



EUROPEAN UNION

HORIZON  
EUROPE

#HorizonEU

THE EU RESEARCH & INNOVATION  
PROGRAMME  
2021 - 2027

# Horizon's ERC funding scheme: from the applicant's viewpoint

Mariya Shamzhy



[Physchem.cz](http://Physchem.cz)

Dpt. of physical and macromolecular chemistry



# Did I win or lose?

*“Sometimes when you win, you really lose. And sometimes when you lose, you really win”*

*Rosie Perez*

## Step 2 Evaluation Report

### CONFIDENTIAL

<b>Call reference</b>	ERC-2020-STG
<b>Activity</b>	Starting Grant
<b>Funding scheme</b>	ERC STARTING GRANTS
<b>Panel name</b>	PE5
<b>Proposal No.</b>	950193
<b>Acronym</b>	ENforCE
<b>Applicant Name</b>	Mariya SHAMZHY
<b>Title</b>	Nanoscale-to-atomic Engineering of acid site for selective heterogeneous Catalysis

### PANEL SCORE AND RANKING RANGE

<b>Final panel score:</b> A (fully meets the ERC's excellence criterion and is recommended for funding if sufficient funds are available)	<b>Ranking range*:</b> 53%-55% For your information, only the top 36% of the proposals evaluated in panel PE5 in Step 2 were funded.
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\* Ranking range of your proposal out of the proposals evaluated by the panel in Step 2, in percent, from 1% for the highest ranked proposals to 100% for the lowest ranked.

***While not funded by ERC, my project ENforCE was fully supported within national ERC\_CZ program***

# National analogues of ERC vs regular ERC

- Long-term support of a research topic of your choice 5-year grant
- Building the research team reasonable budget



Funding scheme	Eligibility	Success rate, %	Budget
Starting	2-7 yrs. after PhD	11 – 14	≤ 1.5M €
Consolidator	7-12 yrs. after PhD	12 – 14	≤ 2.0M €
Advanced	-	10 – 14	≤ 2.5M €



Funding scheme	Eligibility	Success rate, %	Budget
Junior STAR	8 yrs. after PhD	9 (2020)	≤ 1M €
EXPRO	“seasoned scientists”	17 (2019)	≤ 2.1 M €

<https://vedavyzkum.cz/granty-a-dotace/granty-a-dotace/jaka-je-uspesnost-ve-verejnych-soutezich-ve-vyzkumu-a-vyvoji>



Funding scheme	Eligibility	Success rate, %	Budget
ERC_CZ	-A or B in ERC call -Resubmission of ERC in 2 years	<b>100</b>	<b>= ERC</b> 2-years B 5-years A

# Meeting the ERC excellence criterion: starting points

*“How you gather, manage, and use information will determine whether you win or lose.”*

*Bill Gates*

## Information about the grant call

### ERC official website

<https://erc.europa.eu/>

- Eligibility criteria, program objectives
- Profiles of successful applicants
- Abstracts of funded projects....

### Video-classes by ERC

<https://www.youtube.com/playlist?list=PLtv6FnsXqnXAYRk6HCErwMxwMLOZKoMcy>

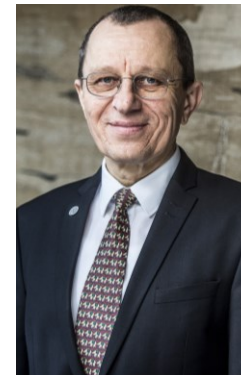
- How to prepare application?
- Evaluation process

## Contact points for ERC at the Faculty of Science

### Following their instructions is important

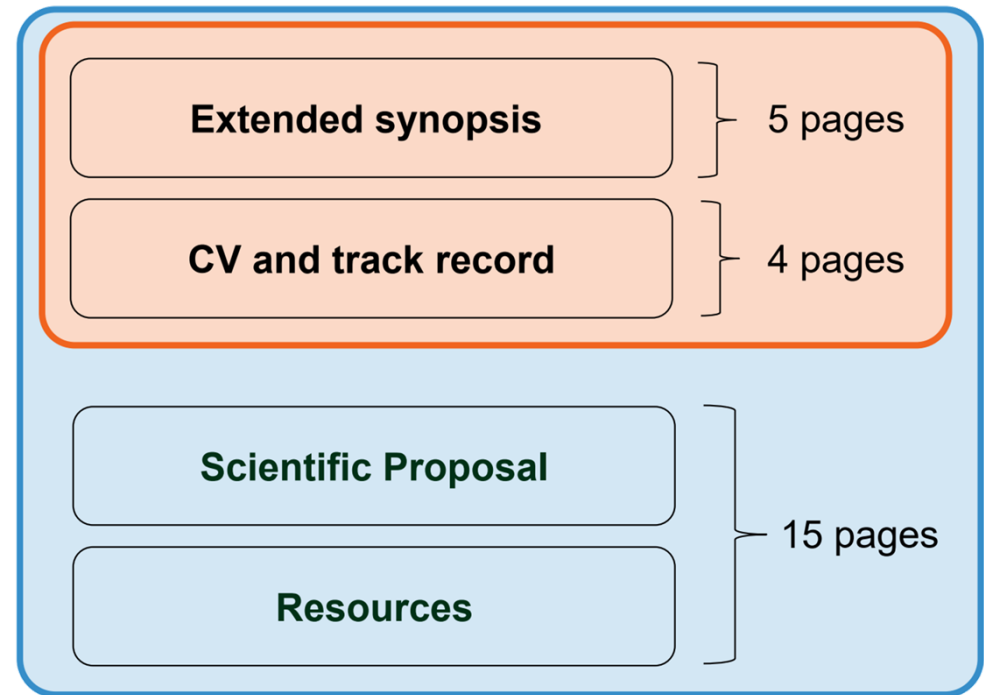
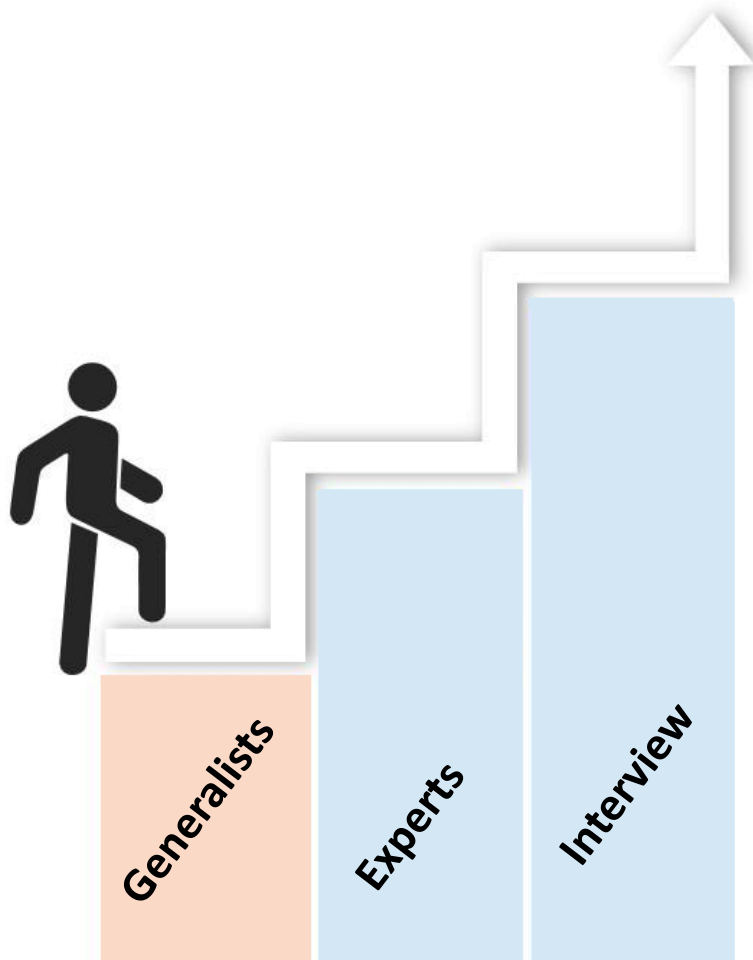
<https://www.natur.cuni.cz/eng/project-management-department/funding-opportunities/erc/erc-pipeline>

- individual consultations
- ERC-related events
- “homeworks” and feedback from ERC evaluators and much more...



# Meeting the ERC excellence criterion: points to consider

**The 2-step evaluation process** with the same criteria (questionnaire at each step)



## ***Proposal***

- ***Understandable for a generalist***
- ***Appealing for experts***

# Meeting the ERC excellence criterion: points to consider

## Reviewer's questionnaire

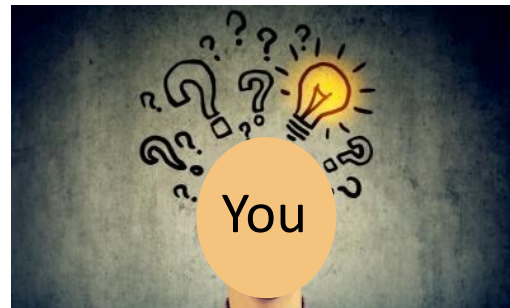
### Research Project

- Ground-breaking nature
- Potential impact
- Scientific approach



### Principal Investigator

- Intellectual capacity
- Creativity
- Expertise



### *Proposal*

- *Presents what reviewers will be looking for*

# Example of a reviewer report

## Reviewer 3

### Research Project

**Ground-breaking nature and potential impact of the research project**  
The proposed research addresses the open challenge of controlling the atomic-level characteristics of active sites for zeolite catalysts introducing a chemo- and regioselective post-synthesis approach exploiting unique features of germanosilicate zeolites.  
The set objectives are ambitious while the proposed research is rated of medium risk although potentially of high gain.

**Scientific Approach**  
The proposed approach is rated feasible bearing in mind the extent that the proposed research is medium risk/high gain.  
The research methodology is novel and the working arrangements are appropriate to achieve the goals of the project.  
  
The proposed timescales are appropriate and well placed. Resources in as far as post-docs and PhDs are well justified although the involvement for three senior researchers with an active engagement need to be better explained be and the request for an EELS /TEM is not convincingly elaborated.

**Principal Investigator** **Exceptional / Excellent / Very good / Good / Non-competitive**

To what extent has the PI demonstrated the ability to conduct ground-breaking research?	Excellent
To what extent does the PI provide evidence of creative independent thinking?	Excellent
To what extent does the PI have the required scientific expertise and capacity to successfully execute the project?	Exceptional

**Comments (Optional for reviewers)**  
Excellent CV for the scientific age. The project witness the capacity of creative thinking. The applicant has the relevant experience and the ambition to go forward.



# Visualization of the idea. Structure of the proposal

## Reserve enough time for making your proposal “reviewer-friendly”

- Provide the information, which they are looking for in specific sections
- Follow the template as much as possible
- Avoid excessive words
- Make important things visible and easy to get

Mariya V. Shamzhy

Part B1

ENforCE

Accordingly, major breakthroughs in the field have highlighted the key role of “atomic” characteristics (i.e., *confinement*,<sup>16</sup> *pairing*<sup>14, 17</sup> and *molecular connectivity*<sup>15, 18</sup>) of acid sites on the activity of zeolite catalysts. The concept of site confinement (i.e., location in micropores of different sizes, Figure 1) has been pioneered by Prof. Iglesia,<sup>19</sup> who demonstrated that only specific parts of a given zeolite structure are catalytically active as specific transition states must be appropriately stabilized in the zeolite void through spatial constraints to ensure catalytic activity.<sup>20-22</sup> Furthermore, the distribution of framework Al atoms (act as independent catalytic sites, Figure 2) and paired (act in concerted manner in particular reactions, Figure 2) configurations has been recently recognized to determine zeolite activity and selectivity in some of industrially relevant processes (e.g., methanol-to-hydrocarbons,<sup>14, 23</sup> propene oligomerization,<sup>24-25</sup> alkanes cracking,<sup>26</sup> among others). Therefore, overlooking “atomic” characteristics when designing zeolites inherently limits atom efficiency of a catalyst.

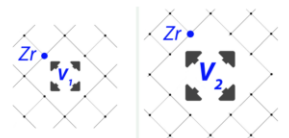


Figure 1. Framework metal atoms differing in confinement

In contrast to aluminosilicates, hydrophobic Lewis acid zeolites (i.e., Ti- and Sn-substituted silicates) are exceptionally active heterogeneous catalysts in a number of liquid-phase catalytic transformations of bio-renewable compounds.<sup>27</sup> However, they typically have several structurally distinct configurations of metal sites (i.e., “open” and “closed” centers, Figure 3),<sup>28</sup> only some of which are catalytically active in a targeted chemical process. In particular, the number of “open” (SiO)<sub>3</sub>T-OH sites correlates with the rates of (1) epoxidation of alkenes over Ti-substituted zeolites,<sup>29</sup> (2) Baeyer-Villiger oxidation of cyclic ketones and glucose-to-fructose isomerization over Sn-substituted zeolites<sup>15, 18, 30</sup> and (3) Meerwein-Ponndorf-Verley reduction of cyclic ketones over both Sn- and Zr-substituted zeolites,<sup>28</sup> whereas the number of “closed” Sn-sites ((SiO)<sub>2</sub>Sn) correlates with the rate of aldol

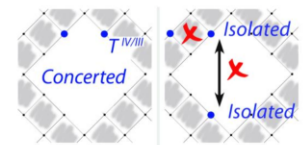


Figure 2. Framework metal atoms differing in pairing

condensation.<sup>28</sup> Thus, the ratio between “open” and “closed” sites of Lewis acid zeolites can be easily detected **but not controlled** using available synthetic methods, which precludes catalysts tunability.

Based on the above, I hypothesize that not only *confinement*, *pairing* and *molecular connectivity* but also the *local geometry* (set of interatomic distances and respective angles for atoms in specific crystallographic positions, Figure 4) of framework metal atoms govern the activity and selectivity of zeolite catalysts.

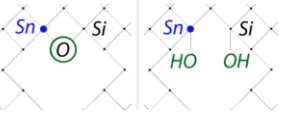


Figure 3. Structurally distinct configurations (molecular connectivities) of Sn sites proposed in the literature

Although conventional hydrothermal synthesis and post-synthesis approaches are excellent tools for tuning the chemical composition of zeolite catalysts, they are still unable to control “atomic” characteristics of acid sites.<sup>14-15, 17</sup> Accordingly, **in this project, I will address the aforementioned challenges facing zeolite chemistry** by going beyond conventional “nanoscale” engineering of acid sites and venturing into new frontiers in materials design – manipulating metal atoms in zeolite frameworks with atomic precision.

### 2. Research proposal

I propose controlling the “atomic” characteristics of acid sites (i.e., *confinement*, *pairing*, *molecular connectivity* and *local geometry*) through chemo- and regioselective post-synthesis approach, which is based on the following well-known, but yet unexploited features of zeolites:<sup>31</sup>

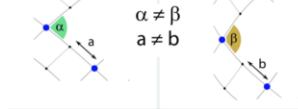
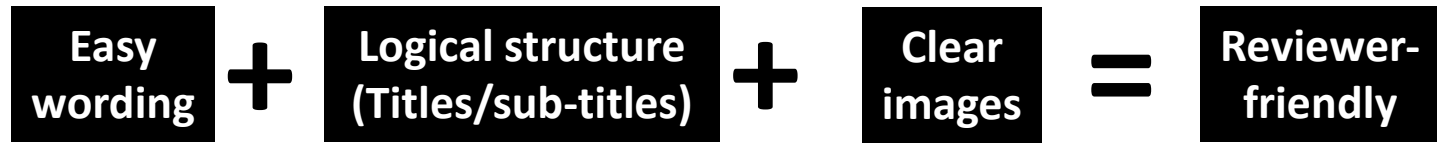


Figure 4. Framework metal atoms differing in local geometry

- 1) Ge atoms are preferentially located at T-sites, corresponding to the double-four ring (D4R) units in zeolite frameworks (Figure 5).<sup>32-34</sup> Ge was confirmed (i) to induce the formation of D4R units at the beginning of crystallization (as shown by electrospray ionization mass spectrometry), (ii) to accelerate the crystallization of zeolites, containing D4Rs (by kinetic studies of zeolite crystallization) and (iii) to stabilize such structures (by computational modelling studies). In contrast, the random location of framework B and Al atoms precludes us from fine-



# Preparation of ERC Proposal in short



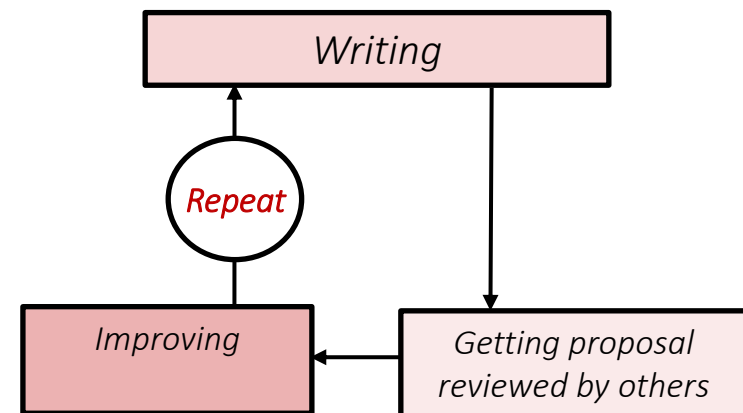
- Examining and following the instructions of ERC program
- First drafting CV and track record not to leave them for the last moment  
*Am I competitive? Is it right time to apply for ERC?*
- Writing the whole proposal (B2) than the extended synopsis (B1)  
*Similar like preparing the article*
- Spend time on planning your needs, clearly reflected in the budget  
*Evaluated at the 2<sup>nd</sup> step*

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*“Perfection is not attainable, but if we chase perfection we can catch excellence.”*

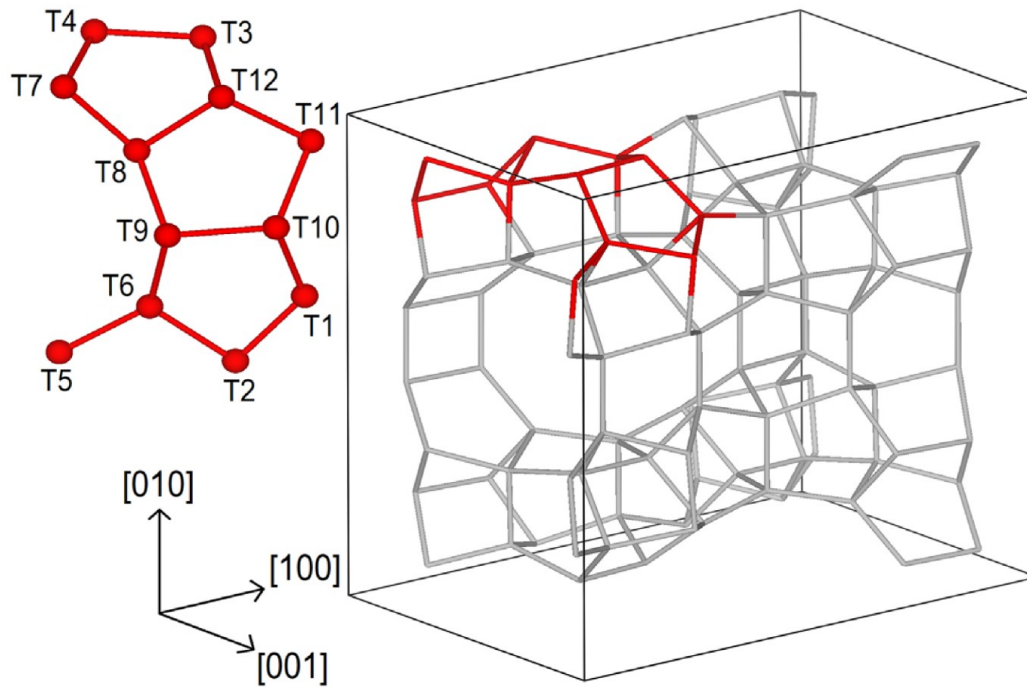
*Vince Lombardi*

- Not only re-writing  
**BUT**
- Rethinking / reshaping the idea  
*in line with high risk / high gain philosophy of ERC*



*Meeting the ERC excellence criterion starts with an idea...*

**Important  
functional  
material**



**Controllable** chemical composition

**Uncontrollable** positions of atoms in the structure

**My idea:** super-efficient materials by controllable positioning of atoms

**Is it ground-breaking and high gain?**

**Is it risky, but still feasible?**

## B1&B2: addressing hard question #1

### Why is my idea high-gain?

#### ERC

- Major breakthroughs, taking the field **considerably** forward
- Disruptive to other fields of research

#### NOT ERC

- Publications / dissemination
- Mainly applicative
- Steppingstone, which requires additional research to achieve significant gain

**To address the key problem, answer the following questions:**

**What would happen** if the project successfully achieves its objectives?

What would **the field of research**, or the world, then look like?

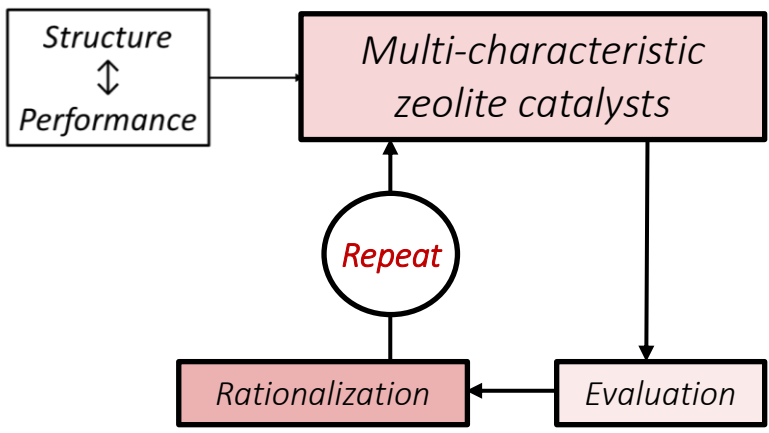
Will the project generate **new valuable scientific knowledge**?

How will this knowledge **impact the field**?

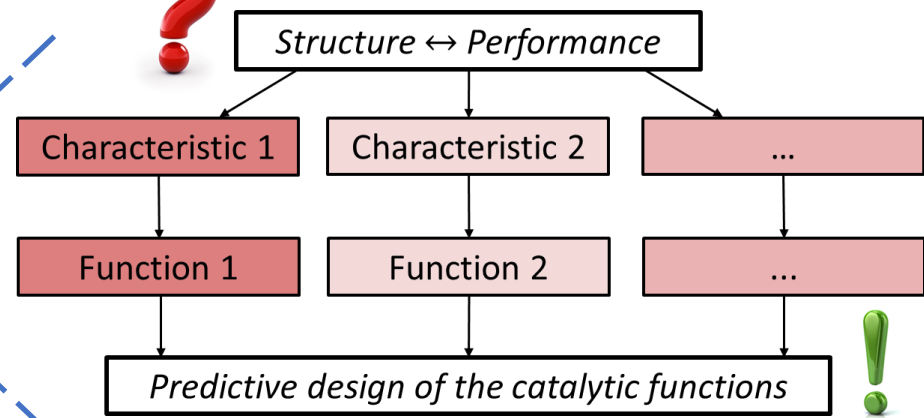
# B1&B2: addressing hard question #1

Why is my idea high-gain?

How did I address this question in the proposal?



Current trial-and-error approach



New "divide-and-conquer" research strategy

Shift in the experimental paradigm for zeolite chemistry

- ... truly innovative synthetic strategies will boost the field and provide important fundamental and practical knowledge
- ...will help to address the long-standing structural problem of zeolite catalysis
- ...new concepts will be applicable in a wide variety of fields ranging from material sciences, inorganic chemistry, catalysis and chemical engineering
- ...will deliver new mechanistic concepts and help to push forward the industrialization of more sustainable and green chemical conversions
- There are many open scientific questions that will be addressed in this project and that make it so exciting and innovative

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■ The work is groundbreaking but to only focus on the most traditional materials, zeolites, will limit the scientific impact.

## *B1&B2: addressing hard question #2*

*Why is my project high-risk, but feasible?*

### **Conceptual risk**

*(high)*

*Research is based on  
-far-reaching assumptions*

*-preliminary result-based  
ambitious **scientific hypothesis***

### **Methodological risk**

*(low)*

*Realistic and detailed **methodology***

***Preliminary results***

*Clear **workplan***

*Well-justified **budget***

*(Needed resources, available resources)*

***Risk mitigation plan***

***My hypothesis:** sub-nm control significantly improves the performance of the materials*

***The risk is that the hypothesis can be proven right or wrong and the answer will be found only after the research is done***

- The project is of high risk/high gain. The experience of the applicant gives confidence that goals of importance will be reached
  - ...contains medium to high risk parts...The risk is mitigated by including several design approaches...and the strong background of the PI
  - rated of medium risk although potentially of high gain
  - the risks ... are very high while if successful the impact is expected to be quite good at the fundamental level
  - ... good balance between preliminary results, yet leaving enough questions open
  - Risk analysis is well discussed
- 
- ... this task is far of being trivial
  - I see no evidence that the expertise is available in the group for CS-corrected EM
  - Little detail is given in the catalytic evaluation
  - ...if there are preliminary synthesis results about the de-germanation, there is no first evidence of a successful metal precise substitution.



# CV and track record

**Ground-breaking  
nature**

**Low methodological  
risk (feasibility)**

**High  
conceptual risk**



**PI Profile**

## **Intellectual capacity**

- *Publications*
- *Awards*

## **Scientific expertise**

- *Publications*
- *Grant history as PI*
- *Supervising students*
- *Invited lectures*

## **Independence / Creativity**

- *Grant history as PI*
- *Collaborations*
- *Corresponding authorship*
- *Group leader*

# My CV and track record

**Ground-breaking nature**

**Low methodological risk (feasibility)**

**High conceptual risk**



## PI Profile

### Intellectual capacity

- Publications
- Awards

### Scientific expertise

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- Grant history as PI
- Supervising students
- Invited lectures

### Independence / Creativity

- Grant history as PI
- Collaborations
- Corresponding authorship
- Group leader

*Objectively*

*Independence: team member, leading small grants with a couple of students*

**Grants:** 2 GACR grants as PI

**Awards:**

2020 – Dean’s Award

2017 – Werner von Siemens Award

**Publications:**

54

1<sup>st</sup> author: 14

Corr. author: 14

h-index: 18

**Supervised students:** BSc: 2; MSc: 2 (1 defended) PhD: 1 Visiting associates: 3

*Research environment-dependent achievements: **tell your story***

## **Independent creative thinking** – independence + creative thinking

(**Exceptional**: 2/9; **Excellent**: 3/9, **Very good**: 3/9, **Good**: 1/9)

- she was able to build an independent and unique research profile within a community of strong senior researchers working on closely related problems
- the ability to coordinate and guide research students
- PI has started her independent career as seen from her recent publications, grant applications and international collaborations
- The leading role of PI is apparent from the corresponding (and last) authorship on most recent publications
  
- ...in most of the papers, the PI does not appear as corresponding author, suggesting that the PI is not fully independent in her research

**Quality + quantity:**

*Senior/corresponding authorship is preferred*

## **Ability to conduct a ground-breaking research (Excellent: 7/9, Very good: 2/9)**

- ...excellent track record
- ...scientific breakthroughs in previous work documented through a significant number of high impact publications
- involved in several research projects demonstrating her ability to successfully execute this proposed project
- ...a publication list and list of achievements, which would place her among the top 10% of her peer group

***Quality is better than quantity:***

*tell what is important about your publication and about your unique role in them*



European Research Council  
Executive Agency

Established by the European Commission

Brussels, 08 July 2021  
Ares(2021)4248633

Review session: Step 1

Mariya SHAMZHY  
Hlavova 2030/8  
12840 Prague  
Czech Republic

Dear Dr. SHAMZHY,

**Subject: Additional information on the interview**

As announced in our previous communication, please find below additional information regarding your interview.

<b>Applicant name</b>	Mariya SHAMZHY
<b>Applicant address</b>	Hlavova 2030/8 12840 Prague Czech Republic
<b>Evaluation panel:</b>	PE11
<b>Interview date:</b>	14 October 2021
<b>Interview slot:</b>	08:40 - 09:50 Brussels time

## **Annex I: Specific requests from Panel PE11**

**Interview format and any other panel specific comments about your interview:**

The panel will ask you to make a **5 minutes presentation** of yourself and your proposal, followed by **20 minutes of questions and answers**.

These time limits will have to be strictly followed.

# Interview

*“If I had more time, I would have written a shorter letter”*

*Blaise Pascal*



## 1. Short presentation (5 min)

- Strictly follow the instructions on the duration / slide numbers
- Main message – originality of the project and your capability to lead it  
No PI's CV, team members, etc.  
Don't summarize the whole proposal, it is hardly possible  
Focus on the main idea of the project, gain/risk aspects, feasibility
- Less information on slides is more
- Refresh your presentation skills, practice

## 2. Q&A (20 min)

# Interview

*“With confidence, you have won even before you have started.”*

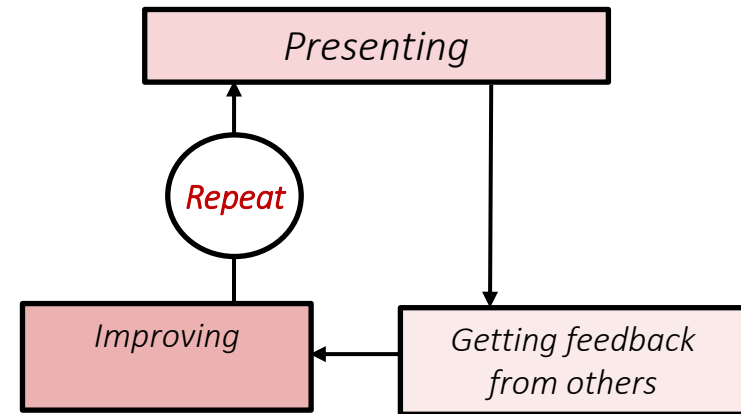
*Marcus Garvey*

## 2. Q&A (20 min)

- Questions by external referees are raised at interview
- Short answers, to the point

### How did I prepare?

- Mock interviews in front of different audience (experts, non-experts, former ERC evaluators/grantees)
- Simulation of different scenario of discussion:  
pleasant / unpleasant, positive/negative, supporting/provocative,  
encouraging/confrontational
- Mental preparation / (try to) be confident





# Summary

***Preparation of the ERC proposal can be totally exhausting even if it is based on appropriate idea.***

***Be ready for laborious process in marathon style to make an excellent proposal outstanding for generalists and experts***

***BUT***

***“When you compete with someone as good or better than you, you may not always win, but you never lose.”***

***Michael Josephson***

***Thank you for your attention and good luck in your grant applications!***