous system is a crucial regulator of immune responses: the functional anatomy of the inflammatory reflex

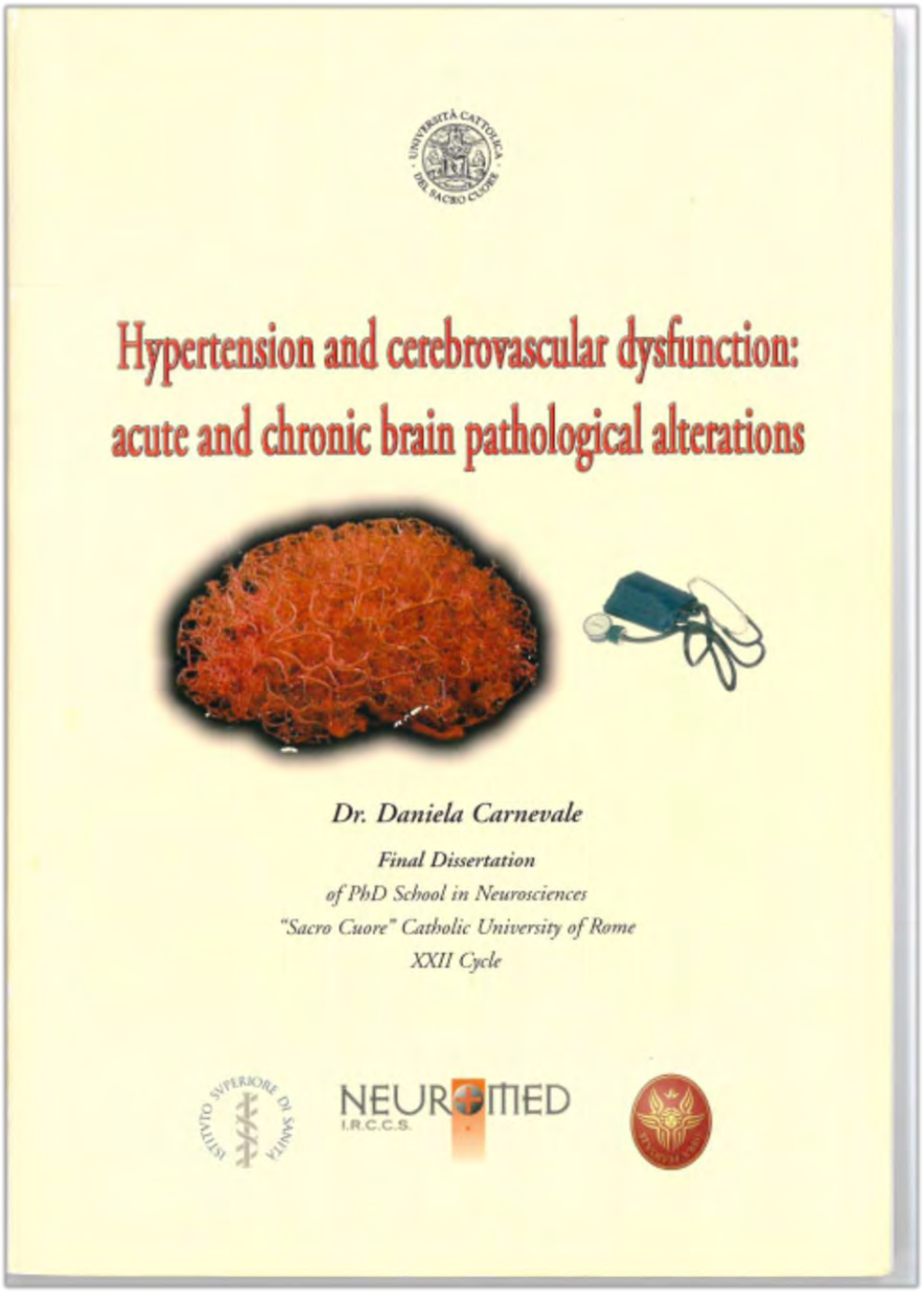


Pavlov, V. A. & Tracey, K. J. *Nat. Rev. Endocrinol.*, 2012

2007 – 2010

PhD School
Neuroscience





Hypertension and cerebrovascular dysfunction: acute and chronic brain pathological alterations

Dr. Daniela Carnevale

Final Dissertation
of PhD School in Neurosciences
"Sacro Cuore" Catholic University of Rome
XXII Cycle

2010 – 2012

NEUROMED I.R.C.C.S. ISTITUTO NEUROLOGICO MEDITERRANEO

SAPIENZA UNIVERSITÀ DI ROMA

Dept Angiocardioneurology and Translational Medicine

Mentor Prof Giuseppe Lembo

PostDoc Fellow (2010-2012): investigating the brain to body interactions in Cardiovascular Diseases

Hypertension

EDITORIAL

Global Burden of Raised Blood Pressure Coming Into Focus

Mark D. Huffman, MD, MPH; Donald M. Lloyd-Jones, MD, ScM

JAMA January 10, 2017 Volume 317, Number 2

Figure 1. Projected Global Rates of Systolic Blood Pressure of 140 mm Hg or Higher

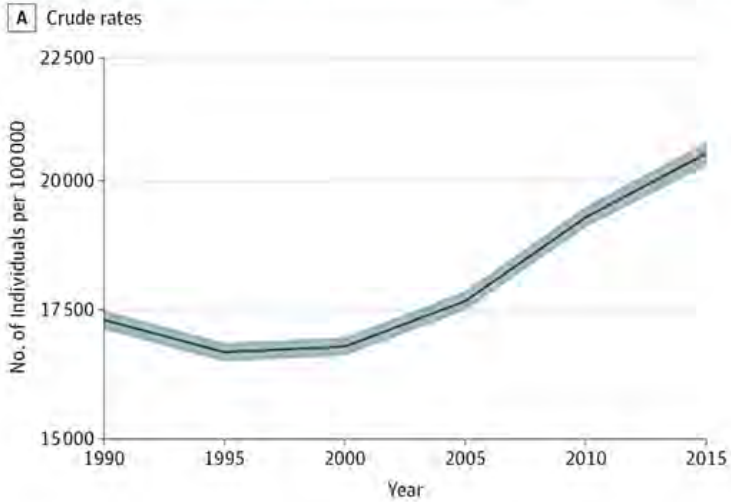
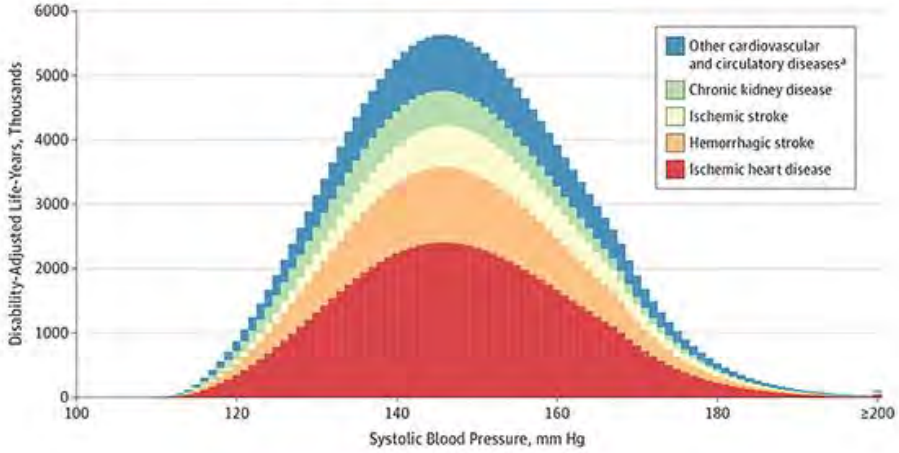


Figure 2. Projected Global Disability-Adjusted Life-Years by Systolic Blood Pressure Level and Cause, 2015



*"… These data cannot inform clinical practice guidelines regarding appropriate levels for initiation of blood pressure–lowering therapy or goal levels for treatment. However, **these data strengthen the case to lower the risk for cardiovascular diseases** in those with SBP of 140 mm Hg or higher **by all effective means available…***

*The GBD project continues to evolve and engage the medical community with its impressive scope of data and even if the **extensive amounts of data** are fuzzy and imperfect, they **provide valuable estimates of current global disease burden**."*

JAMA – January 2017 - Volume 317, Number 2

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ELSEVIER

Neurobiology of Aging 33 (2012) 205.e19–205.e29

NEUROBIOLOGY OF AGING

www.elsevier.com/locate/neuaging

Role of neuroinflammation in hypertension-induced brain amyloid pathology

Daniela Carnevale[a,*], Giada Mascio[a], Maria Antonietta Ajmone-Cat[b], Ivana D'Andrea[c], Giuseppe Cifelli[a], Michele Madonna[a], Germana Cocozza[a], Alessandro Frati[d], Pierluigi Carullo[a], Lorenzo Carnevale[a], Enrico Alleva[c], Igor Branchi[c], Giuseppe Lembo[a,e], Luisa Minghetti[b]

[a] Department of Angio-Cardio-Neurology, IRCCS "Neuromed", 86,077 Pozzilli (IS), Italy
[b] Section of Experimental Neurology, Department of Cell Biology and Neurosciences, Istituto Superiore di Sanità, 00161 Rome, Italy
[c] Section of Behavioral Neurosciences, Department of Cell Biology and Neurosciences, Istituto Superiore di Sanità, 00161 Rome, Italy
[d] Department of Neurosurgery, IRCCS "Neuromed", 86,077 Pozzilli (IS), Italy
[e] Department of Molecular Medicine, "Sapienza" University, 00161 Rome, Italy

Received 5 March 2010; received in revised form 18 August 2010; accepted 24 August 2010

Hypertension
JOURNAL OF THE AMERICAN HEART ASSOCIATION

American Heart Association®

Hypertension Induces Brain β-Amyloid Accumulation, Cognitive Impairment, and Memory Deterioration Through Activation of Receptor for Advanced Glycation End Products in Brain Vasculature

Daniela Carnevale, Giada Mascio, Ivana D'Andrea, Valentina Fardella, Robert D. Bell, Igor Branchi, Fabio Pallante, Berislav Zlokovic, Shirley ShiDu Yan and Giuseppe Lembo

Hypertension. published online May 21, 2012;
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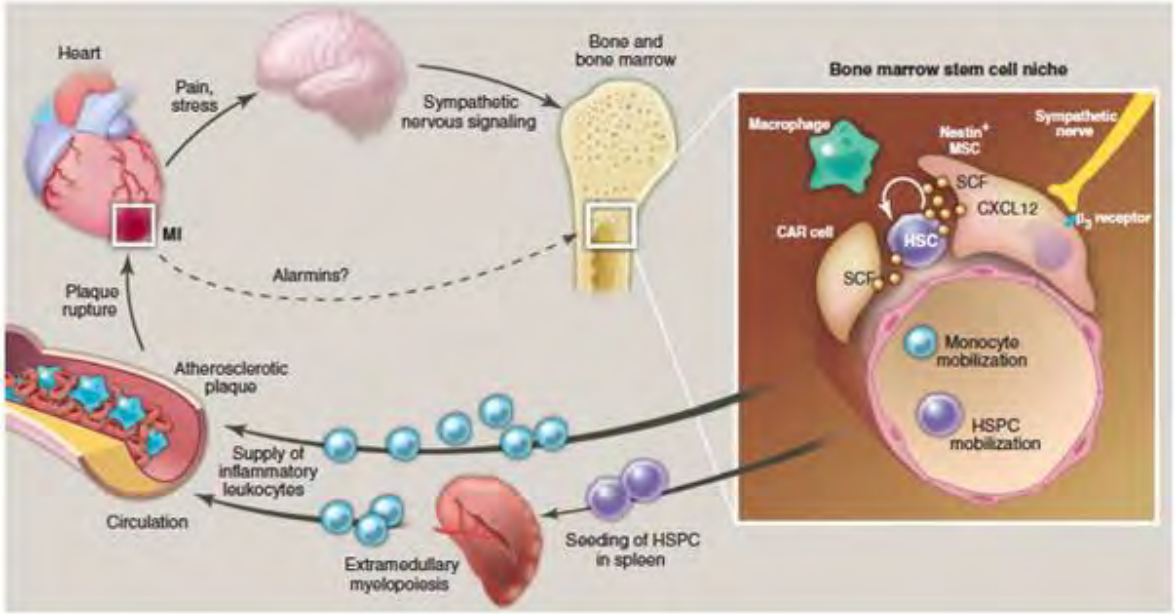
Print ISSN: 0194-911X. Online ISSN: 1524-4563

"The immune system protects us against pathogens such as viruses, bacteria, and parasitic worms, but its influence is much broader. The system recognizes and responds to divergent environmental and endogenous stimuli, and every known disease is at least partially associated with or dependent on immune function. Cardiovascular disease is no exception."



Swirski FK & Nahrendorf M. *Science*. 339(6116):161-6 *e*; 2013

The New York Times

SCIENCE

Finally, the Spleen Gets Some Respect

Basics

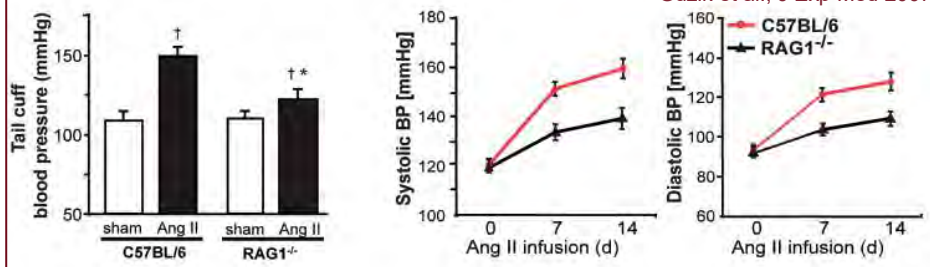
By NATALIE ANGIER AUG. 3, 2009

As a confirmed crab apple who has often been compared to the splenetic Lucy Van Pelt character from Peanuts, I am gratified to learn that should my real spleen ever decide to vent in earnest, the outburst may just help save my life.

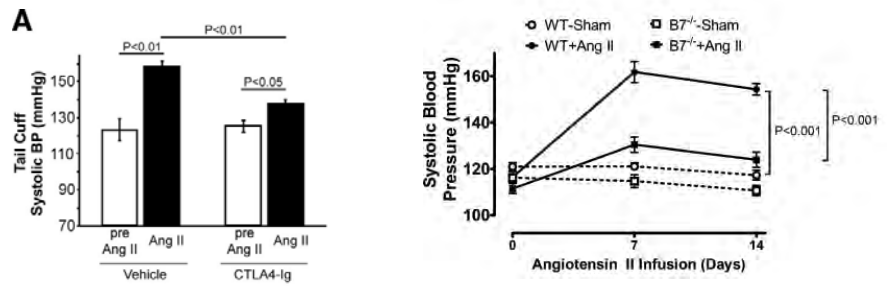
Timeline of research linking immunity and hypertension

- 1961 — Human vascular antigen complex identified in patients with hypertension[7]
- 1964 — Renal accumulation of immune cells is observed[11]
- 1967 — Passive transfer of autoimmune hypertension[12]
- 1970 — Increased serum levels of IgG found in humans with essential hypertension[8]
- 1976 — Thymectomy protects against DOCA-induced hypertension in mice[16]
- 1980 — Passive transfer of splenic T cells from rats with hypertension induces hypertension in normotensive rats[13]
- 1987 — Cyclophosphamide-mediated immunosuppression prevents hypertension in rats[14]
- 1995 — Agonistic autoantibodies detected in patients with primary hypertension[58]
- 2003 — Imbalance of T cell subsets found in spontaneously hypertensive rats[31]
- 2007 — *Rag1*$^{-/-}$ mice are protected from experimental hypertension. Hypertension is restored by adoptive transfer of T cells[17]
- 2010 — Monocyte depletion in mice protects against experimental hypertension[83]; Regulatory T cells prevent vascular inflammation and reduce experimental hypertension[95]
- 2011 — Isolevuglandin-modified proteins in DCs activate T cells and promote hypertension[69]; Placental growth factor mediates a neuroimmune interaction in the spleen to allow the onset of hypertension[177]; CD8$^+$ T cells promote renovascular rarefaction during hypertension[28]
- 2013 — NLRP3 inflammasome activation promotes renal inflammation and hypertension in DOCA-and-salt-induced hypertension[123]; Sex-specific T cells mediate regulation of angiotensin II-dependent hypertension[216]; Brain–spleen axis is identified in hypertension[178]; CD70 and long-lived effector memory T cells underlie hypertensive immune memory[157]; Memory and effector T cells accumulate in patients with hypertension[30]
- 2014 — SCID mice are protected from experimental hypertension[18]; T cells are classically activated in response to hypertension-specific antigens[68]; IL-17 promotes renal inflammation, dysfunction and hypertension[36]; Centrally mediated pressor effects of angiotensin II have a crucial role in T cell activation and development of vascular inflammation[168]
- 2015 — *Rag1* mutation protects against salt-induced hypertension in Dahl salt-sensitive rats[19]; Immune reactivity to HSP70 expressed in the kidney is a cause of salt-sensitive hypertension[158]
- 2016 — BAFFR deficiency and B cell depletion protect against experimental hypertension[47]; A GWAS identified the gene encoding SH2B adaptor protein 3 as a major susceptibility gene for hypertension[184]
- 2017 — γδ T cells are required for the development of experimental hypertension[43]; Salt-responsive gut commensals may regulate T_H17 cell responses in hypertension[39]
- 2018 — NOX2 in regulatory T cells promotes angiotensin II-induced cardiovascular remodelling[98]

Guzik et al., J Exp Med 2007



Vihn et al., Circulation 2010



Anteroventral third ventricle lesion

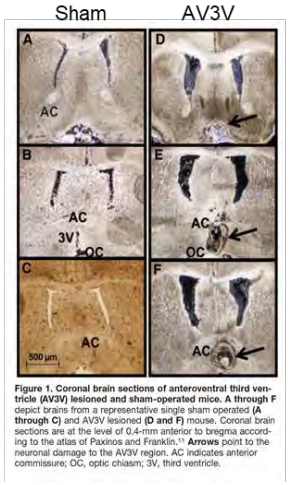
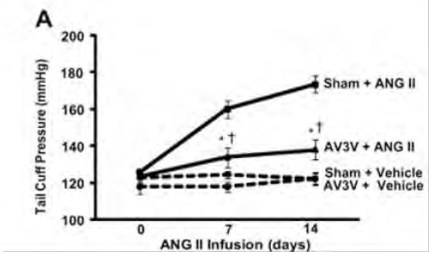
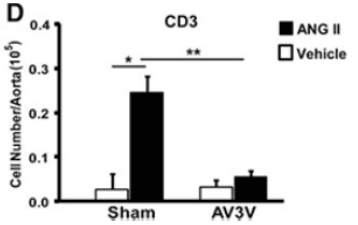


Figure 1. Coronal brain sections of anteroventral third ventricle (AV3V) lesioned and sham-operated mice. A through F depict brains from a representative single sham operated (**A through C**) and AV3V lesioned (**D and F**) mouse. Coronal brain sections are at the level of 0.4-mm anterior to bregma according to the atlas of Paxinos and Franklin.[11] **Arrows** point to the neuronal damage to the AV3V region. AC indicates anterior commissure; OC, optic chiasm; 3V, third ventricle.

Marvar et al., *Circ Res* 2010

AV3V ablation markedly reduced hypertension induced by peripheral infusion of Ang II





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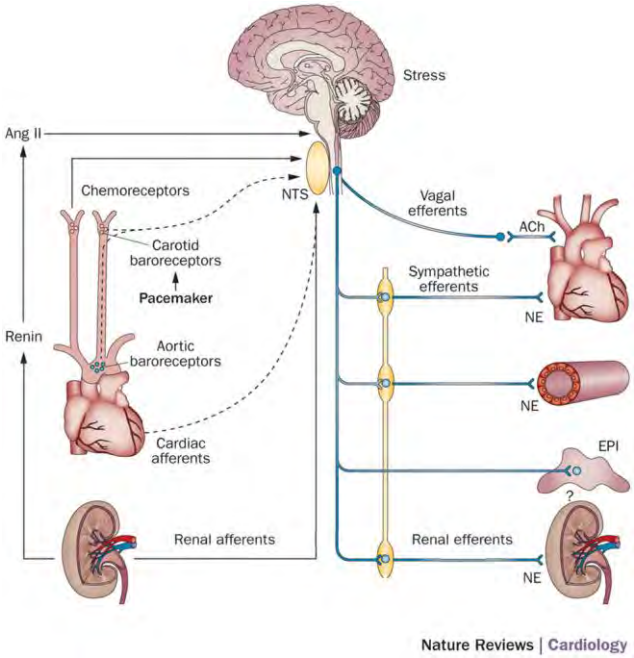
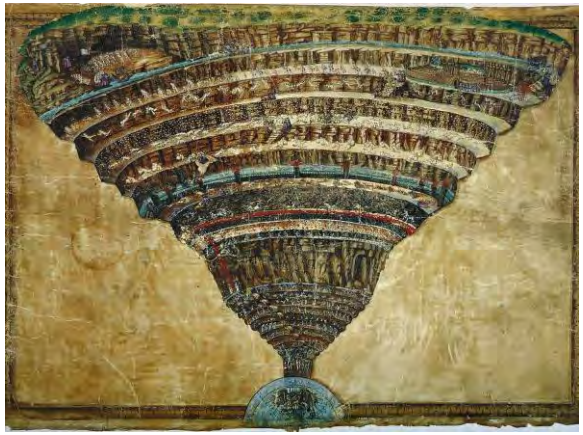
UNIVERSITÀ DI ROMA

The Autonomic Nervous System control of Cardiovascular Function

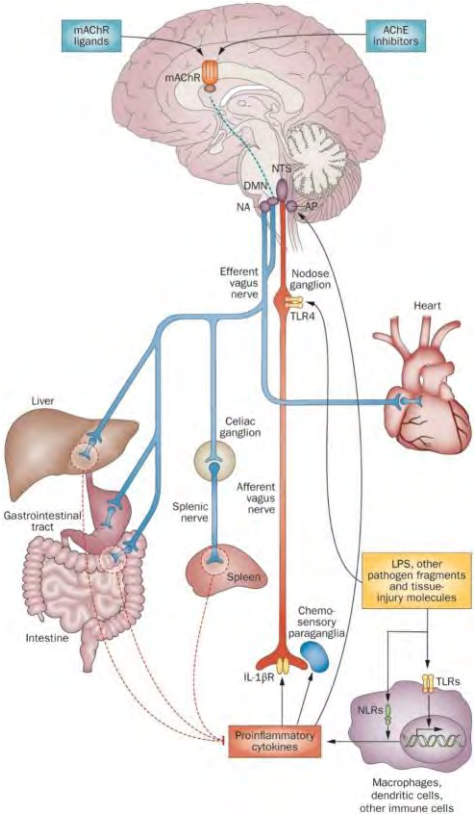


Victor R,
Nature Reviews Cardiology 2015

"We shall not cease from exploration
And the end of all our exploring Will
be to arrive where we started And
know the place for the first time."
Little Gidding by T. S. Eliot (1942)



The inflammatory reflex

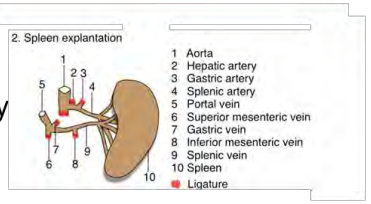


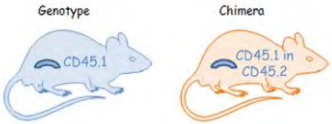
Pavlov VA & Tracey KJ
Nat Rev Endocrinol 2012

Assistant Professor (2012-2017): investigating the brain to body interactions in Cardiovascular Diseases through the Immune System

The spleen is necessary for the establishment of hypertension in response to Angiotensin II

Splenectomy



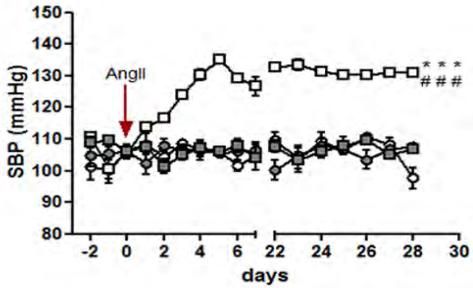


Experimental Strategy

AngII

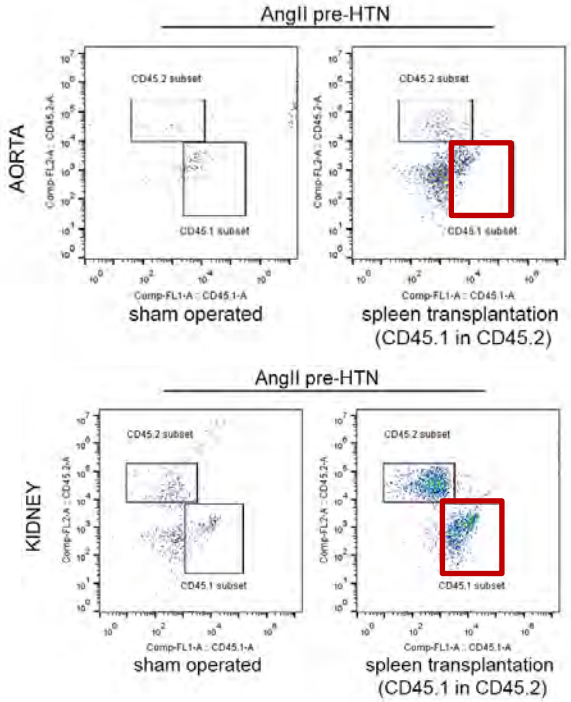
AngII

Splenectomized mice are protected from AngII hypertension



Carnevale D et al, *Immunity.* 2014

T cells in target organs origin in the spleen



Carnevale D et al, *Immunity.* 2014

ESC European Society of Cardiology
Cardiovascular Research (2018) **114**, 356–357
doi:10.1093/cvr/cvy029

EDITORIAL

The nerve of the spleen! Causing hypertension by placental growth factor

Justin P. Van Beusecum and David G. Harrison*

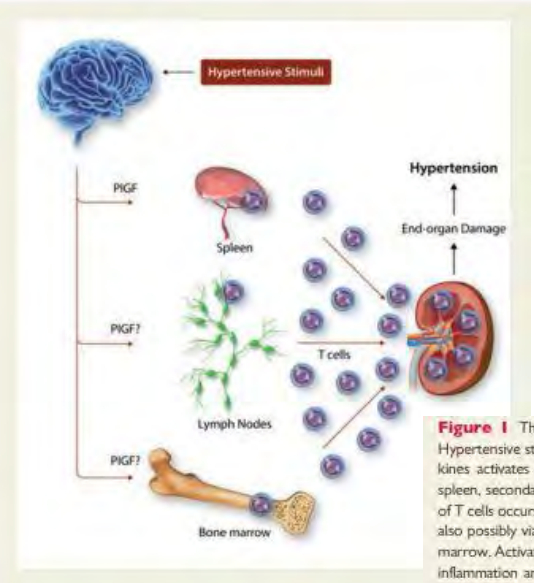
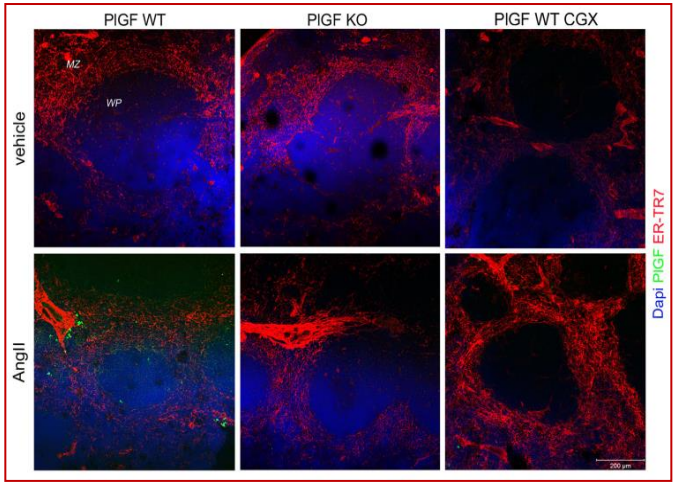
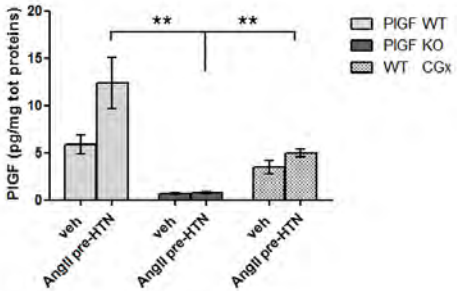


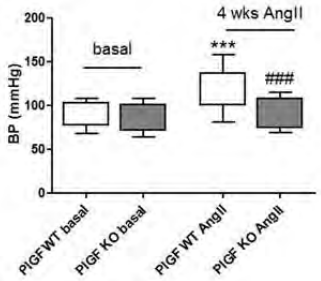
Figure 1 The role of PlGF in the pathogenesis of hypertension. Hypertensive stimuli such as salt, Angiotensin II, and cytokines/chemokines activates the sympathetic nervous system that innervates the spleen, secondary lymphoid organs, and the bone marrow. Activation of T cells occurs not only through the release of PlGF in the spleen but also possibly via analogous mechanisms in the lymph nodes and bone marrow. Activated T cells traffic to the kidney causing subsequent renal inflammation and end-organ damage, promoting the development of hypertension.

The splenic sympathetic nerve activates Placental Growth Factor (PlGF) in the spleen

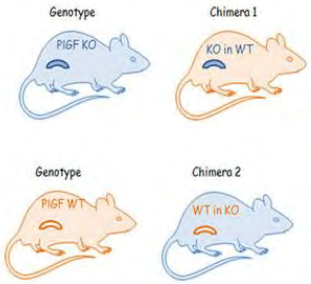




Angiotensin II

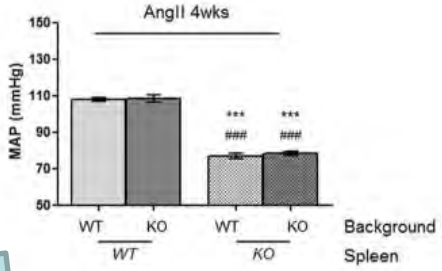


Experimental Strategy



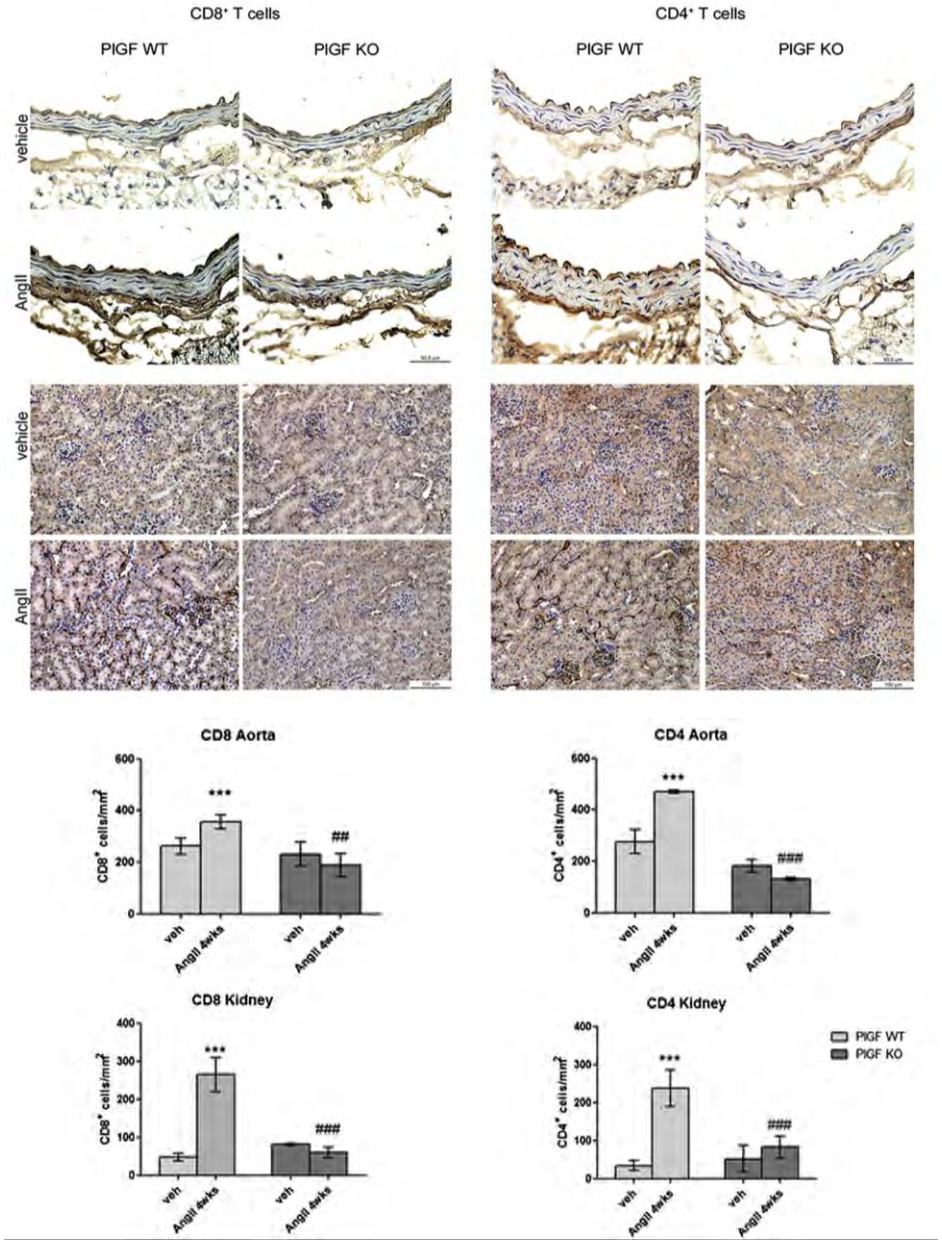
Angiotensin II

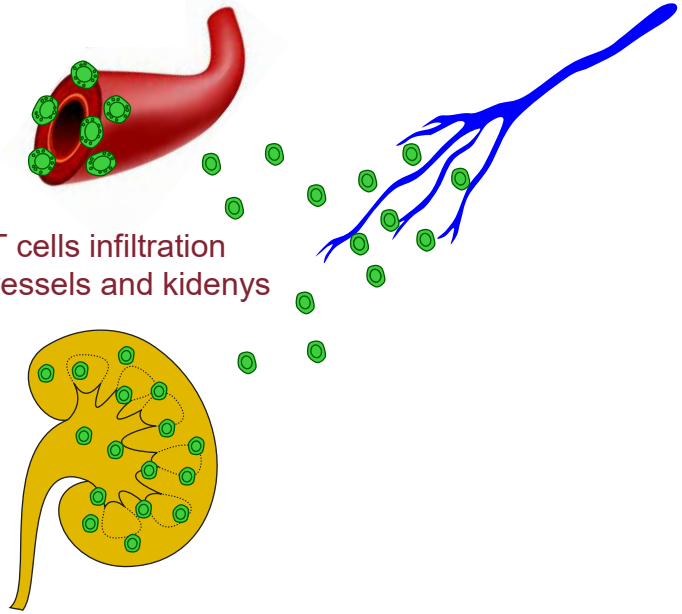
Generation of chimeric mice by spleen transplantation clarified the selective contribution of PlGF in the spleen



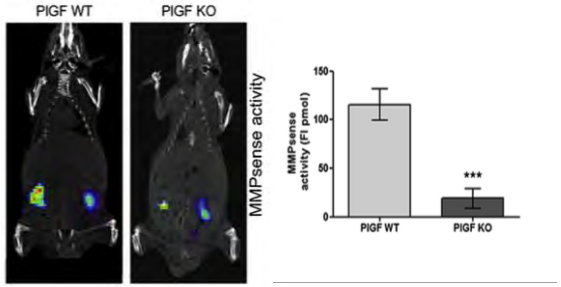
Carnevale D et al., *Immunity* 2014

Hypertension and T Cell Vascular Infiltration in Target Organs Induced by AngII Requires PlGF





FMT-CT of in vivo inflammatory activity (MMPsense) in kidneys



Carnevale D et al., *Immunity* 2014

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Milestone Paper showing for the first time that the spleen is required for Hypertension, playing a role mediated by a neuroimmune activation of PIGF

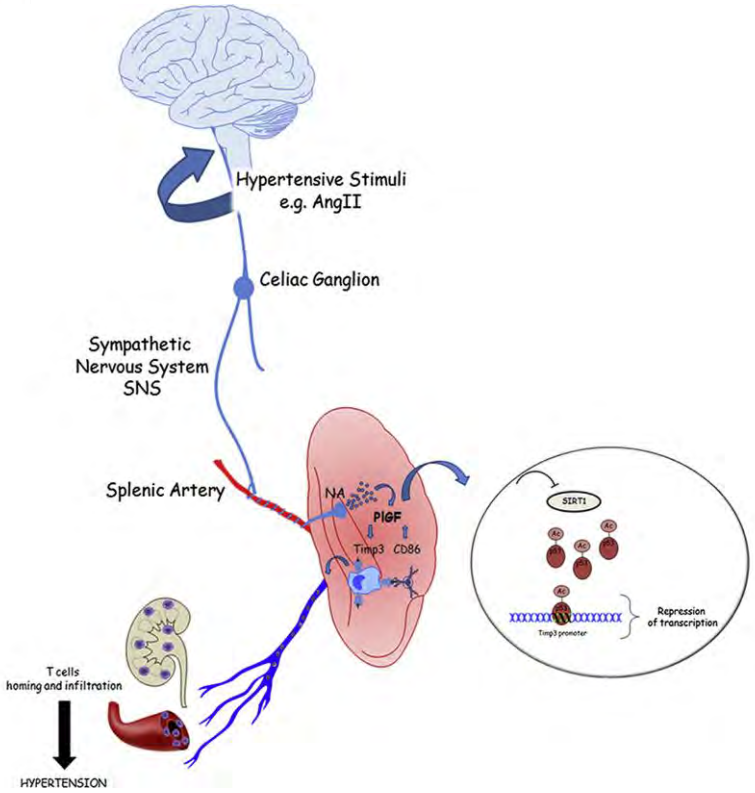
Immunity
Article

CellPress

The Angiogenic Factor PlGF Mediates a Neuroimmune Interaction in the Spleen to Allow the Onset of Hypertension

Daniela Carnevale,[1,2] Fabio Pallante,[1] Valentina Fardella,[1] Stefania Fardella,[1] Roberta Iacobucci,[1] Massimo Federici,[3] Giuseppe Cifelli,[1] Massimiliano De Lucia,[1] and Giuseppe Lembo[1,2,*]
[1]Department of Angiocardioneurology and Translational Medicine, Neuro and Cardiovascular Pathophysiology Research Unit, IRCCS Neuromed, 86077 Pozzilli, Italy
[2]Department of Molecular Medicine, "Sapienza" University of Rome, 00161 Rome, Italy
[3]Department of Systems Medicine, University of Rome "Tor Vergata," 00133 Rome, Italy
*Correspondence: lembo@neuromed.it
http://dx.doi.org/10.1016/j.immuni.2014.11.002

Graphical Abstract

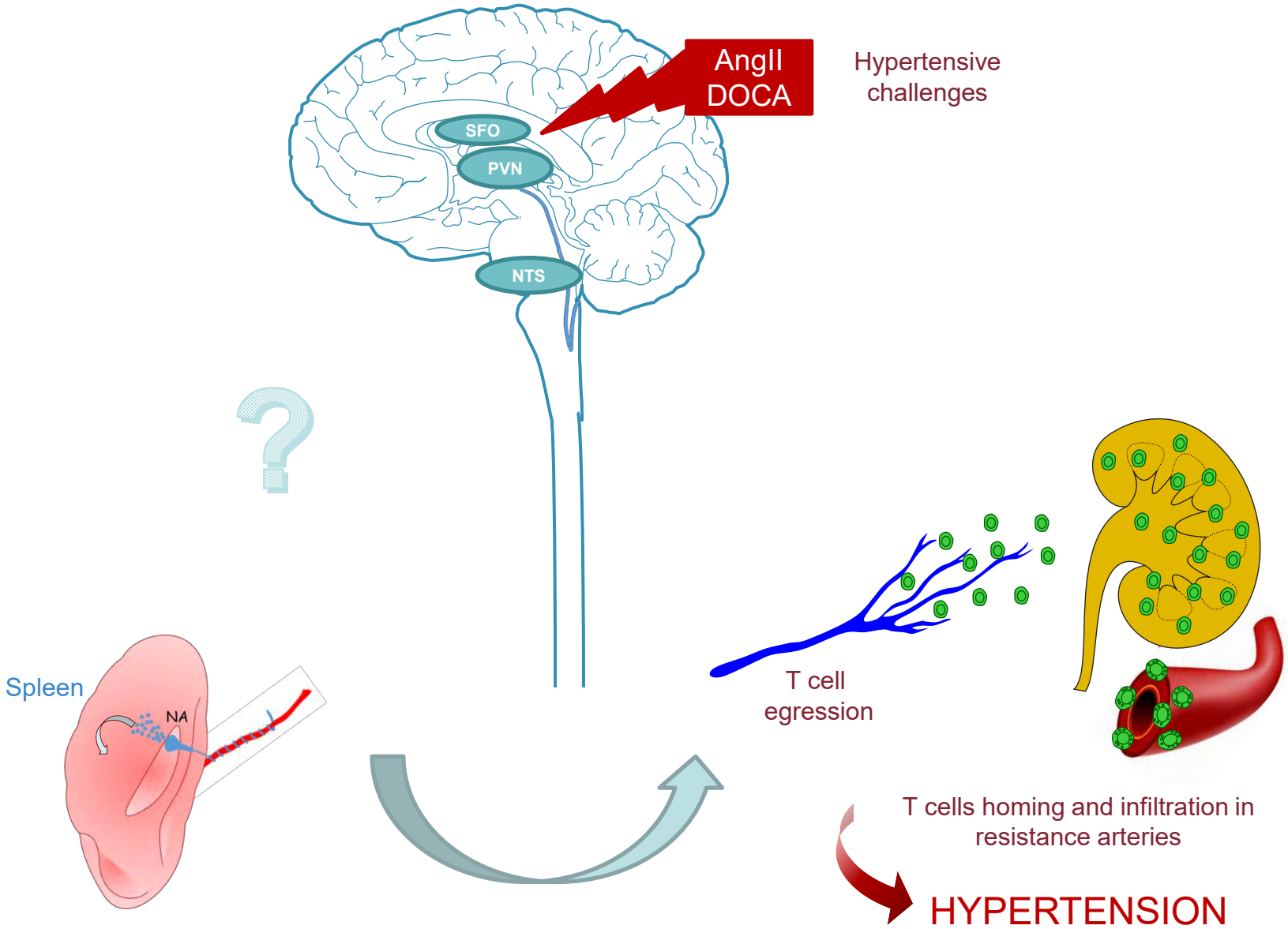


Hypertension: An Immune Disorder?

Kevin J. Tracey[1,*]
[1]Feinstein Institute, Manhasset, NY 11030, USA
*Correspondence: kjtracey@nshs.edu
http://dx.doi.org/10.1016/j.immuni.2014.11.007

T cell depletion can prevent hypertension in experimental animals. What is the nature of T cell activation in hypertension? In this issue of *Immunity*, Carnevale et al. (2014) implicate PlGF signaling in a reservoir of splenic T cells.

How does the spleen is connected to the brain in hypertension?



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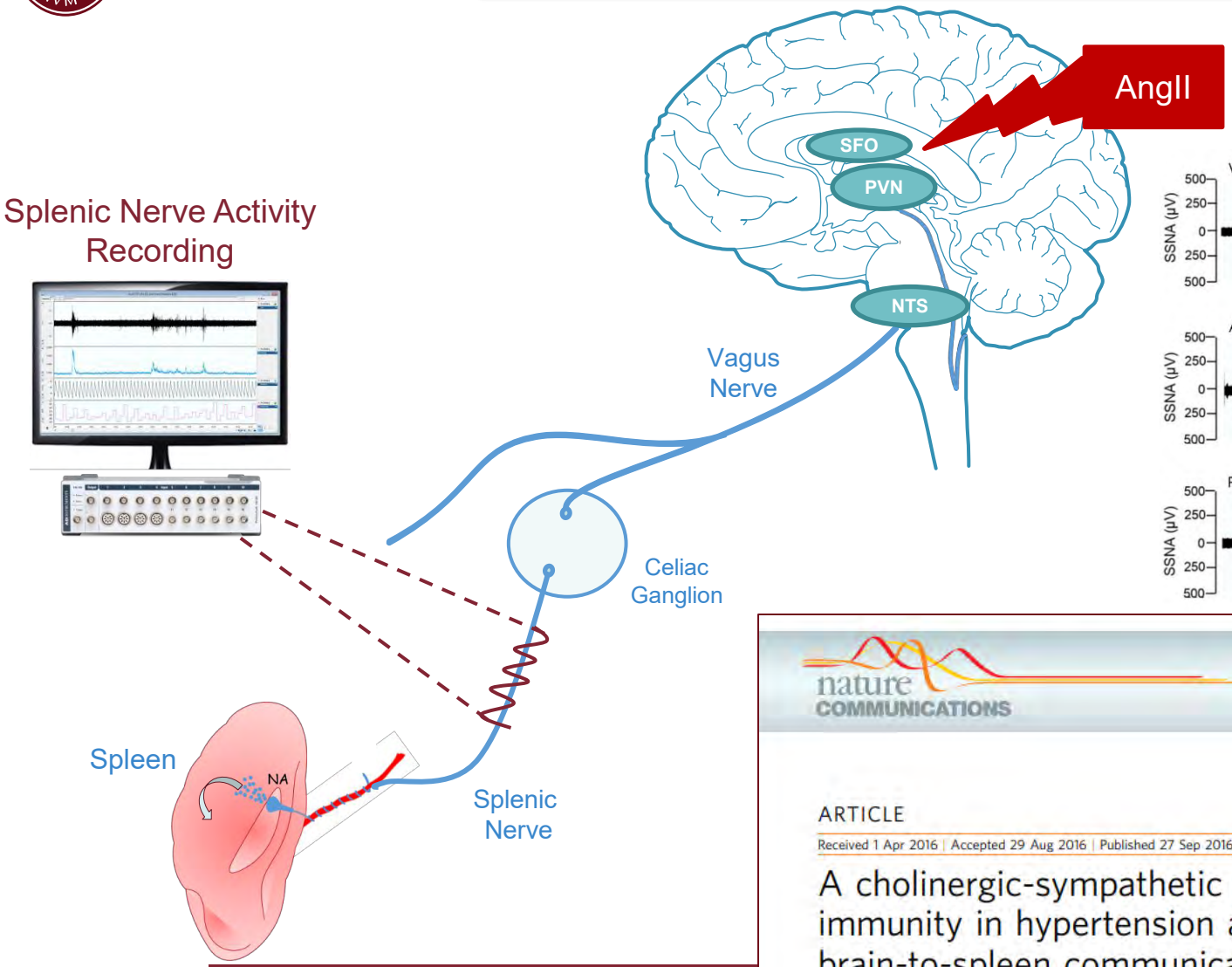
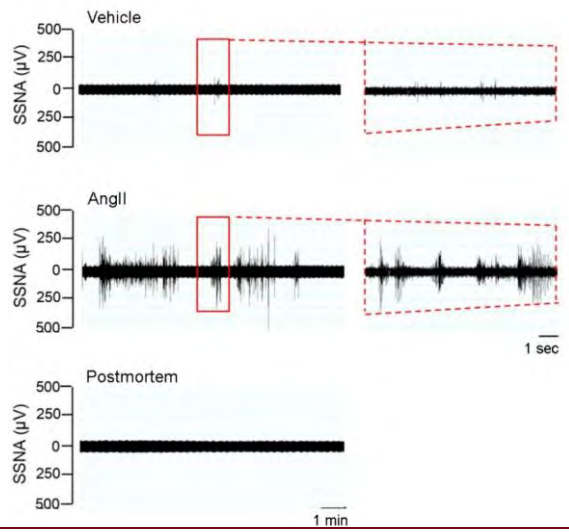
Milestone Paper showing a functional brain-to-spleen connection activated by hypertension and necessary for blood pressure increase



Hypertensive challenges



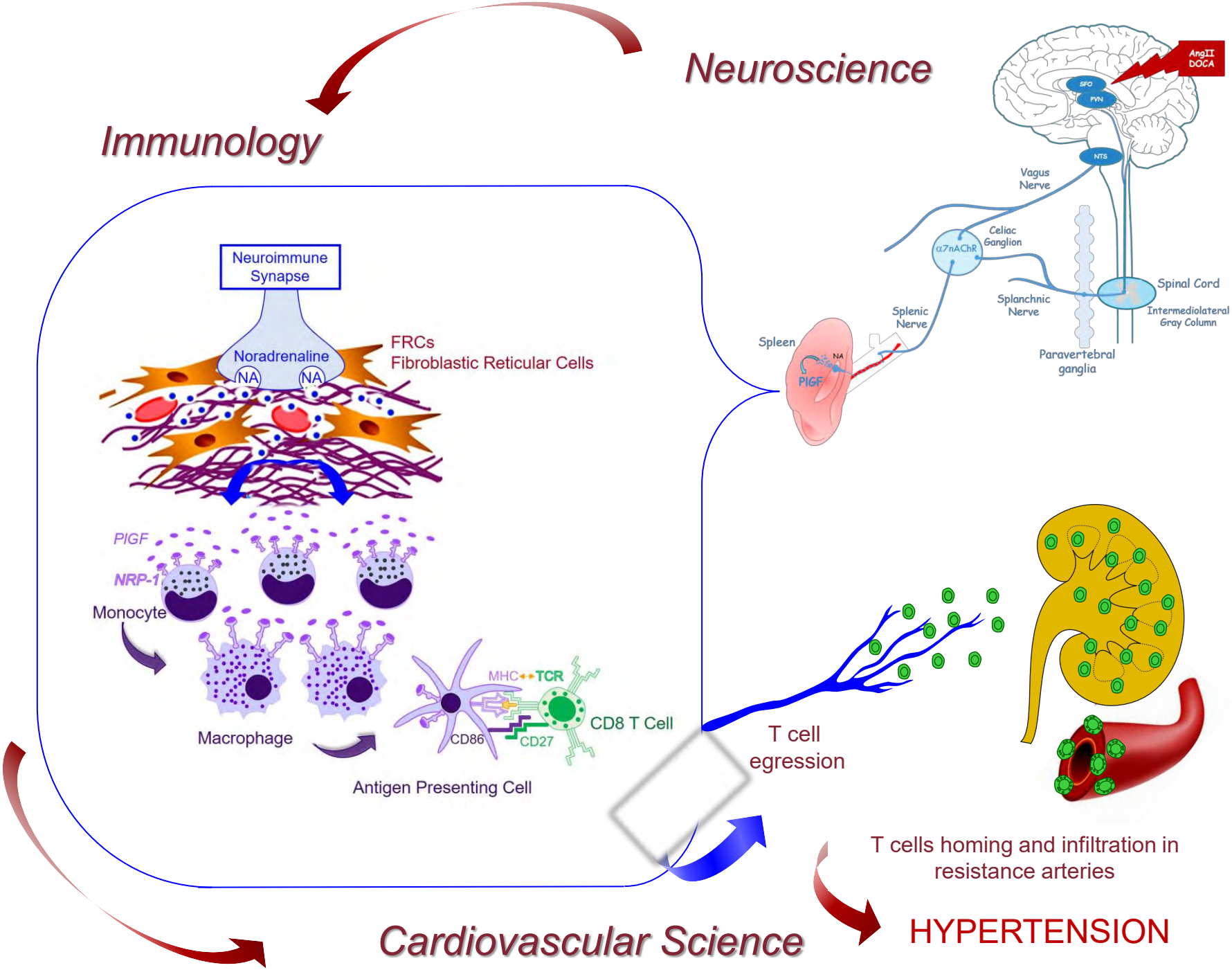
nature COMMUNICATIONS

ARTICLE

Received 1 Apr 2016 | Accepted 29 Aug 2016 | Published 27 Sep 2016 DOI: 10.1038/ncomms13035 OPEN

A cholinergic-sympathetic pathway primes immunity in hypertension and mediates brain-to-spleen communication

Daniela Carnevale[1,2], Marialuisa Perrotta[1], Fabio Pallante[1], Valentina Fardella[1], Roberta Iacobucci[1], Stefania Fardella[1], Lorenzo Carnevale[1], Raimondo Carnevale[1], Massimiliano De Lucia[1], Giuseppe Cifelli[1] & Giuseppe Lembo[1,2]


Neuroscience
Immunology
Neuroimmune Synapse
Noradrenaline
NA
NA
FRCs
Fibroblastic Reticular Cells
PIGF
NRP-1
Monocyte
Macrophage
MHC
TCR
CD86
CD27
CD8 T Cell
Antigen Presenting Cell
AngII
DOCA
SFO
PVN
NTS
Vagus Nerve
Celiac Ganglion
α7nAChR
Splanchnic Nerve
Spinal Cord
Intermediolateral Gray Column
Splenic Nerve
Spleen
NA
PIGF
Paravertebral ganglia
T cell egression
T cells homing and infiltration in resistance arteries
HYPERTENSION
Cardiovascular Science

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UNIVERSITÀ DI ROMA

Why I applied ERC Grants from a Researcher's Perspective

ERC Grants – Main Criteria to be analyzed by the Applicant

- Substantial Grant - Long-Term Funding program (5 years)
- Ambitious frontier research: High-risk/high-gain
- Investigator-driven/bottom-up: free to identify new opportunities in any field
- One fundamental criteria: Excellence of the researcher and project
- ERC Starting Grant: 2-7 years from PhD

Steps for proposal preparation

1. CV of the applicant and HI
2. Research Project and Acronym definition
3. Presentation for the interview

ERC Grants – Main Criteria of the Peer Reviewers

1. **Principal Investigator**: Potential to become an independent research leader
   - *Quality of research output* (high quality peer reviewed journals, groundbreaking nature of the findings obtained)
   - *Intellectual capacity* and creativity
2. Quality of the proposed **research project**
   - *Ground-breaking* nature of the research (challenges addressed, ambitious aims, transdisciplinary approaches)
   - *Methodology* (rigorous, feasible)
   - Present *alternative strategies* that will ensure to reach you experimental aims

Research awards

- "Istituto Giuseppe Toniolo di Studi Superiori" for studies on Alzheimer's Disease, in 2007;
- Foundation "Roberto Cornelli" for excellent studies presented at the 9th International Conference on Alzheimer "AD/PD" Prague, Czech Republic, 2009;
- Italian Society of Arterial Hypertension for studies on hypertension, XXVII National Congress held in Rome, September 30th – October 3rd, 2010.
- Fellow of the **American Heart Association for scientific merits**, during the AHA Council on Hypertension held in Orlando, 13-16 September 2016

Granted Patents

2010 - **International Patent** in the technological field applied to medicine: "Recombinant melusin fusion protein as pharmacological agent in the treatment of heart pathologies and compositions thereof" (date of deposit: 12 May 2010; number of deposit: TO2010A000397).

Invited presentations

My research work has been presented at different **national and international conferences and meetings.** Among the **invited lectures**, I can quote:

- "Neuroimmune interactions contribute to hypertension". ***American Society of Nephrology*** – Chicago, November 17-20, 2016.
- "Phenotyping cardiovascular and immune systems with ultrasound imaging". 20th Annual Meeting of the ***European Council for Cardiovascular Research (ECCR)***, Garda (VR), October 14-16, 2016.
- "Neuroimmune Interactions in Hypertension". Angiotensin: From Cell Biology and Signaling Networks to Novel Physiological Paradigms and Therapeutics - ***Gordon Research Conference***, February 21-26, 2016.
- "Role of immune system in hypertension". ***Medical Academy of Rome***, June, 5, 2014.
- "Molecular mechanisms of hypertension-induced target organ damage." CERM - ***European Center for NMR in the Life Sciences***, University of Florence, 21 February 2012.
- "Alzheimer-like pathology in a murine model of arterial hypertension. Models of dementia; the good, the bad and the future". ***The Biochemical Society, Cambridge (UK)***, December 15-17, 2010.
- "Role of neuroinflammation in hypertension-induced β-amyloid deposition". Bis10 (***Brain Ischemia and Stroke***), Rome, Italy, October 6-9, 2010.

Research activity

Characterized by a highly **multidisciplinary approach,** reflected by the different topics covered by publications, and mainly concerning the integration of ***immunology, neuroscience and cardiology***. My **research activity** led to **31 publications** in major international peer-reviewed multidisciplinary journals (*Nat Commun, Immunity, EMBO Mol Med*) or in the leading journals **of the subject categories in which I am active** (*Circulation, Hypertension, ATVB, Cardiovasc Res*). Contributing in 20 out of 31 papers as first author or last author, my publication track had the following **bibliometric indices**: *Total IF*: 190; *H-index*: 13

Selected Publications

5 papers (4 First Author / 1 Last Author)
total IF: 68.2
mean IF/publication: 13.6

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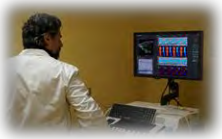
SymPAtHY Research Team

PI
Daniela Carnevale



Post-Doctoral Scientist
Cardiovascular Disease Models

Post-Doctoral Scientist
Neuro/Cardio immunology

Technician
Mouse surgery and in vivo phenotyping

Technician Molecular Biology

Technician Immunology

PhD Student

PhD Student

Technician Surgery/Colonies

Technician In vivo imaging

Technician
Mouse surgery and in vivo phenotyping

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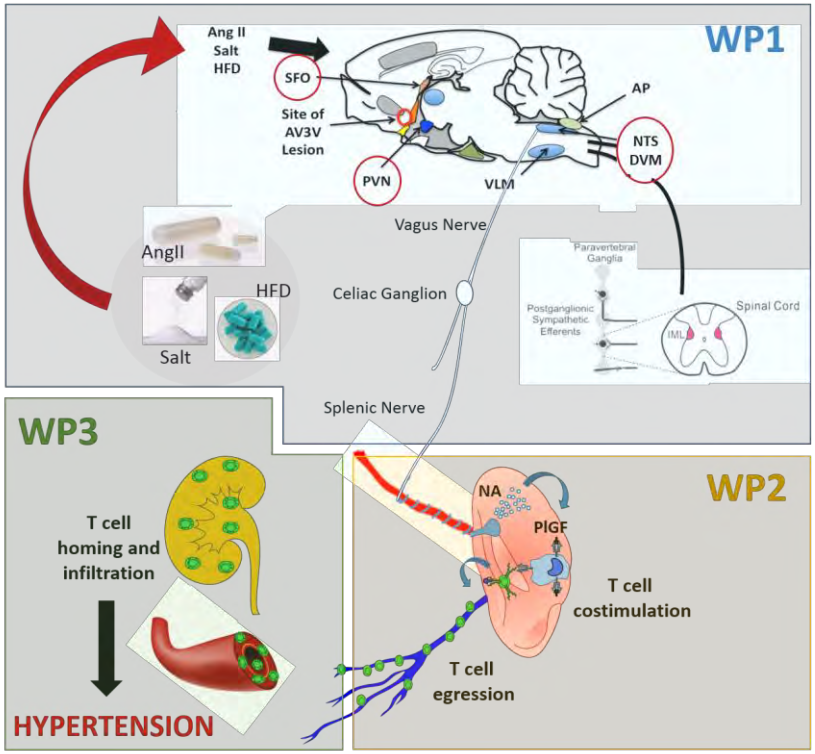
Research Project: questions to be addressed



Where does the brain sense peripheral hypertensive challenges and how does it turn in the activation of the cholinergic-sympathetic vagus-splenic pathway?

Hypothesis WP1

Central nervous system relay stations sense hypertensive challenges to activate immune responses contributing to blood pressure increase.

The spleen acts as a hub connecting nervous signals and immune mechanisms in hypertension. Which are the mechanisms relevant to this neuroimmune connection?

Hypothesis WP2

A nervous signal transmitted by noradrenaline should be converted in the activation of a specific T cell able to egress from the spleen and colonize target organs of increased blood pressure. In this cascade the following steps remain still unexplored.

Despite the increasing evidence of immune cells infiltrating target organs of hypertension, it is still an intricate issue how these cells deal with the “classical” mechanisms regulating blood pressure.

Hypothesis WP3

The use of novel approaches could allow to dissect how T cells directly interact with vascular resistances to increase blood pressure.

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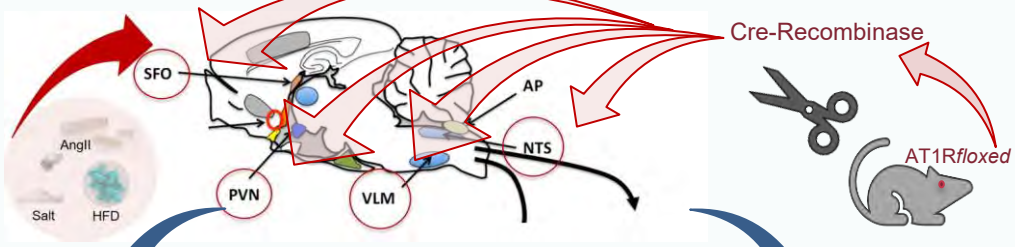
WP1 - Neuroscience

a) Subfornical Organ (SFO)
b) Paraventricular hypothalamic nucleus (PVN)
c) Solitary–vagal complex (NTS/DVM)

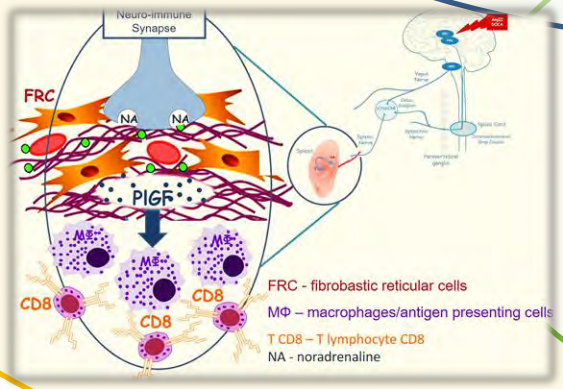


Analysis of the
Brain to spleen Interface

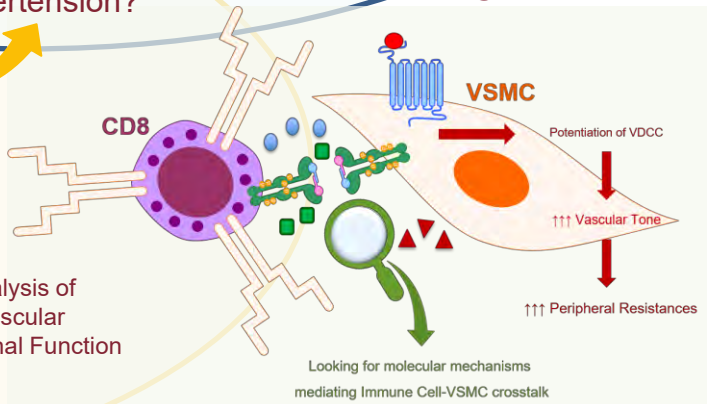
Analysis of
Vascular and Renal Function

Hypertension?

WP2
Neuroimmunology



WP3
Cardioimmunology



Analysis of
Vascular
and Renal Function

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Tips for presentation: Interview phase

Presentation:

- Show something ***understandable***
- Show something ***impressing***
- Show something that entertains (you will only have 10 minutes)
- Show ***what for*** and ***why*** ERC should support your idea
- Show **existing infrastructure** and where you want to build up your proposal and team (Host Institution)
- Show the ***relevance*** of your ***proposal***
- Consider that the ***audience*** (your panel of experts) is composed by scientists with different expertise

Interview: what the Peer Reviewers want to know about your project

1. **Brief background and state of the art**
    - You have to show how your ***project will bring significant step forward*** on the topic proposed

2. **Strengths of the Applicant and feasibility of the project at the HI**

3. Quality of the deliverables you will provide with the proposed **research project**
    - High impact publications
    - Building a ***new research group*** and contribute to the formation of younger investigators

NEUROIMMUNE INTERACTIONS IN HYPERTENSION

SymPAtHY
ERC StG 2017

DANIELA
CARNEVALE

SAPIENZA
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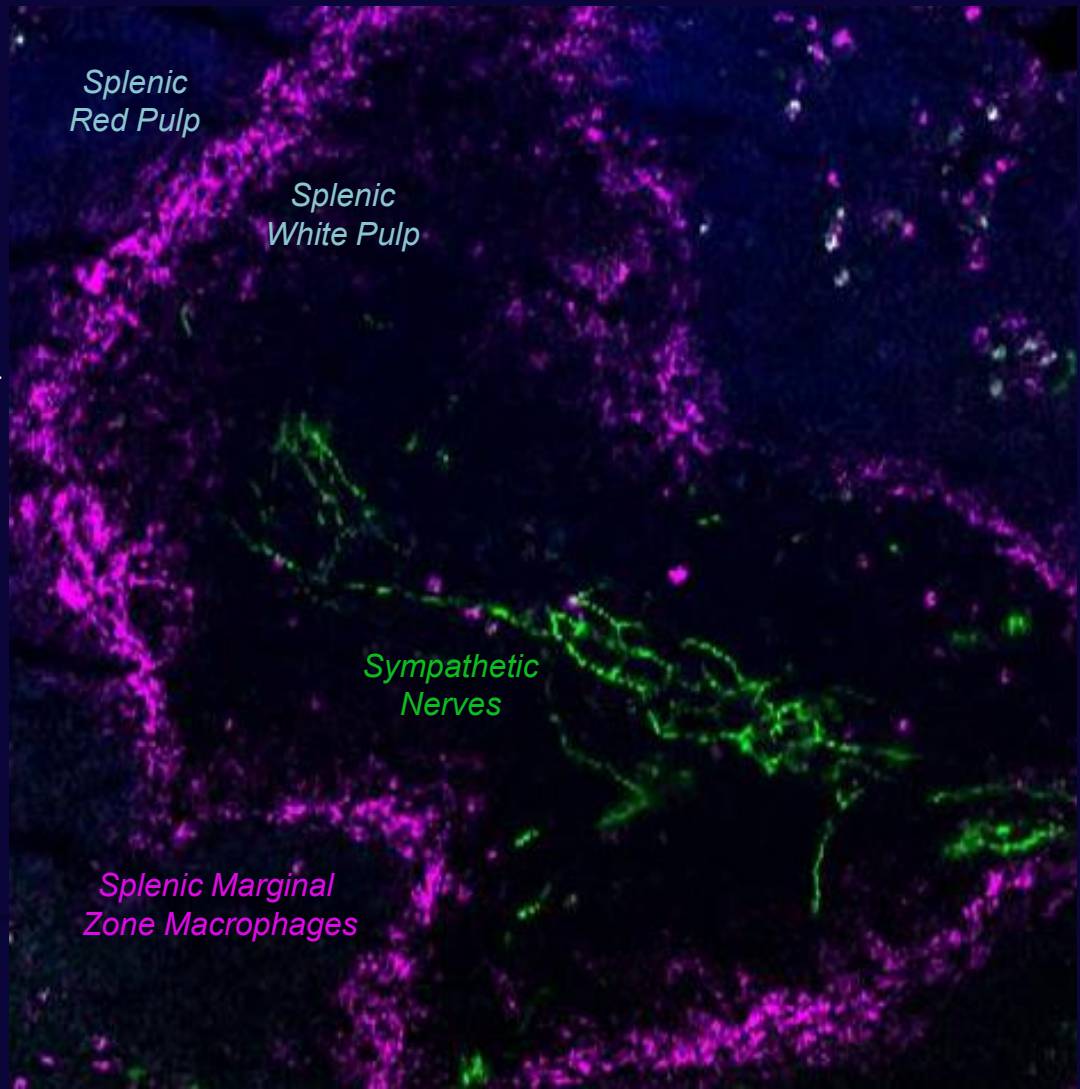
DEPARTMENT OF
MOLECULAR MEDICINE



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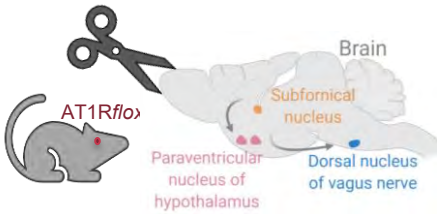
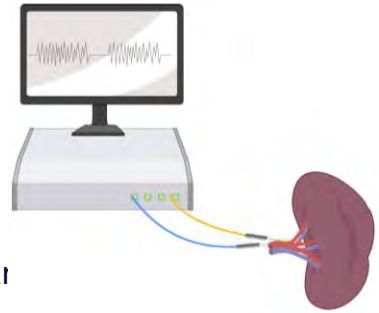
My ERC Experience after 3 years of project's development: the science

Main scientific milestones reached from project's starting December 2017:



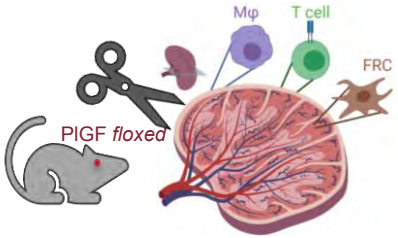


WP1 – Neuroscience

- We have *developed 3 transgenic mice* to study one of the key signaling pathway involved in CVD (Angiotensin II) in the brain.
- We have developed a *unique setup for evaluating in vivo* the activity of *peripheral nervous system* involved in *neuroimmune modulation of cardiovascular function*. This gave rise to a new branch of investigation exploiting *bioelectronic medicine*

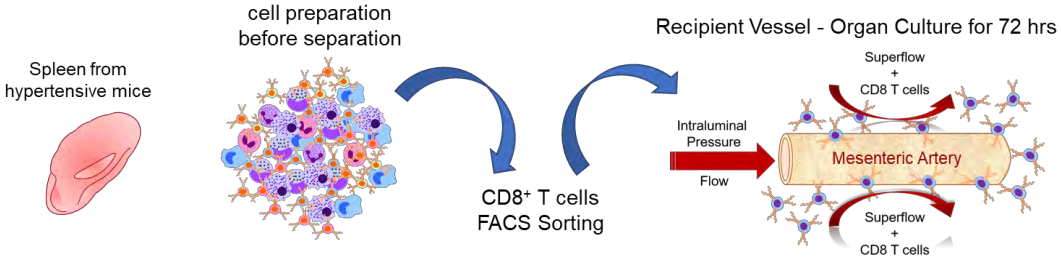
WP2 – Neuroimmunology

- We are developing a *new mouse model to delete* placental growth factor – PIGF - *the mediator of neuroimmune interactions* relevant for CVD *in desired cell types*. This aim was more challenging than expected and we are working at the planned alternative strategy ("importance to have a plan B")
- We have *discovered* how a neural stimulus conveyed in the spleen is able to induce *immunomodulatory mechanisms* relevant for *hypertension*
- We have significantly *increased our know-how in in vivo immunophenotyping* (flow cytometry, FACS sorting, adoptive transfer, etc)



WP2 – Cardioimmunology

- We have developed a *new system to reproduce a 3D vascular-immune interface*, a unique system allowing to address the question of SymPAtHY project but also an invaluable tool for future studies where investigating the crosstalk established between vascular and immune cells might be worthy.
- We have identified a *signaling pathway* that is critically *involved in immune-mediated target organ damage* and might be *targeted for therapy*



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My ERC Experience: scientific output

Main publications:

- Invited Reviews (*Circulation, Hypertension, Cardiovascular Research*)
- Original Articles (*Cardiovascular Research, Cell Reports*)
- Original Articles in collaboration (PNAS)

Circulation

CLINICAL IMPLICATIONS OF BASIC RESEARCH

Heart, Spleen, Brain

Neuroimmune Axis of Cardiovascular Control

Daniela Carnevale, PhD
Giuseppe Lembo, MD, PhD

ESC European Society of Cardiology
Cardiovascular Research
doi:10.1093/cvr/cvy001

Deoxycorticosterone acetate-salt hypertension activates placental growth factor in the spleen to couple sympathetic drive and immune system activation

Marialuisa Perrotta[1], Andrea Lori[1], Lorenzo Carnevale[1], Stefania Fardella[1], Giuseppe Cifelli[1], Roberta Iacobucci[1], Francesco Mastroiacovo[1], Daniele Iodice[1], Fabio Pallante[1], Marianna Storto[2], Giuseppe Lembo[1,3]*, and Daniela Carnevale[1,3]*

[1]Department of Angiocardioneurology and Translational Medicine, IRCCS Neuromed, 86077 Pozzilli, Isernia, Italy; [2]Clinical Pathology Laboratory, IRCCS Neuromed, 86077 Pozzilli, Isernia, Italy; and [3]Department of Molecular Medicine, 'Sapienza' University of Rome, 00161 Rome, Italy

Received 17 May 2017; revised 31 October 2017; editorial decision 3 December 2017; accepted 6 January 2018

Hypertension
Volume 76, Issue 3, September 2020; Pages 622-628
https://doi.org/10.1161/HYPERTENSIONAHA.120.14637
American Heart Association.

REVIEWS

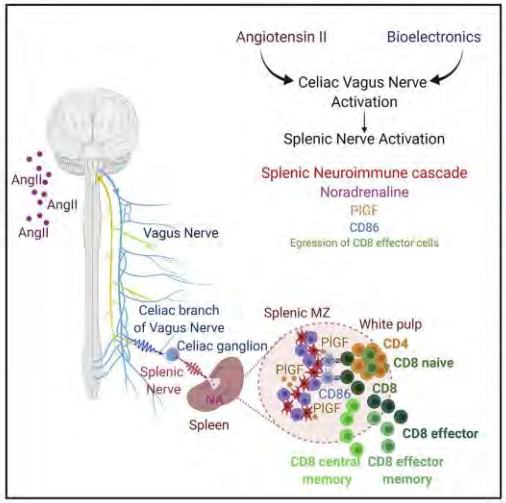
Neural Control of Immunity in Hypertension: Council on Hypertension Mid Career Award for Research Excellence, 2019

Daniela Carnevale

Article
Cell Reports

Celiac Vagus Nerve Stimulation Recapitulates Angiotensin II-Induced Splenic Noradrenergic Activation, Driving Egress of CD8 Effector Cells

Graphical Abstract



Authors
Lorenzo Carnevale, Fabio Pallante, Marialuisa Perrotta, ..., Francesco Mastroiacovo, Daniela Carnevale, Giuseppe Lembo

Correspondence
lembo@neuromed.it

In Brief
Carnevale et al. show that stimulation of the celiac vagus nerve primes an immune response in the spleen, driving selective egress of CD8$^+$ T cells. This is mediated by placental growth factor, whose expression in the spleen is regulated by a α-adrenergic receptor signaling.

PNAS Proceedings of the National Academy of Sciences of the United States of America

RESEARCH ARTICLE

Identification of a brainstem locus that inhibits tumor necrosis factor

Adam M. Kressel, Tea Tsaava, Yaakov A. Levine, Eric H. Chang, Meghan E. Addorisio, Qing Chang, Barry J. Burbach, Daniela Carnevale, Giuseppe Lembo, Anthony M. Zador, Ulf Andersson, Valentin A. Pavlov, Sangeeta S. Chavan, and Kevin J. Tracey

PNAS November 24, 2020 117 (47) 29803-29810; first published November 9, 2020;
https://doi.org/10.1073/pnas.2008213117

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My career development after 3 years of ERC project

Career upgrade

- The ERC project gave me the opportunity to have a ***direct upgrading*** to the position of ***Full Professor*** (March 2020)

Awards/Honours

- ***Appointed by the Ministry of Health*** as one of the 5 ***Under 40 Young Italian Scientists*** Member of the ***National Committee for Health Research*** (CTS of the Italian Ministry of Health).
- ***2019 recipient*** of the ***Hypertension Mid-Career Award for Research Excellence,*** selected by the ***American Heart Association's Council on Hypertension*** recognizing a mid-career investigator who has significantly contributed to understanding of the causes of hypertension and related cardiovascular disease. Award and Lecture presented at the American Heart Association's Hypertension 2019 Scientific Sessions (New Orleans, Louisiana, Sept 5-8, 2019).
- ***Appointed as Associate Editor of Cardiovascular Research*** (journal of the European Society of Cardiology, IF 8.168)

Invited Lectures

- More than ***10 invited lectures*** at Gordon Research Conferences, European Society of Cardiology, Bioelectronic Medicine Summit, etc…
- Invited as ***opinion scientist at the NIH*** "Neural Control of Hematopoiesis: a Virtual Workshop" October 30, 2020, presenting on the "Neural control of immunity in hypertension".
- Invited as ***visionary scientist*** at the "Janelia Workshop on Cellular Mechanisms of Brain-Body Interactions, Feb 25-26, 2021", to build the program of recruitment for a new research area of the ***Howard Hughes Medical Institute*** on "4D Cellular Physiology".

Collaborations/New Projects

- Our group consolidated ongoing ***international collaborations*** and started new ones. This was particularly important to further foster our granting sources and enlarge the team.
- I was granted with two ***Eranet-CVD projects*** (NemoImmune-againstHF and GutBrainImmuneHHD) in collaboration with investigators in Germany, Canada, Poland.
- I was granted by the Italian Ministry of University and Research with a ***FARE-MIUR*** (HyperImmuneSeq) research grant.

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Challenges faced during my ERC project development

Challenges:

1. Scientific
   - ***Technical challenges*** **>** *plan to have different experimental strategies to answer project's questions*
   - ***Failure*** *of planned experiments* **>** *have a plan B ready to go*
2. Recruitment
   - *Start to* ***interview*** *PhD students/PostDoc candidates that could join your team, soon after funding notification*
3. Handling Administrative procedures and bureaucracy
   - *If your project is based on* ***animal experimentation****, you will need the Italian Ministry of Health* ***Authorization*** **>** *start to prepare documents for application to the Italian MoH Veterinarian Office and consider* ***that it will take months*** *to have the process done.*
   - *Often the* ***activities planned by your Gantt Table*** *(that is based on scientific assumption of project's needs and feasibility) will be* ***continuously challenged by the timeline of administrative procedures****. While you will not be able to overcome the delays posed by bureaucratic issues, you will have to handle project's aims development, staying on time as planned.* **>** *This is not easy and I did not find a solution to this challenge yet.*

Nonetheless, you will

- ✓ upgrade your career
- ✓ have money to perform breakthrough experiments and publish top papers
- ✓ foster new collaborations
- ✓ enlarge your research team and provide younger investigators a good environment for their career

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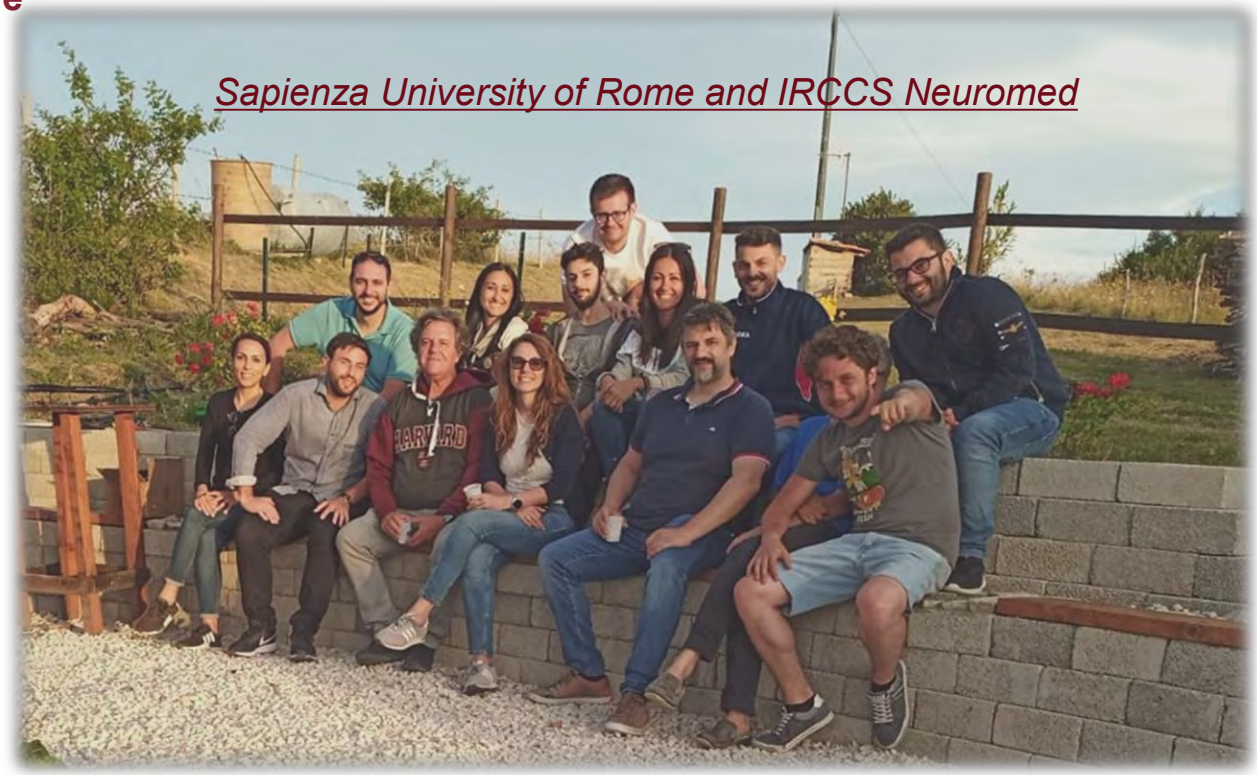
Daniela Carnevale

SymPAtHY Team

PostDoc
Marialuisa Perrotta
Sara Perrotta

Lab Technician
Raimondo Carnevale
Stefania Fardella
Daniele Iodice
Fabio Pallante

Project Manager
Valeria Berardi



Grants

erc Starting Grant 2017 — Principal Investigator SymPAtHY grant n. 759921

ERA CVD JTC 2018 "NEMOIMMUNE against HF"

ERA CVD JTC 2019 "GutBrainImmuneHHD"

Ministero della Salute

ISTITUTO PASTEUR FONDAZIONE CENCI BOLOGNETTI LA RICERCA IN PERSONA

FARE RICERCA IN ITALIA

MIUR

Collaborators

Giuseppe Lembo (Sapienza University)

PostDoc
Lorenzo Carnevale
Giuseppe Cifelli
Angelo Maffei

Lab Technician
Valentina Fardella
Pietro Iodice
Francesco Mastroiacovo

International Collaborators

Matthias Nahrendorf (Harvard University)
David Harrison (Vanderbilt University)
Tomasz Guzik (Glasgow University)
Andreas Habenicht (University of Munich)
Slava Epelman (Toronto University)