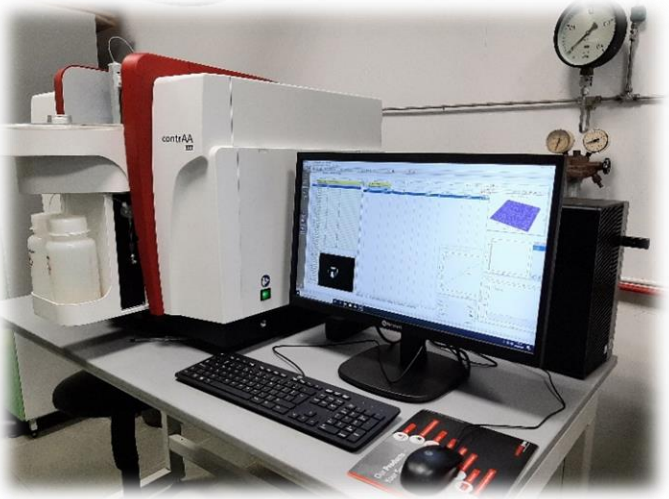
NICOLAUS COPERNICUS
UNIVERSITY
IN TORUŃ
Faculty of Earth Sciences
and Spatial Management

The Laboratory for Environmental Analysis of the Faculty of Earth Sciences and Spatial Management at NCU in Toruń has modern scientific and research equipment with extensive analytical capacity.

The **Vario MACRO Cube CHN/CHNS macro elemental analyser** by **Elementar** is a fully automatic (built-in 60-position carousel autosampler) elemental macroanalyser capable of simultaneous analysis of C, H, N and S content in solid environmental samples (soil, sediment, plant material). **Measurement ranges:**
C : 0.004–150 mg C
H : 0.002–15 mg H
N : 0.001–100 mg N
S : 0.005–18 mg S (below 40 ppm S).

The apparatus handles a wide range of solid sample weights (up to approx. 2 g soil and approx. 400 mg organic material). Also measures the content of elements in liquid samples, provided concentrations are relatively high (i.e. within the lower measurement range).

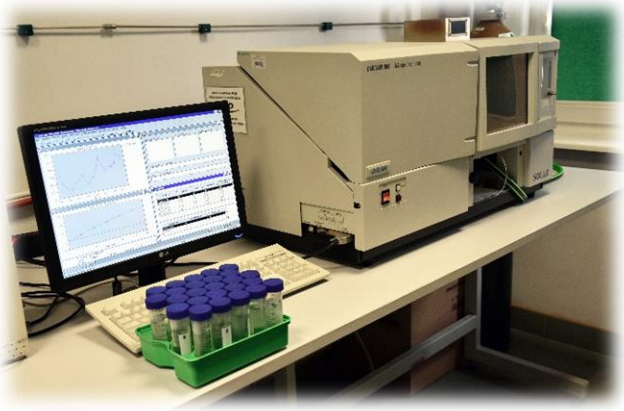


The **contrAA 800 G atomic absorption spectrometer** by **Analytik Jena** is a high-resolution atomic absorption spectrometer for flameless technique (with graphite cuvette) using a continuous radiation source (xenon lamp).

Capable of multi-element sequencing without changing radiation source. High resolution allows analysis of elements at very low concentrations (ppb) and with lines close to each other without interfering. It has a built-in autosampler and sample pre-dilution function for fully automated analysis.

Analytical capacity: determination of Fe, Al, Mn, Pb, Zn, Cu, Cd and other elements in environmental samples (soil, sediment, water and plant material).

The **SOLAAR 969 atomic absorption spectrometer** by **Unicam** is a classic atomic absorption spectrometer equipped with single-element coded lamps, for flame technique (air/acetylene). Resolution enables analysis of selected macroelements present at environmental concentrations (ppm).

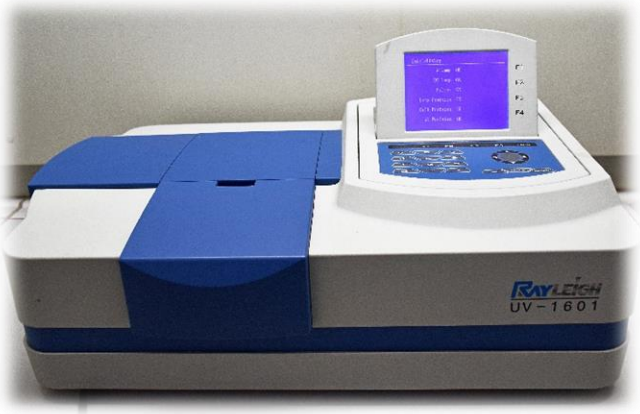


Analytical capacity: determination of Ca, Mg, K and Na in environmental samples (soil, sediment, water and plant material).

The **Dionex Aquion ion chromatograph** by **Thermo Scientific** is equipped with an AS9-HC column, an ADRS600 suppressor and a conductivity detector designed to determine anions in water samples and water extracts. The chromatograph is equipped with an automatic AS-AP feeder for unattended analyses of series of water samples. The Dionex Aquion chromatograph is controlled by Chromeleon 7.2 software.

Analytical capacity: determination of F^-, Cl^-, NO_2^-, Br^-, NO_3^-, PO_4^{3-} and SO_4^{2-} ions in environmental samples.

The **UV-1601 spectrophotometer** by **Rayleigh** and the **Lambda 25 UV/VIS spectrophotometer** by **Perkin Elmer** operate at resolutions of 200–1100 nm in the visible and ultraviolet light ranges



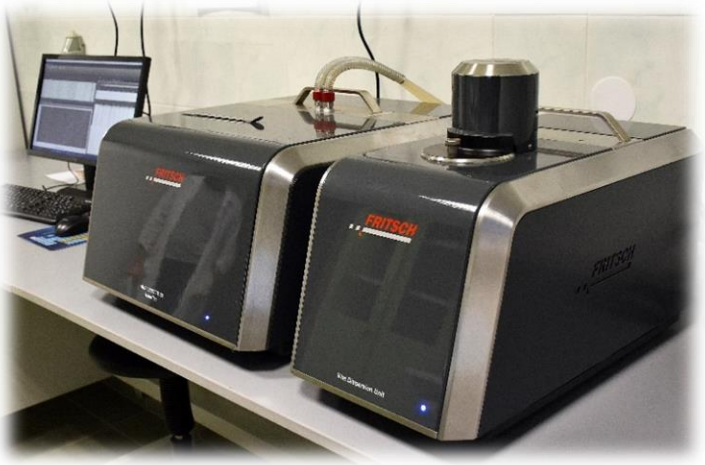
(UV/VIS). Capable of continuous measurement with scanning function, making them widely applicable for colorimetric analyses of water and water extracts.

Analytical capacity: determination of P and SO_4^{2-} in environmental samples (soil, sediment and water) and of optical density of soil organic matter.

The **Spectroquant Prove 100 spectrophotometer** by **Merck** has a wavelength range of 320–1100 nm. It is mainly used in determining mineral forms of biogenic compounds using Merck test kits in water samples and water extracts. The standard curves programmed in the spectrophotometer allow for direct reading of the concentration of a determined ion. Measurement of absorbance also allows the device to be used for chemical analyses using other measurement methodologies. For determining total nitrogen compounds and total phosphorus and other compounds in the spectrophotometer, the **TR 420 thermoreactor** by **Spectroquant** is used.

Analytical capacity: PO_4^{3-}, NO_2^-, NO_3^-, NH_4^+, TP, TN_b and other properties of water and soil extracts determined by Merck tests; chlorophyll "a".

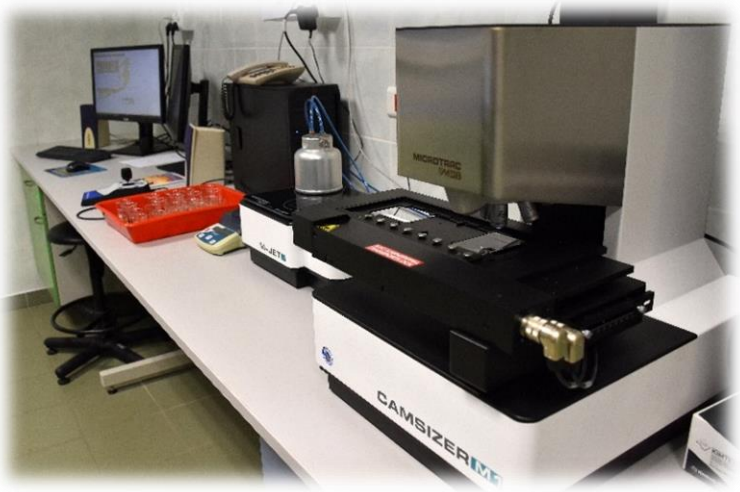
The **ANALYSETTE 22 laser particle sizer** by **Fritsch** is a programmable laser measuring device that can measure particles of sizes from 0.01 to 2000 µm. Particle size is determined by ISO 13320 laser diffraction method using two lasers in 110 effective measurement channels according to the Fraunhofer and Mie theory; wet measurement in any measuring liquid. The device's dispersion unit allows aggregates in the sample to be broken down by ultrasound.



MaS Control software for creating test procedures to ensure repeatable results and proper result conversion to any format. Average determination duration is 60 seconds per sample.

Analytical capacity: determination of particle sizes in accordance with ISO 14688-1, Wentworth and PIG.

The **Camsizer M1 particle size and shape analyser** by **MICROTRAC** is an ISO 13322-1 compliant static shape and particle size analyser with a measurement range of 0.5–1500 µm. The tested material is sprayed onto a base slide by the M-Jet vacuum-pressure dispersion module to ensure statistical correctness of analysis. The analysis is performed using lenses with magnifications of 2.5x to 50x and an 18-MP camera providing a nominal digital resolution of 35 nm.



Particle X-Plorer software by **MICROTRAC** allows analysis of each tested particle by taking 50 different measurements from basic surface type and equivalent diameter to Feret length. Average measurement speed is from 16,000 to 1,000 particles per minute in a sample.

Analytical capacity: determination of particle size in intervals according to ISO 14688-1; Wentworth, PIG and shape of particles in 2D.

The **SteREO Discovery.V20 stereoscopic microscope** by **Zeiss** is a high-resolution microscope for observing geological, soil, biological and archaeological samples at a wide range of magnifications, especially low ones. The set of upper and lower illuminators directing the light beam according to presets allows for full illumination of the preparation, regardless of shape.

The **Axiocam 305 Colour camera** that works in cooperation with the microscope and a workstation with **Zen Core** software allow high-quality documentary photos to be taken, experiments to be programmed and conducted, and analytical work to be conducted on collected material, such as size measurement, colour correction, etc.

Analytical capacity: determination of the nature of particles according to Cailleux, Powers, Mycielska-Dowgiałło and Woronko, Rzechowski, and Górska.