Description of the research areas and research equipment at the University of Nova Gorica

At the University of Nova Gorica we use contemporary approaches to perform research in various areas: from the circulation of materials in industrial processes, including the technologies for waste reduction, lower consumption of raw materials, recycling, reuse of offcuts/scraps etc., to research in astronomy, studies of the impact of various aerosols on the climate, high-sensitive measurements of environmental pollution and physiological processes in organisms, studies on optimizing biotechnological processes by using natural yeast strains, to studying the topic of intimacy and letters from the past in the field of literature, as well as research in the areas of digital humanities, digitalization of cultural heritage and experimental linguistics, including topics dealing with pragmatics and psycholinguistics.

Research units, their infrastructure and equipment

The **Laboratory of Organic Matter Physics** offers a system for characterization of solar cells, while the **Materials Research Laboratory** owns a system for electron microscopy (a scanning electron microscope, a transmission electron microscope) including the equipment for sample preparation and X-ray powder diffraction for the characterization of thin films and the possibility of performing measurements in the atmosphere of up to 1100 degrees. The **Laboratory of Quantum Optics** offers a free-electron laser operating within the X-ray range. At the **Center for Astrophysics and Cosmology** you can access the GoChile telescope, which represents a unique astronomy tool available in Slovenia and which, thanks to its specific location in Chile, offers the opportunity to participate in astronomical observations in the southern sky. The **Center for Atmospheric Research** owns stationary and mobile lidar systems for measuring the transport of aerosols at the altitudes of up to 15 km. The **Laboratory for Environmental and Life Sciences** offers opto-thermal spectrometers and microscopes for the detection in liquid chromatography and microfluid systems, which cannot be found in other

laboratories in Slovenia. The **Wine Research Centre** has its own unique collection of yeasts, which is constantly being complemented by natural yeast strains, isolated in various areas of Slovenia and in other countries. At the **Center for Cognitive Science of Language**, the EyeLink 1000 plus eye-tracking device is available, while the **Research Centre for Humanities** owns a unique collection of digitalized letters useful for research in the field of literary sciences.

Research areas and thematic clusters of the call

Advanced materials and environmental technologies

Project proposals may include studies of the circulation of materials in industrial processes, including the technologies for waste reduction, lower consumption of raw materials, recycling as a reuse of offcuts/scraps and the related advanced materials and their characterization performed by using instrumental techniques such as electron microscopy or opto-thermal spectrometry.

Atmospheric and aerosol research using the LIDAR system

Project proposals must deal with **remote sensing of atmospheric characteristics** from the perspective of observing the time and spatial dynamics, the concentration and the size of aerosols, air masses tracking and the characterization of the physical properties of the clouds using the Raman LIDAR. Alternatively, the proposed projects may also focus on the **studies of the impact of complex mixtures of aerosols on the climate** as a result of the changes of primary aerosol particles (e.g. black carbon) and the related increase of the absorption coefficient, which shall include the analyses of the data obtained through the measurement campaigns performed durign airplane flights.

Organic semi-conductors

Project proposals may include studies in the field of 2 D materials and their Van der Waals heterostructures and organic electronics related to the studies of electronic properties of

materials, promising in terms of the production of new types of electronic elements, organic solar cells, organic transistors, photodetectors and memory elements. Research projects studying biologically relevant systems including, for instance, biosensors based on organic transistors and ionic-electronic conductive materials are also possible.

Quantum optics

Project proposals may deal with the methods of characterization of substances based on laser light sources and enabling the acquisition of data on the composition and interactions occurring in the substance at the atomic level. The project proposals may refer to the studies of principles regulating the generation of light, the development of technologies for creating sources and studies of the various uses of the characterization of substances in connection with the CITIUS light source.

Astrophysics

Project proposals may refer to **studies of astronomical objects and phenomena in the Solar system, our Galaxy** (for instance variable stars, double stars, star-exoplanet systems, star clusters), and **outside of our Galaxy** (e.g. supernovas and other transient events, galaxies where such events take place) with the help of photometric and/or astrometric observations with the automatic GoChile telescope (detailed technical information on the equipment available at: www.gochile.si) and the possibility to use the data from the public databases (e.g. ESA satellite Gaia, Simbad, BHTOM, Transient Name Server, SDSS, NASA/IPAC Extragalactic Database).

Laser opto-thermal spectroscopy

Project proposals may refer to:

1) studies of substances and phonomena in the environment, biomedicine, food processing technologies etc. demanding **highly sensitive techniques of analysis** based on the opto-thermal laser detection in combination with separation techniques (HPLC, IC, CE), FIA and microfluid systems;

2) **nondestructive and contactless** optical, thermal and surface and deep structure **characterization of thin-layer materials** using the opto-thermal spectroscopy techniques.

Collections of yeasts and enology

Project proposals must deal with the observation of the potential impacts of the biotic stress in the form of the introduction of the biocontrol yeast on the composition of the waxy protective down layer of the grape berry, studies of the use of the native Slovene and commercial non-Saccharomyces yeasts in combination with the commercial S. cerevisiae X5, or studies of the ability of the selected yeasts (from the collection of yeasts owned by the Wine Research Centre of the University of Nova Gorica) to create volatile organic compounds (VOC), which can inhibit the development of the agent, e.g. grey mould (*Botrytis cinerea*).

Linguistics and cognitive sciences

Project proposals must include the use of the eye-tracking technology for collecting the data on eye movement during the process of reading texts of natural origin and the analysis of data by extracting the characteristics at all levels of language processing, e.g. at the textual, sentence word and fixation levels, such as checking whether the subject gaps are more difficult to process than object gaps, what the acquired direction of clustering within a clause with a neutral intonation is and what affects the preferrential direction of clustering of Slovene clitics and determining which elements can break which sentence elements.

Literary science studies and the use of electronic collections

Project proposals must include the use of UNG's electronic collection »Pisma«/»Letters«, including the letters of women authors of the Slovene Moderna literary period. They should focus on the transcription of the collected corpus of letters from the respective period and the insertion of data into the electronic collection, meta data processing, and the **analysis of letters in terms of the topic of intimacy** and its transformations in the literary discourse of the Slovene Moderna.