**ELTE's program of excellence to increase the capacity in synthetic chemistry and biochemistry: Synthesis+**

In addition to the primary meaning of the Latin *synthesis* word - assembling and uniting - the scientific meaning of the synthesis word is simply to produce more complex (molecule or material). Most of the 2,000 active ingredients in drugs available in pharmacies today are synthetic. However, synthetic chemistry and biochemistry are much more than this, because most of our clothing, equipment, vehicles, and other items of use are a cleverly assembled Lego system of synthetic materials. Therefore, the development and expansion of synthetic, analytical and technological knowledge and capacity is a top priority!

The **direct objective** of the **Synthesis+** excellence program is to develop and expand the synthetic capacity of ELTE TTK. The indirect goal of the program is to strengthen, coordinate and enhance the synergies between colleagues, workshops and communities related to synthetic works, so that we can be more effective in research, more effective in development, focus on some areas of innovation. In the coming years, therefore, we are planning to

- **strengthen, link and network** different synthetic and associated disciplines,

- introduce the practice of competing **cooperation**,

- **catalyze specialty synergy**, and

- promote the collaboration between already successful researchers and their workshops and materially support them.

**Based on their size and chemical nature**, we begin with the development of four research areas such as 1) organic small molecules, 2) oligo- and polypeptides, 3) proteins, and 4) biologicals, covering major areas of domestic drug, fine chemicals and agrochemistry, prepared for a broad-profile cooperation.

1) In the context of the structure-effect relationship (QSAR), we start or continue to develop organic small molecules (e.g. Fluorine mapping). We will work on the synthesis and cost-effective scaling up of naturally occurring bioactivity compounds, potential active agents, and their market exploitation. Furthermore, we solve the design, synthesis and conjugation of skeletal components and fragment-based compounds.

2) We will develop amino acid, peptide, and protein fragment-based active substances as guiding peptides and bifunctional linker libraries for personalized cure and by producing a large number of specific and selective peptide conjugates, we will produce and test radiotherapy and diagnostic (PET, MRI) products in cooperation with external partner institutions (e.g. National Oncology Institute and SE). We develop a new flow-chemical method for efficient and environmentally friendly synthesis of polypeptides.

3) Bacterial expression systems will be developed and optimized for fermentation for the production and isotopic labeling of proteins. We produce key proteins according to research and market needs, we will develop and analyze the active ingredients for certain diseases (e.g. type 2 diabetes, some neurodegenerative diseases, oncogenic and muscle proteins, and a steroid-resistant kidney disease).

4) The development of biosimilars / biologists is a key economic task. Protein-based in vitro drug testing systems and in vivo disease models will be prepared to test potential active ingredients produced in the first 3 panels.

  Many of the scientists and biologists involved in the projects are international

well-known basic researcher, excellent synthetic chemist and biochemist, spectroscopist,

molecular modeler, applied quantum chemist, material scientist, biocompatible and bioactive

molecule specialist as well as researchers with outstanding scientific indicators, prestigious international connections and important international panel players of prestigious domestic and international editorial committees.

The **current form of grants** is open, the work is now starting with the following **pillars**:

a) **Under the thematic program**, the best projects in which 2-3 qualified researchers work together in synergy will receive financial support to solve a new and promising synthetic or related problem.

b) Researchers may receive financial support (time clock accounting) on ​​dedicated equipment (X-ray, NMR, ESR, MS, SAXS, etc.) **on a time-lapse tender** who need measurements to succeed in their synthetic work.

c) In the case of a **tender for the purchase of equipment**, support may be given to research partners who may significantly advance their synthetic work to a max. 6 million Hungarian forints purchase of a research tool.

d) The purpose of the **feasibility program** is to create synthetic works which support the successful preparation of large domestic or international applications and promise significant scientific / development / patent / innovation results.

e) **The aim is also to promote the development of excellence training**, some methods, knowledge and practical learning, and to expand the knowledge base of ELTE. Its form is open, case-by-case evaluation: can be further training, workshop, course, mentor-student program, etc.

In summary, we will catalyze, strengthen and make more efficient the synthetic disciplines where our research team considers it the most necessary. This new opportunity will be developed, partly based on ELTE models and pilot formations (MedInProt / ELTE, HunProtExc / NKFIH, Research Groups / MTA-ELTE, etc.), alongside the development of established and proven structures. We also want to provide an opportunity

- to formulate and start **new research topics**,

- to stimulate **researcher mobility**,

- to enhance effective and efficient **cooperation**,

- to create a XXI. century, synthetic **research environment**,

- to build bridges for the industry, industrial people, etc.

The aim of the Synthesis+ / Level+ is to translate the experiences of previous integration and cooperation projects, the synergy of researchers into the fields of synthetic chemistry, peptide-, protein- and biochemistry, thereby strengthening integration so that we can be more efficient - competitive and successful - in the international arena.

Our goal is to create a research environment in which the importance of patent and *spin off* activities is appreciated, and the importance of industrial relations continues to grow. We hope that this change will have a fundamental impact on the full range of basic and innovative research at ELTE. For researchers and students, new and strengthening areas of synthesis are becoming an attractive and motivating factor. In this way, synthesis will also have a direct link with the social and economic actors and challenges, including in terms of development and innovation. Thanks to the paradigm shift, in the attitude of students leaving our elite university, in their research attitude and knowledge, innovative thinking will be based on a broader foundation after graduation.

The scientific evaluation and monitoring of our internal projects and commitments is done by the **Synthesis+ Scientific Council**, the development, innovation, industrial and economic aspects will be monitored by the **Synthesis+ Innovation Committee**. In both syndicates, prestigious, recognized and outstanding, as well as industry professionals help our work with their advices.

Authorized Leader of Joint Work:

András Perczel

authorized manager