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AGENCY FOR MOBILITY AND EU PROGRAMMES

**Ministry of Science, Education and Sports and the Agency for Mobility and EU Programmes Scholarships on the basis of Bilateral Agreements between the Republic of Croatia and Other Countries**

# FINAL REPORT

# SCHOLARSHIP of the REPUBLIC of CROATIA academic year 2015/2016

This report on your experiences will provide the Ministry of Science, Education and Sports and the Agency for Mobility and EU Programmes with valuable information from which will benefit both future students and researchers and will contribute to the continued improvement of the programme. Please return this report in an electronic format to the Agency for Mobility and EU Programmes via e-mail: bilaterala@mobilnost.hr within 30 days after the scholarship ends.

**Together with the Final Report scholarship holders for the following scholarship types must submit additional documentation:**

**A/1.one semester studies for students of Croatian Language abroad**

- a certificate about a final language exam

**B. undergraduate/graduate studies**

- at the end of the each academic year, latest until 1st October:
  - Certificate about successful enrolment in the next academic year
  - Certificate about acquired ECTS credits
- a certificate about a final language exam (scholarship holders for an initial one academic year for Croaticum)
- a transcript of records or a copy of student identification document (indeks) at mid-semester to present their study progression

## 1. General information

**Your name (family, given): Atanasova Pachemska Tatjana**
**Your gender:** M/F, F
**Subject area of your degree/major: mathematics**
**Your email address:tatjana.pacemska@ugd.edu.mk**
**Name of HOST higher education institution: Faculty of Food Technology and Biotechnology, University of Zagreb**

## 2. Academic quality

**How do evaluate the quality of the professors and other teachers at your host institution?**
scale 1-5: 1=poor/negative, 5=excellent
1 – 2 – 3 – 4 **– 5**

**How do you evaluate the quality of the courses you took and study material you received at your host institution?**
scale 1-5: 1=poor/negative, 5=excellent
1 – 2 – 3 – 4 – **5**

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## 3. Information and support

**How did you get information about the study programme of the host institution?**

Home institution - **Host institution** – Other students- Former participants- **Internet** - Other (please specify): …

**How useful was this information?**

scale 1-5: 1=poor/negative, 5=excellent

1 – 2 – 3 **– 4** – 5

**Did you receive adequate support from your host and home institution before and during your study period?**

scale 1-5: 1=poor/negative, 5=excellent

Home institution: 1 – 2 – 3 – 4 **– 5**

Host institution: 1 – 2 – 3 – 4 – **5**

**Did you receive adequate support from the Agency for Mobility and EU Programmes before and during your study period?**

scale 1-5: 1=poor/negative, 5=excellent

1 – 2 – 3 – **4** – 5

## 4. Your personal experience – overall evaluation of the study period

**Judgement of <u>academic</u> outcome of the study period:**

scale 1-5: 1=poor/negative, 5=excellent

1 – 2 – 3 – 4 – **5**

**Judgement of <u>personal</u> outcome of the study period:**

scale 1-5: 1=poor/negative, 5=excellent

General judgement: 1 – 2 – 3 – 4 – **5**
Intercultural skills: 1 – 2 – 3 – 4 – **5**
Linguistic skills: 1 – 2 – 3 – 4 – **5**
Self-reliance: 1 – 2 – 3 – 4 **– 5**
Independence: 1 – 2 – 3 – 4 – **5**
Self-awareness: 1 – 2 – 3 – 4 –**5**

**Did you encounter any serious problems during the study period?**

Yes / **No**

**If yes, please specify:** ……..

**Overall evaluation of your study period:**

scale 1-5: 1=poor/negative, 5=excellent

1 – 2 – 3 – 4 – **5**

**Other comments regarding your study period in Croatia**:

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**5. Detailed Final Report about the studies or research you have carried out (max 1 page)**

The problem of multiplication of distributions, appeared in the very beginning of the development of the theory of distributions, and as for studying this area, as well as for its application, it is still popular. As it is well known, standard product can not be properly defined in the Schwartz distribution space; this is so called Schwartz impossibility result.

This problem is overcome in the framework of the Colombeau algebra, but still it is not possible to find a weak approximation of Delta distribution so that $\delta^2$ converges in $D'$.

The aim of this study visite was to introduce the "new distribution space" – a distribution space on discontinuous test functions.

We can explain the introduction of such a space of the distribution using the arguments leading to the principle of indeterminacy in quantum physics. Namely, we know that we can detect micro particles only when they interact with some substance or some field. If they do not interact we cannot speak even about their existence and we cannot notice any of their properties. Since all properties of the micro particles are obtained as a consequence of their interactions and not from themselves as independent natural objects, we cannot be sure how they will behave in some situation.

In distribution theory we have similar situation. The distributions can be "detected" only in the "interactions" with some space of test functions. Therefore, their behaviour will depend on the test function space that "interacts" with them. We can agree that the linear properties of the standard distribution space will remain unchanged independently of the test function space while the nonlinear phenomena will change depending on the test function space defining the distributions.

When we say nonlinear properties, we mean the operation of multiplication between distributions defined in an appropriate manner. In the framework of this project we will define multiplication between two distributions analogically with the Colombeau construction. Roughly speaking, that means that we will replace a new distribution f by a family of smooth functions $(f_\varepsilon)_\varepsilon$ which weakly converges toward the new distribution (i.e. $f_\varepsilon \to f,\ \varepsilon \to 0$ where the weak convergence is understood in the "new distributions" sense). Then, we can define the product between the new distributions f and g as the family $(f_\varepsilon g_\varepsilon)_\varepsilon$ where $f_\varepsilon \to f,\ \varepsilon \to 0$ and $g_\varepsilon \to g,\ \varepsilon \to 0$. The approximating families constructed over the "new distribution space" are substantially richer than smooth families approximating the distribution in a standard weak sense and the concept presented in this project allows us to embed $\delta^2$ into $D'$.

This is very important because the theory of distributions can be used to solve problems in different areas of mathematics, such as mathematical physics, theory of ordinary and partial differential equations, harmonics analysis, theory of pseudo differential operators, etc.

This visit was an opportunity to get knowledge about organization and performing teaching process at host institution. Visit (1. 05 – 1. 06. 2016) was also an occation for arrangement of scientific cooperation between faculties.

Stip, 23.06. 2016

Tatjana Atanasova – Pachemska, PhD
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Macedonia