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Genomics technologies create the foundation for understanding who we are, how we function, and what we drink!

The genome of each organism represents a complement of protein-coding genes, regulatory non-coding RNA genes, and regulatory elements (promoters and enhancers) that direct the development of an organism. This information encoded in the DNA, is critical for an organism's growth and reproduction, underlying physiological processes, behavior, and overall phenotype. In addition, DNA sequence contains information on the evolutionary history, risk factors for diseases and determines responses to the external environment. With the development of massive sequencing technologies, we can extract enormous amounts of information from the genomic data. Consequently, genomic tools are becoming essential in virtually any area of research, personalized medicine, disease prevention, agriculture, and the development of novel technologies.

In this presentation, we will show how genome sequencing projects can answer key biological questions in evolution, using our spider mite genome sequencing project¹, and how this genomic research leads to novel technologies for environmentally safe pest control and the development of new materials for pharmacology. Understanding the genetic relationship of the grapevine grown in one area is key for the development of the wine industry based on autochthonous varieties, combating climate change, and science-based wine marketing. Using the genomic approach, we established the full pedigree of Montenegrin grapevines² and initiated similar research in Serbia that illustrates the power of genomics in this sector. Finally using human genomics, we are establishing answers to our origins showing the power of genomics in the area dominated previously by archeology and historiography, frequently producing controversial theories. Using ancient DNA (aDNA), we have shown that the genome in Serbia and other former YU republics represents the mixture of the Ancient Balkan population with Slavic migrants³. Using a similar aDNA approach we are deciphering which grapevine varieties were grown before the Filoxera period in Fruska Gora extracting DNA from grapevine leaves discovered in Volny's Herbarium from 1812 in the Sremski Karlovci High School. These various applications of genomics illustrate how this technology is critical for the development of genomic-based science and different sectors of the economy of the 21st century.

Literature:

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