Device for observing large transparent objects

Problem

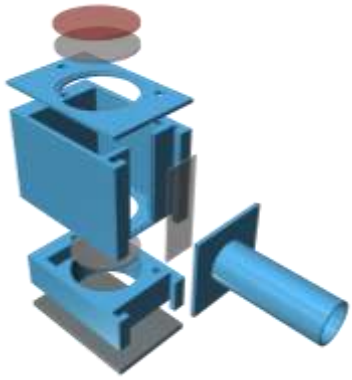
Recently presented concept of the optical tissue clearing was showed to enable high throughput studies of the entire, transparentized murine organs in 3D. However, development of the **light sheet fluorescence microscopy (LSFM)** devoted for visualization of 3D **structure of transparent objects** has been focused on achieving higher magnification and increasing the resolution of the images obtained during tissue scans. Therefore, we aimed to develop LSFM capable of visualizing literally the entire transparent organs. Such invention could find a broad application **in research and academic institutions**. In addition, it can be applied at the **educational level** - biology classes and educational centers or museums where students will be able to easily learn the structure of organs and will undoubtedly become fascinate by the beauty of their complexity.

Solution

Our invention solves the problem of **imaging of the transparent objects in macro-scale**. It enables rapid, precise visualization of both endo/exogenous fluorochromophores and organs' structure, such as bronchial tree, trabeculae or vascularization. Additionally, 3D volumetric reconstructions are feasible with the device, as well as the examination of spatial distribution of elements of your interest.

Visualization of kidney, spleen and 3D reconstruction of heart using our novel device.

Device is the **first-in-class**, novel apparatus enabling the **observation of transparent objects** of **macro-scale biological origin** with the visualization of their **macroscopic structure** without the need for complex optics, while simultaneously displaying their surface and visualizing areas characterized by different optical density.



The device consists of a **vertical movable table** on which is a transparent **cuvette filled with liquid** in which an observed specimen is placed. The cuvette is located between **two polarizers** whose polarizations are relative to each other at **an angle of 90 degrees**, where the first polarizer is between the light source and the formulation and the second is between the formulation and the observer or detection system. The observed object might be illuminated by **laser light** and additional filter and/or optical systems can placed between the preparation and the observer.

In aggregate, the advantage of the developed solution is its **simplicity** allowing the device to be used even **without the need for laboratories**, e.g. in schools.

Our invention has been submitted for **patent protection as PL423173** (2017-10-16).

Our needs

We are looking for **investor and project manager** to help us in product development and commercialization:
Product development: Although the prototype already exists, it still needs some improvements to become **comfortable device easy-to-use for everyone:**
- upgraded automatics, especially connection to stepper motor,
- development of **mobile app** (for smartphone use and remote control) and **camera** of the device.

Expected cost of investor support: 5.000 €
We expect the product to be finalized soon and commercialized within one year – we are looking for the partner with **manufacturing capacity** and expanded **distribution channels.**

Project Core Team

Łukasz Bożycki is a Ph.D. student at Laboratory of Biochemistry of Lipids of the Nencki Institute. Łukasz completed his M. Sc. at Warsaw University of Life Sciences, where he studied Biology. He has published 5 research papers and his research interests concentrate on the early stages of biomineralization with a focus on biogenesis and the function of matrix vesicles from human osteosarcoma cells. Being also a professional photographer, ex-chairman of Polish Society of Nature Photographers', he came up with the initial idea of the setup and contributed to its development at every stage.

Kacper Łukasiewicz is a Ph.D. student at Laboratory of Molecular Basis of Behavior of the Nencki Institute. Kacper completed his M. Sc. at University of Warsaw, where he studied Biotechnology and initialized thriving project "Aspects of Neuroscience". He has published 3 research papers and received patent for "Device and assembly for immobilizing an animal, use of such device and method for immobilizing an animal" (PL410001). His research interests focus on long-term memory. Kacper's contribution involves all forms of engineering.

Paweł Matryba is a medical student from Medical University of Warsaw and he also obtained bachelor's degree in Biotechnology from University of Warsaw. Since 2013 he is involved in projects focused on development and optimization of tissue clearing techniques. Being an intern at Harvard Medical School and Amgen Scholars Europe Programme, he recently contributed to development of novel tissue clearing method called uDISCO and already published 2 research articles in Nature Publishing Group. His active projects are aimed to decipher T-cell mediated immunity within cleared organs of the immune system. In our Team, he is responsible for sample preparation and description of the acquired results.

About Nencki Institute

The Nencki Institute of Experimental Biology of the Polish Academy of Sciences is the largest non-university biological research center in Poland. High quality of research, excellent publication record, and strong international links place the Nencki among the leading biological institutions of Central and Eastern Europe. The main focus of Institute's research relates to novel therapies and diagnostic methods in diabetes, neurodegenerative diseases, neurological disorders, cancer and other diseases of modern civilization. The Nencki Institute also provide a wide range of services including preclinical trials, dermo-cosmetology studies, genetic engineering, transgenic animals production and biological imaging from electron microscopic to MRI levels. We appreciate the existing collaborations and **we are open to new cooperation with industrial entities to bring novel products to the pharmaceutical, biomedical and biotechnological market**.

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