



Reflection

Students' Reflections on 8th Socratic Lectures

Štrbac Aleksandra¹, Ambrožič Janja¹, Barlič Leja¹, Berce Nika¹, Bolte Nuša¹, Čoralić Ajla², Cingere Matija¹, Černigoj Aljaž¹, Dedić Amra¹, Djura Meta¹, Fuks Tia¹, Georgijev Blaž¹, Gosarič Urban², Gril Mirjam¹, Jakše Maruška¹, Japelj Neža¹, Jesenko Petra¹, Keber Pia¹, Klančnik Klara¹, Kne Uma¹, Kozjek Zala¹, Krk Loti¹, Kuselj Klara¹, Lalović Zoja¹, Lazić Leon¹, Lesjak Sara¹, Lešnik Jon¹, Majcen Sandra¹, Malič Sara¹, Marenče Manca¹, Maselj Petja¹, Mesić Alen¹, Mihelič Ajda¹, Miholič Anja¹, Miljkovic Emina², Modrijan Kim¹, Moškrič Lara¹, Oprin Anamarija¹, Ozmec Maja¹, Pikec Tinkara¹, Požgaj Svitl¹, Prelec Tijana¹, Primožič Sara¹, Pristov Alja¹, Puškar Raisa¹, Sok Nika¹, Sovič Maruša¹, Škof Anej¹, Šuštarich Valentina¹, Topolovec Nika¹, Udovč Šink Živa¹, Vaš Taris¹, Zupančič Urša¹, Kralj-Iglič Veronika^{1,*}

Citation: Štrbac A, Ambrožič J, Barlič L, et al., Students' reflections on 8th Socratic Lectures. Proceedings of Socratic Lectures. 2023, 8; 193-196.
<https://doi.org/10.55295/PSL.2023.II24>

- ¹ University of Ljubljana, Faculty of Health Sciences, Ljubljana, Slovenia
² University of Ljubljana, Faculty of Medicine, Ljubljana, Slovenia
 * Correspondence: Veronika Kralj-Iglič; veronika.kralj-iglic@zf.uni-lj.si

Publisher's Note: UL ZF stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2023 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Abstract: Symposium Socratic Lectures is primarily devoted to the students. For 15 years, excellent scientists donate their lectures to the students who are the *agens movens*, for their dedication and interest. The students were actively involved in discussions. Recently developed technologies enabled creation of documents by simultaneous writing in real time during the symposium. In this contribution, the reflections of the students on the content of symposium are given in terms of statements.

Keywords: Education; Open book; Social networks



1. Curriculum

Socratic Lectures that took place on Saturday, January 21 online, from 10 a.m. to 2 p.m. were the final event of the 1.st semester study in academic year 2022/2023. Included were the students of the subject Biophysics and Biomechanics (1.st year of Orthotics and Prosthetics and 1.st year of Laboratory Dental Prosthetics, Faculty of Health Sciences), the subject Biomechanics of joints (2.nd – 6.th year of General Medicine, Faculty of Medicine) and the subjects Biophysics of membranes, Biomechanics and Biophysics and Electrostatics of surfaces (Doctoral School of the University of Ljubljana). For the undergraduate students, the symposium offered the possibility to gather sufficient bonus to be excused of the written exam. A day before (on January 20, 2023), the students of the Faculty of Health Sciences were gathered for solving physical problems within the open-book system. At the symposium, the students listened to the plenary lecture and then they were uniformly divided over the scientific sections. There were 7 sections (Human Medicine, Veterinary Medicine, Musculo - Skeletal Health, Prosthetics, Physics, Nanostructure and Crossroads of Science, Medicine, Art and Education). The role of the students was to record the impressions in the form of reflections. GoogleDrive tools were used to design the documents on each section and all participants of the symposium were given the access to the link. The idea was to benefit from the gathering of many excellent scientists to concentrate the knowledge on particular subjects. Below, the selected reflections are presented in the form of statements.

1.1. Plenary lecture (Sergej Tomić)

Small cellular particles are tiny materials having size ranges from 1 to 100 nanometers. They can have different shapes and are classified according to their properties. They have great potential in medicine and pharmaceuticals because of their specific mechanical, optical and electrical properties.

1.2. Human medicine (Chaired by Boštjan Kocjančič and Yelena Istileulova)

Gold nanoparticles are attractive and broadly used nanomaterials in the biomedical areas for analytical purposes such as medical diagnosis labeling and biosensing. They are being applied to capture cancer-associated proteins, circulating tumor DNA, circulating tumor cells, and exosomes. Nanotechnology enables the manipulation of materials at nanoscale and has shown potential to enhance sensitivity and selectivity and lower the cost of diagnostics.

1.3. Musculo-skeletal health (Chaired by Renata Vauhnik)

The musculo-skeletal system is an essential component of human health. The emerging problems in musculo-skeletal health are osteoporosis, arthritis, bone and joint problems, cancer and bone fractures. Osteoporosis is the weakening of bones that occurs when the body loses bone tissue that is not adequately replaced. As people age, they are more likely to develop osteoporosis and be at higher risk of broken bones. Osteoarthritis results from the deterioration of the cartilage that coats and cushions bones, enabling joints to operate smoothly. Loss of cartilage results in pain, swelling and movement problems. Rheumatoid arthritis is caused by inflammation of the joints and other tissues. Often, it is caused by autoimmune disorders. Bone and joint problems can develop in association with other conditions, such as diabetes, chronic kidney disease, or genetic disorders.

Several types of cancer can originate in bone tissue. Multiple myeloma cause abnormalities in the bone marrow and other bone tissues.

Musculoskeletal biomechanics aims to understand the effects of age, activity, disease and various causes of pain, including acute, chronic and recurrent conditions. A broad range of methods and experimental conditions are used to study movement strategies and function.

Biomechanical parameters provide crucial information differentiating pathological gait and posture and can be used to assess the risk of falling in elderly. Pattern recognition models based on biomechanical parameters may provide greater insight for such classification. The biomechanical multiphysics model is a powerful tool for analyzing the mechanical functions of living systems. The biomechanical parameters extracted from the



force plate data include the three-dimensional Ground Reaction Force (GRF) data and can be recorded in a stance or in gait. GRF data are normalized to body weight and percent stance duration.

1.4. *Veterinary medicine (Chaired by Vladimira Erjavec and Angelo Beletić)*

Liposomes have been considered promising and versatile drug vesicles. In comparison to traditional drug delivery systems, they exhibit better properties, which include protection of drugs from degradation and clearance, superior therapeutic side effects, lower toxic side effects, side targeting, sustained or controlled release. Several liposomal drug products have been approved and are used in clinics. Single cell proteins or microbial proteins refer to edible unicellular microorganisms.

Biomaterial implants are an established part of medical practice, encompassing a broad range of devices that widely differ in function and structural composition. However, one common property amongst biomaterials is the induction of the foreign body response: an acute sterile inflammatory reaction which overlaps with tissue vascularisation and remodelling and ultimately leads to fibrotic encapsulation of the biomaterial to prevent further interaction with the host tissue. Severity and clinical manifestations of the biomaterial-induced foreign body response are different for each biomaterial.

1.5. *Prosthetics (Chaired by Blaž Mavčič and Drago Dolinar)*

Prosthetic devices are becoming more and more common in both the medical and engineering fields, and now many body parts can be replaced by a prosthesis. Prosthetics is a part of the bio-mechatronics which is the science of using mechanical devices with human muscles, skeleton, and nervous system, to assist or enhance motor control lost by trauma, disease, or defect. These devices can help the individual accomplish the tasks that they previously could not. This significantly improves the quality of life. There are many materials in prosthetics such as metals, polymers, carbon fibers etc. Prostheses vary in size, weight, lifestyle, and design required by the type of amputation. Thus there is not one material or design that will fit all needs.

1.6. *Physics (Chaired by Aleš Iglič and Matej Daniel)*

Small cellular particles (SCPs) are sub-micron particles harvested from different samples, which contain cells (like for example body fluids). Methods for SCPs characterization are dynamic light scattering, flow cytometry, nanoparticle tracking analysis and other methods. The term batch methods means methods that include a large number of particles. The most important parameters are the number density and the size of the particles in the samples. With different microscopic techniques, the morphology of different particles in the samples can be determined. An essential element of a biomembrane is a lipid bilayer, which is composed of lipid molecules. These molecules have a hydrophilic head and a hydrophobic tail.

Nanomaterials are applied for the detection of biological molecules, imaging of diseased tissues and innovative therapeutics. Nanoparticles can be used for drug delivery. Liposomes and SCPs can be used for targeted drug delivery, as they can be functionalized to target specific cells or tissues in the body. Inorganic nanoparticles, on the other hand, are not composed of natural materials, but of metals, ceramics, or semiconductors. They are typically smaller than SCPs and liposomes and have unique optical, electronic and magnetic properties, which can be exploited for various applications.

1.7. *Nanostructure (Chaired by Gabriella Pocsfalvi and Gitta Schloser)*

A nanostructure is a structure of intermediate size between microscopic and molecular structures. Nanostructural detail is microstructure at nanoscale. Nanoscale structure in biology is often called ultrastructure. Mass spectrometry is one of the fastest and most powerful analytical tools of all time. Atoms are ionized and analyzed. They are moving within a mass analyzer. Mass spectrometry is used to identify, quantify and analyse the role of molecules in diseases and different processes. Proteomic analysis showed that there are more than 3000 proteins in the isolated extracellular vesicles (EVs) of healthy individuals. Urine EVs have a potential to be used in diagnostics of different diseases,



including those involving distant organs like lungs and breast, as they move within all body fluids. Proteins on EVs can be labelled and subsequently followed through the organism. Thereby certain processes can be elucidated on a very small scale which wouldn't be possible otherwise. The end result shows up and down-regulated proteins. These are proteins that are either too common or too scarce in the organism, respectively. A specific subset of 1300 proteins were identified as a human membranome. Plasma derived EVs could have an effect in immunological processes. Hence they play a role in viral infections, e.g. in COVID-19. Gene expression can vary in time and due to different condition. Liquid Chromatography – Mass Spectrometry is the most widely used method for identification of proteins. Proteins cannot be sequenced easily while peptides can. Specific enzymes (e.g. trypsin, Lys-C) can assist in sequencing peptides. Carbohydrates can be attached to polypeptides to form glycoproteins. Prions are small parts of proteins that are used for analysis of hydrophobic interaction. A correct structure of the protein, including its tertiary and quaternary structure is necessary for its normal functioning. Protein misfolding in small proteins derive from breaking the hydrogen bonds which may induce a change in the protein structure. Hydrogen bonds in beta structure are slightly weaker than in alpha structure so the chain may misfold. Thermodynamics is an important factor in folding of protein chains.

1.8. Crossroads of Science, Medicine, Art and Education (chaired by Anita Prelovšek and Tatia Dolidze)

The main challenge is to prevent law students from learning legal texts by heart because critical thinking and analytical thinking are important in this profession. Open book method is therefore preferred. Within this method, the student is allowed to use all kinds of sources (e.g. literature) in order to develop analytical and critical thinking. An important point is selecting appropriate teaching methods that allows programs to include a large number of courses. Each of these courses has its specifics, so the key point is to select appropriate methods for each locus. The times are changing and so are the methods in education. Medical education itself is constantly developing and there are several new methods of teaching. The COVID pandemic induced implementation of technologies in education. Due to priorities to treat patients, the students had less access to clinical experience and alternative methods were developed. Two new methodologies were introduced: The first is the virtual anatomy class where students could use computer programs to envisage the organ systems. High quality images are a valuable tool and help in memorization. The second is the virtual patient simulator. This tool represents the clinical cases with different scenarios. The student considers a case beginning with questioning the simulated patient. The problem must be solved in a limited time.

Ludwig van Beethoven is one of the best classical composers to ever walk the earth. Despite gradually losing his hearing this medical condition did not prevent him to write music. Some of his best work was written in complete absence of hearing. His legacy will forever be remembered and cherished all over the globe.