IIP UNIVERSITY OF SOUTH BOHEMIA, CZECH REPUBLIC

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Projects

- Optimal experimental design for FRAP measurements with Stepan Papacek
- Belousov-Zhabotinsky reaction with Anna Zhyrova

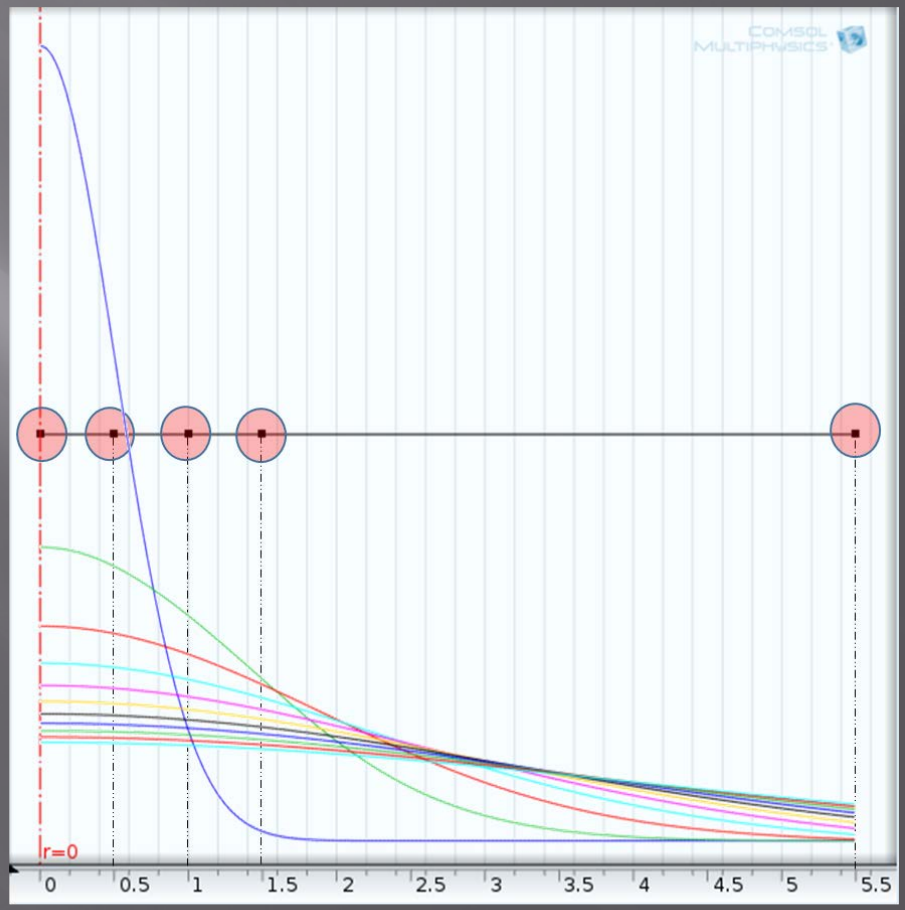
Optimal experimental design for FRAP measurements

OBJECTIVES AND MOTIVATION OF THE PROJECT:

- Use COMSOL as a tool for simulating FRAP experiments (proof of concept)
- Proof of the existence of some optimal bleach radius
- Optimize experimental protocol for the inverse problem of parameter estimation

COMSOL and Problem Formulation

Geometry and bleach profiles over time and space.

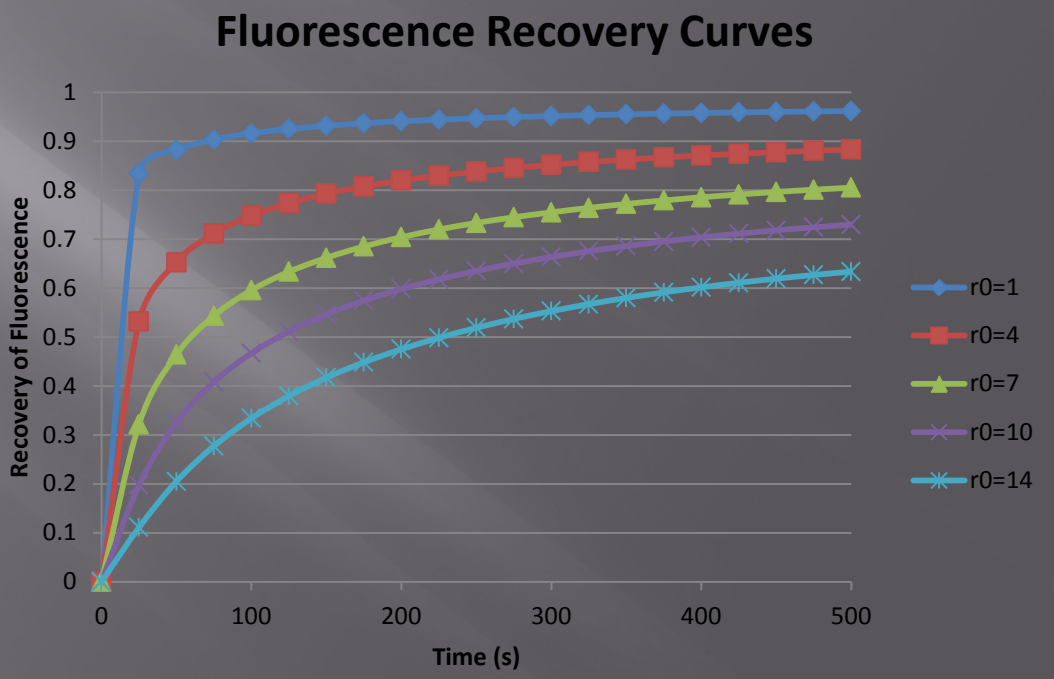


Sensitivity analysis and optimal experimental design

-COMSOL is an appropriate tool for simulating the diffusion processes in FRAP experiments

-Under the model conditions, sensitivity is maximized between a bleach radius of 7 and 10m.

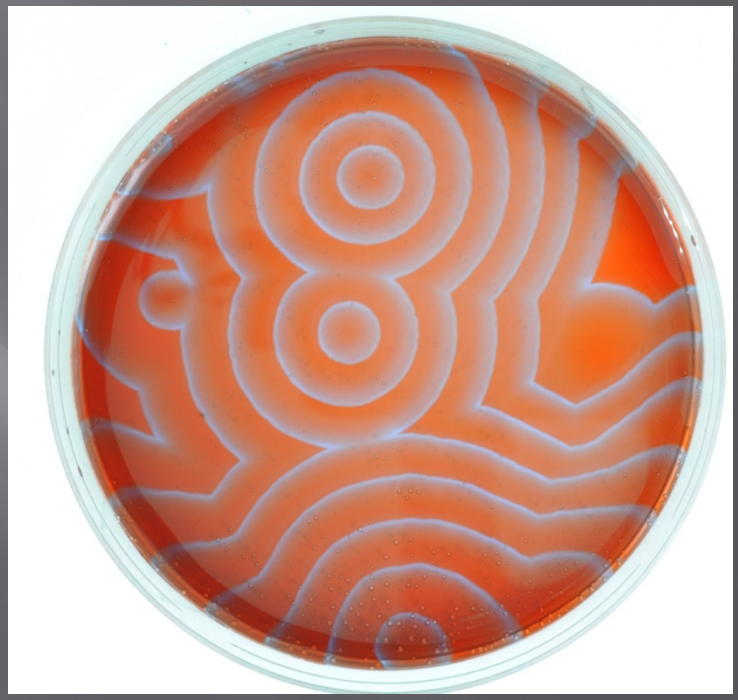
-There exists a maximum of sensitivity and consequently and optimal bleach radius.



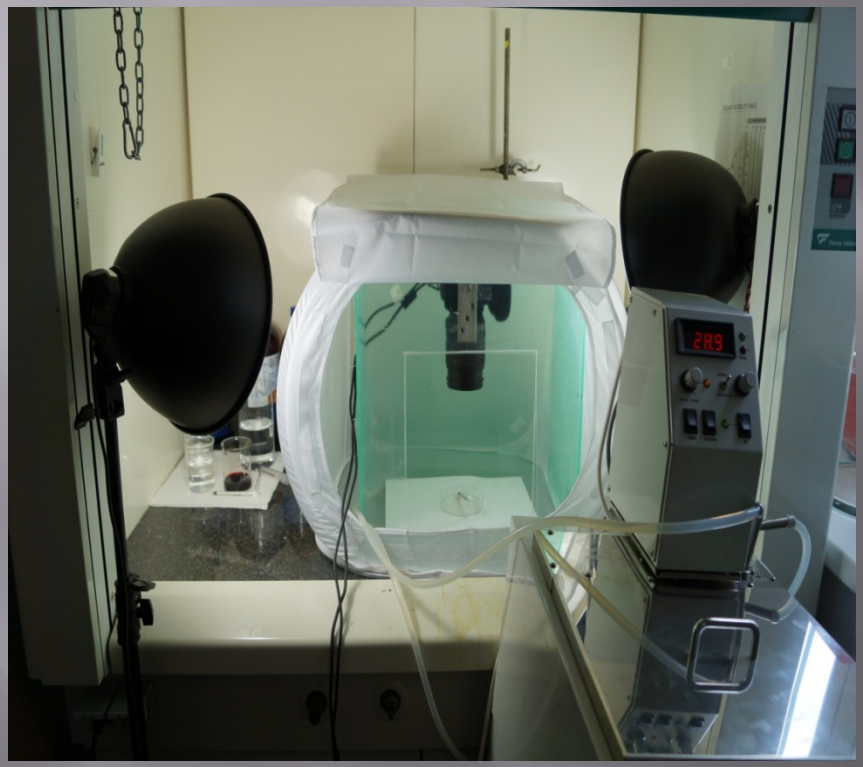
Belousov–Zhabotinsky Reaction

Objective:

Perform a representative series of the Belousov-Zhabotinsky reaction, and observe how changes in temperature, shaking, and Petri dish size and shape affect the pattern formation in the reaction.



Equipment and Experimental Setup



BZ Experiment Conclusions

- There is a long period of time at the end of the reaction with just short waves
- In the square dish the reaction originates predominantly from the corners and edges and we observe more of the wave defects described by pattern formation theory
- There are more points of pattern formation in the large petri dish, due to the volume
- Short waves are first seen at the edges of the dish
- Points of origin have some stable period of wave formation which continues until it is absorbed by another wave
- When a magnetic mixer is used, the reaction reaches short waves more quickly
- Mixing by hand and by Trigon Plus 3D mixer produces similar results

Highlights and Most Rewarding Parts of Experience

- Learning how scientific work is conducted in an international environment
- Working with the BZ reaction
- Traveling, both within the Czech Republic and to other countries
- Having the opportunity to contribute to papers and articles written at the University
- Working with Dr. Stepan Papacek and Anna Zhyrova

What I've taken away from this IIP Placement

- Exposure to research in chemistry and chemical engineering
- I found the BZ reaction very interesting and I would be interested in researching it in future internships or jobs
- First experience studying or working abroad and first time in the Czech Republic
- Thank you to the IIP office and to all sponsors for making this experience possible