

**Press release****MUSE Museo delle Scienze****Monika Vettori**

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<http://idw-online.de/en/news630598>Research results, Transfer of Science or Research  
Biology, Environment / ecology  
transregional, national**Expedition Genomics Lab: the mobile revolution in genetic analysis**

**Through the integration of a platform that allow on site DNA extraction and amplification and a new mobile sequencing device with cloud based analyses, DNA can be sequenced for the first time directly in the field freeing biological exploration from the constraints of large and expensive research laboratories and allowing real time DNA barcoding.**

On May 4, 2015, the MUSE - Science Museum (Trento, Italy) and the University of Verona (IT) presented Expedition Genomics Lab, a technology innovation project developed in collaboration with Oxford Nanopore Technologies (Oxford, UK) and Biodiversa (Trento, IT).

Expedition Genomics Lab uses the first system that can perform DNA sequencing outside a controlled environment, as a laboratory. The DNA Finder by Biodiversa allows DNA extraction, purification and amplification with a battery-powered device without the need of special lab equipment like centrifuges and frozen chemicals. The portable DNA sequencer MinION™ and cloud based analysis system Metrichor™ from Oxford Nanopore Technologies, allows to sequence the DNA in any part of the world, as it is powered by the USB3 port that transfers data to a laptop computer. This portable lab brings molecular analysis directly in the field, revolutionizing biological exploration.

The first public test of Expedition Genomics Lab was performed during a press conference held in Trento (IT), by Michele Menegon, researcher of the MUSE, and Massimo Delledonne, Professor at the University of Verona. A non-invasive biological sample was taken from a frog in Nkuka Forest, Tanzania (as part of an on-going project under the auspices of the Tanzania Wildlife Research Institute), which was immediately released back into its environment. Using Expedition Genomics Lab, they sequenced the DNA of the wild frog species and sent the data via a standard smartphone to Oxford Nanopore's cloud based application and to the MUSE of Trento. This allowed the team in Tanzania to determine in real time the identification of the sampled frog, providing live data to researchers based in Italy.

The innovative technology of Expedition Genomics Lab opens up a wide range of possible applications in all contexts where the portability of the system and the speed of the results can make a difference. It is the hope of the inventors that the low cost of the system and the autonomy from traditional labs, will enable its use in more regions and fields of biology. Particularly in developing countries in the tropics where in many cases the lack of infrastructure dedicated to genetic analysis is a limiting factor for scientific research. Elsewhere, the potential fields of application of Expedition Genomics Lab extend from personalised medicine to customs controls, analysis of food security, crop science and environmental applications.

Expedition Genomics Lab - Description

The kit contains optimized versions for use in the field, and at room temperature, of devices and reagents for extraction, purification, amplification and DNA sequencing. Expedition Genomics Lab is based on the use of technologies that enable the extraction of DNA without the need for complex laboratory equipment. It is equipped with a small thermocycler specially designed to operate at 12V and with a fluorometer for DNA quantification. Expedition Genomics Lab sequences the target region by means of a third-generation sequencer, the MinION™ from Oxford Nanopore Technologies. Analyses are performed in the cloud using the system Metrichor™ from Oxford Nanopore. The sequence obtained can then be sent worldwide by using standard (3G / 4G) or satellite network.

#### Areas of application of Expedition Genomics Lab

Since 1977 DNA sequencing has become possible and information obtained from DNA sequencing has revolutionized different fields such as medicine, forensic science, and evolutionary biology. But DNA sequencing is still constrained by the use of expensive infrastructure and processes that are virtually absent from the large majority of the countries in the tropics, where most of the earth's biodiversity is located. Expedition Genomics Lab has been designed primarily to allow DNA analysis of wild species in these countries. Its portability, low cost, and intuitive use will accelerate the acquisition of information critical in biodiversity studies and conservation activities. The initiative takes its first steps at a time, today, where a loss of about 150-200 species every twenty-four hours has been estimated (UNEP) - the so-called "sixth mass extinction".

The assessment of biodiversity based on molecular data is an imperative of every action of prioritization of important areas for conservation and is therefore an essential tool for scientifically informed planning. Key areas of application of the kit will be:

##### 1. Conservation of biodiversity

Expedition Genomics Lab will produce real-time data on biological complexity of the sites investigated by rapid molecular identification of taxa. This allows an identification of cryptic biodiversity and therefore to distinguish between similar taxa. From a practical point of view the use of Expedition Genomics Lab would allow cutting down times and logistics costs due to collection and storage of samples. It will also promote a rapid and effective collaboration between local researchers and those from abroad in order to quickly define, on a molecular basis, indices of biological diversity for investigated areas.

##### 2. DNA barcoding and taxonomic implications

Expedition Genomics Lab has been primarily developed to perform DNA barcoding and can therefore provide an effective contribution to all the research projects based on this method, such as the Barcode of Life ([www.barcodeoflife.org](http://www.barcodeoflife.org)), which aims to create public databases of species diversity. The kit will however allow fast and efficient comparison between any genomic region, even among organisms which are evolutionarily very distant. Furthermore, the possibility to obtain molecular data directly in the field will help limiting the collecting of museum specimens that might be rare and endangered, while focusing effort on collecting poorly understood species.

##### 3. Forensic investigations on wild species

The ability to sequence, locally and quickly, any suspect sample will make of Expedition Genomics Lab an effective tool to fight the illegal trade of endangered species. The kit will be of particular help in contrasting all illegal practices that are based on the impossibility to verify the identity of the traded species at customs (e.g., exported species 'under' the name of other parts of animals attributed to non-CITES species).

#### Potential users of the Expedition Genomic Lab

1. Research Institutes, Museums of Science, University working in the documentation of biodiversity.
2. Non-governmental organizations working on species and land conservation.
3. Government agencies concerned with land management.
4. Parks, Protected Areas, etc.
5. Institutes dealing with eradication of alien species.
6. Customs, and trade control of illegal wildlife.
7. Any agency/company dealing with quality control (e.g. food).

#### Partner of the project

Biodiversa SRL. is a start-up founded in 2014 by a multidisciplinary team (physicians, geneticists, biologists, biotechnologists, chemists and physicists) convinced of the utility of genetic testing to understand the state of health of humans, animals and plants, to assess possible therapies and to quantify the amount of biodiversity present in a certain environment. The company has developed a portable device of great sensitivity and precision which is at the same time inexpensive and easy to use: it is called the Finder and allows rapid amplification and quantification of DNA. Within the Expedition Genomics Lab, the Finder plays a vital role in providing the genetic material necessary to phase sequencing. <http://www.biodiversa.it>

Oxford Nanopore Technologies established in 2005 is a company dedicated to the development of new methods of molecular analysis, based on the development of nanopores technologies with potential applications in scientific research, personalized medicine, crop science and security / defense. Born from the idea Hagan Bayley, from Oxford University, the company is a leading developer of technologies boasting several collaborations with prestigious international research institutions such as Harvard, University of California at Santa Cruz and Boston University. <https://www.nanoporetech.com>

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