PL.2

The stability and reversal of cell differentiation

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The different cell types that compose our bodies are remarkably stable. Hardly ever do we find skin cells in the brain or liver cells in the heart. In those very special cases where some regeneration can take place in vertebrates, there is little if any evidence for a switch in cell-type. Nevertheless, nuclear transfer, cell fusion, and induced pluripotency can result in pluripotent embryo cells being derived from specialized adult cells. The mechanisms by which nuclear reprogramming can occur in these cases is beginning to be understood. It may become possible for new, regenerated cell-types to be derived from adult cells and given back to a patient so that they receive new cells of their own genetic constitution, thereby avoiding the need for immunosuppression. The history of work in this area, and the prospects for cell replacement in the future will be discussed.

PL.3

Big data in biology

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Molecular biology is now a leading example of a data intensive science, with both pragmatic and theoretical challenges being raised by data volumes and dimensionality of the data. These changes are present in both "large scale" consortia science and small scale science, and across now a broad range of applications – from human health, through to agriculture and ecosystems. All of molecular life science is feeling this effect.

This shift in modality is creating a wealth of new opportunities and has some accompanying challenges. In particular there is a continued need for a robust information infrastructure for molecular biology. This ranges from the physical aspects of dealing with data volume through to the more statistically challenging aspects of interpreting it. A particular problem is finding causal relationships in the high level of correlative data. Genetic data are particular useful in resolving these issues.

I will end with the serendipitous invention of using DNA for an entirely different reason – as a long-time horizon digital archiving material. I will describe this method and some of its benefits (as well as a few downsides) and explain how a future culture in 10000 years time may still be able to read all of Shakespeare's sonnets – and perhaps much more.

PL.4

Introduction to EMBL: What does it offer to you?

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The European Molecular Biology Laboratory (EMBL) is Europe's flagship intergovernmental research organization for the life sciences. EMBL is supported by its Member states to carry out a programme around its five fold mission: state of the art research in molecular biology, service provision, advanced training, technology development and technology transfer and integration of European life science research. Some examples will be given of recent research activities and EMBL's services in bioinformatics, structural biology as well as its core facilities will be introduced. An overview will be provided of the training opportunities at EMBL. The talk will also outline opportunities for Polish researchers in view of building stronger links between Poland and EMBL.

PL.5

Regenerative medicine by somatic stem cells: the paradigm of epithelial stem cells

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Recent breakthroughs in regenerative medicine have generated enthusiasm and many efforts to explore new therapeutic potentials of both somatic and pluripotent stem cells. About 30 years passed since a discovery of a method of producing a great number of human epidermal keratinocytes by cultivation from a small skin biopsy, many possibilities are now envisaged for therapeutic application of different cultured cell types. The importance of stem cell content was proven for many tissues or organs in different pathologies. Ocular burns cause depletion of limbal stem cells, which lead to corneal opacification and visual loss. Most of available treatments are palliative and focused on the relief of the devastating clinical picture. Recent developments in epithelial cell-based therapy allowed limbal stem cell deficiency treatment, moreover tissue-engineered human trachea could replace end-staged airways, epithelial cells from oral mucosa or from urethral meatus of hypospadic patients can be cultivated and used to reconstitute the anterior urethra, finally ex vivo gene therapy of junctional epidermolysis bullosa led to full functional correction of the disease. All findings can provide support for improvement and standardization of the cure for these disabling diseases.