



CENIEH

Centro Nacional de Investigación
en Evolución Humana

ANNUAL ACTION AND PROJECT PLAN

Fiscal Year 2023

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I. Background.

The year 2022 stands out for our successful achievements in all areas, which have helped the CENIEH to advance as an ICTS and research center. The rise in the already numerous high-impact publications of the Center, the opening of all its essential laboratories to competitive access, methodological or equipment improvements in all the infrastructures, and a vibrant outreach activity, are the crowning scientific and technical achievements of the CENIEH in the period.

Among the main feats, we should highlight:

- In **scientific publications**, we have maintained the upward trend in SCI papers, both those by the Center's own scientific staff and those derived from accesses by external users.

Year	2018	2019	2020	2021	2022
SCI publications	54	72	90	83	103 <i>*12 in press</i>
SCSI publications linked to the ICTS	8	14	9	16	19 <i>*4 in press</i>
TOTAL SCI	62	86	99	99	122 <i>*16 in press</i>

*The count is up to December 23rd 2022.

- The pre-pandemic pace of **excavations** has been restored, with an increase over 2021 from 19 field interventions to 25, despite the current difficulties posed by conflicts on the African continent where some of the most emblematic work of the CENIEH is performed.
- Of particular note is the very strong participation of CENIEH staff in **competitive calls for hiring and attracting funds**. This activity entails major involvement and coordination of all the areas: scientific, technical, and management. During 2022, no fewer than 15 hiring contracts were obtained, 11 of them 100%-funded with projects, and 32 applications were submitted to research project calls. The Center confirmed its increasing success in this type of call, something seen especially when this is in unique international projects, such as the three ERC (European Research Council) grants currently active at the CENIEH.
- **At the moment, competitive funding represents no less than 59%** of the Center's sources of financing. This markedly positive trend over the last four years underlines the

endeavors and proactive involvement of CENIEH staff in the quest for resources that make excellent research and technical activity possible.

	2019		2020		2021		2022*	
	€	%	€	%	€	%	€	%
Consortium funding	3,841,667	74	4,051,667	63	4,201,666	72	4,305,000	40
Competitive funding	1,223,355	24	2,231,480	35	1,454,463	25	6,337,540	59
ICTS services	125,863	2	109,702	2	179,329	3	154,444	1
Total	5,190,884	10	6,392,849	100	5,835,459	100	10,796,984	100

*Recognized as at December 7th 2022. The figures may be different at closure.

- Among the grants awarded during the year, we must mention: two AEI MCIN “Knowledge Generation Projects” which will be used to finance the research at the emblematic Sierra de Atapuerca and other key sites in the western Mediterranean; the grants related to two new research projects supported by the European Research Council (ERC); and the award by the MCIN in the public call for Unique Scientific and Technical Infrastructures ICTS 2022, Recovery and Resilience Plan. Molecules for Evolution (MOLEVOL) ICT2022-007840 (€1,053,000), with which a Paleoproteomics and Ancient DNA laboratory will be created and commissioned.
- Referring to the laboratories, we emphasize the milestone that **all the essential ones ("outstanding facilities") are now open in the competitive access mode**, with the Conservation and Restoration and Cosmogenic Nuclides laboratories joining the list of those recognized as essential following the CAIS evaluation report received this year.
- At the close of 2022, **298 ICTS access requests had been received during the year** (compared to 302 in 2021), of which 24 (the same as in 2021) are international ones. The maintenance of the number of requests and the variety of projects handled consolidate the role of the CENIEH ICTS as part of this country's R+D+i.
- The CENIEH also offers competitive access to its facilities on the **European infrastructures network IPERION HS**, whose organization has acknowledged that our Center is one of the most demanded overall, and has highlighted the Center's successful organization and running of the first IPERION HS Training Camp.
- With a view to guaranteeing high-quality security standards in information and communications technology (ICT), numerous actions were taken over the course of

2022, which culminated in certification of the CENIEH ICT system to the **National Security Scheme (ENS)**.

- Likewise in 2022, the CENIEH attained **renewed certification to the standard ISO 9001:2015**, thus accrediting its engagement in guaranteeing the quality and traceability standards that ought to be demanded of services provided to the community by a public infrastructure.
- Finally, we must mention the **welcome and success of the Center's communication and outreach program**, which has consolidated the adaptation of the majority of the activities to remote assistance, to the hearing-impaired and which, in line with its efforts to promote inclusive programming, **has expanded its activity to the rural environment**. These activities were made possible thanks to financial support from the FECYT and the supportive collaboration and engagement of CENIEH staff in all areas.

II. Objectives and actions.

This Annual Actions and Projects Plan 2023 sets out the main objectives and lines of action of the CENIEH for fiscal year 2023, directed at further overall compliance with the Strategic Plan 2021-2024. This Plan is aligned with the Spanish Strategy for Science, Technology, and Innovation (EECTI) 2021-2027, the Horizon Europe Framework Program, and the quality and service ethos of the ICTS with regard to pursuing this country's research and technological development. This Plan is organized around a series of **objectives and actions directed at encouraging R+D+i**, structured in turn into a series of **transversal objectives** which connect all the areas and ensure effective flow of information and management of resources.

As set out in its Strategic Plan, the CENIEH continues its commitment to excellence in the R+D+i sector, pursuing scientific and technical leadership in all the main areas of its research field, but also promoting a first-class contribution to other emerging lines. In addition, as an ICTS at the service of the scientific, technological, and industrial community, it assumes the mission to reinforce its scientific and technical offering by attracting the human and financial resources to become an outstanding player in the development of Spain. This vocation for scientific and technical excellence is necessarily bound up with an endeavor to promote the development of a scientific culture through a comprehensive knowledge transfer program that helps to form an inclusive and holistic society. The strategic objectives for 2023, directed at further compliance with the Strategic Plan 2021-2024 along all the dimensions mentioned, are:

O.1. Enhance the quality of the scientific and technical production.

Its publications in the world's most prestigious scientific journals, and its leadership in developing projects and excavations that are models for their fields, are the strongest

endorsement of the excellence of the CENIEH as a research center. To strengthen and boost this leadership by the CENIEH, several specific objectives and actions are proposed:

O.1.1. Promote the attraction of researchers and technicians.

A.1. Participate in competitive calls to attract staff.

Attracting talent through competitive funding calls is one of the main guarantors of quality and sustainability for the scientific activity of the CENIEH at the levels of excellence to which it aspires. During 2023, there will be incentives, as is now habitual, for participation in hiring calls to facilitate dealing with the rise in ICTS access requests, and the scientific objectives of the Programs.

- *Indicator: Hiring of at least six new researchers/technicians by participating in competitive talent attraction calls (Yes/No).*

O.1.2. Promote publication in SCI impact journals.

A.2. Increase the number of SCI publications per researcher.

The target set in the Strategic Plan for the 2021-2024 horizon is to raise the number of SCI publications per researcher (final indicator: 3.3). Currently, the four-year average 2019-2022 (72 SCI/25 researchers in 2019: 90/30 in 2020, 83/24 in 2021 and 103/25 in 2022) is 3.36 papers. To meet the objective at the end of the period, the target for 2023 is to maintain the new four-year average.

- *Indicator: Maintain the new four-year average of SCI publications per researcher (Yes/No).*

O.1.3. Promote leadership and participation in prestigious paleontological and archaeological excavations.

A.3. Maintain the number of paleontological and archaeological excavations where the CENIEH participates.

Excavations and field interventions represent one of the most idiosyncratic and representative activities of the CENIEH, and are the wellspring of archaeopaleontological materials which feed research in human evolution, as well as being the main hub for connection and interaction among teams of international stature. Following the critical period of the pandemic, the efforts of the CENIEH have borne fruit in recovering the number of excavations where it participated proactively before COVID-19 burst onto the scene. Over 2022, its staff have gone from participating in fieldwork at 19 sites in 2021 to 25, despite the threat that the civil conflicts in Africa pose for in-person activities there.

Taking this into account, the objective for 2023 is to maintain the number of field interventions at the level of 2022.

- *Indicator: Maintain the number of excavations and field interventions where the CENIEH participates, compared with 2022 (Yes/No).*

O.1.4. Promote leadership in unique research projects.

A.4. Increase the number of applications to project funding calls.

Over the last two years, the CENIEH has passed through a major turning point for both submissions and success in competitive research projects, and we must highlight the award of 3 European Research Council (ERC) projects and several others from the National Plan for 2022. With 23 submissions at the start of the period (in 2020), the trend increased significantly: 38 in 2021 and 32 in 2022. These submissions, and the proper management of these resources, entail a titanic effort, and not only by the scientific and technical areas, but also the administrators who have to handle the applications and the grants received. To reach the four-year average of 25 applications at the end of 2021-2024, it is calculated that at least 15 submissions should be made to competitive calls during 2023.

- *Indicator: Submission of at least fifteen applications in research project calls (Yes/No).*

O.2. Strengthen the uniqueness of the infrastructure.

One of the milestones to be passed in the Strategic Plan 2021-2024 was the opening of all the essential laboratories ("outstanding facilities") to competitive access mode. Doing this forced an in-depth reorganization of the resources, schedules and work procedures, which were especially complex in the transition and overlap period when the accesses already admitted in earlier years had to be concluded, and the new ones channeled. In addition to this achievement, there was the extra work necessary to add two new laboratories (Conservation and Restoration, and Cosmogenic Nuclides) to this list of outstanding facilities, and to open them in competitive mode to the scientific-technical and industrial community. On top of this, improvements in all the laboratories to diversify, expand, or optimize the offering of methods and services are proposed as a matter of routine anyway. For 2023, it is envisaged: i) to continue to offer the outstanding facilities by launching competitive access windows, and ii) to make further improvements and updates to the facilities or the work procedures. Along these lines, the objectives for 2023 are:

O.2.1. Enhance the uniqueness of the Geochronology and Geology Program by expanding its capacities.

Today, the CENIEH is a clear international leader among institutions capable of answering geochronological questions in a very broad range of sedimentary and time contexts. This capacity is upheld by a continuous striving to maintain its facilities up to date and develop the know-how of the sophisticated techniques these types of analysis require. To remain competitive internationally, various improvements will be undertaken in each one of them during 2023, related fundamentally to tuning the protocols and techniques while also guaranteeing at least one competitive access window.

O.2.1.1. Improve and enhance the capacities and offering of the Luminescence Laboratory.

A.5. Tuning the “MSCL Geotek” unit for measuring cores.

The “MSCL Geotek” equipment is a multi-parameter geophysical core logger. It is a device for the continuous measurement of certain physical properties of cores, using non-destructive high-resolution techniques. The model at the CENIEH includes three sensors: (1) color spectrophotometry; (2) magnetic susceptibility (using loop and with point contact sensor); and (3) natural gamma. It can work with a full core or one cut longitudinally, from 50 to 150 mm in diameter and maximum length 1.5 m, from probes drilled into rock or unconsolidated materials, in which case these must be protected with a plastic capsule or liner.

Over 2023 it is expected to tune the equipment by verifying the correct operation of the three sensors with natural cores of different lengths. Specifically, this should include: (a) measurements with the three sensors together and separately, (b) measurements over intervals of constant and variable readings, (c) estimation of measuring times according to the parameters indicated.

- *Indicator: Documentation accrediting the correct operation of the equipment (Yes/No).*

O.2.1.2. Improve and update the Electron Spin Resonance equipment and procedures.

A.6. Develop a specific procedure for scanning fossils and control their impact on dating

Publications by CENIEH researchers have documented that microtomography scanning of fossil material can have a small but significant effect on the result of ESR dating of this material. The development of a specific protocol for these cases could, on the one hand, advise the potential user of this effect and, on the other, offer a way of controlling and measuring the energy the fossil has absorbed and correct any deviation if it is finally dated. With this idea, in 2023, the Conservation and Restoration Area, in collaboration with the Microtomography Laboratory, and the Dental Anthropology Group and Electron Spin Resonance researchers, will develop a specific procedure for scanning material

that can be dated using ESR, which will be incorporated into the ICTS offering for this laboratory.

- *Indicator: Procedure for scanning fossils and control of impact on ESR dating developed (Yes/No).*

A.7. Develop a specific procedure for U-Th analysis of fossil teeth by laser ablation.

The great majority of the new fossil finds in recent decades in the field of human evolution are too old (> 50,000 years) for radiocarbon dating. Therefore, direct dating of fossil records involves the use of other methods like uranium-thorium (U-Th) series and electron spin resonance (ESR), both available at the CENIEH. Since the start of the century, technological advances have made it possible to couple a laser ablation (LA) system and a mass spectrometer (ICP-MS) to perform high-resolution U-Th dating that causes very little damage, which is a key issue for analyzing human fossils. In fact, LA-ICP-MS analyses offer an additional advantage, as they enable rapid prescreening of fossils to assess their potential for future ESR dating, and to thus discard any paleontological material whose characteristics are unsuitable. In this context, developing a specific laser ablation U-Th analysis procedure for fossil teeth at the CENIEH would enable human fossils to be dated directly in the medium term, positioning the Center as a leader in dating archaeopaleontological sites. For 2023, it is proposed to develop this procedure through collective work involving technicians and researchers from the laboratories and the Geochronology Program.

- *Indicator: Procedure for LA-ICP-MS dating developed (Yes/No).*

O.2.1.3. Improve and update the capacities and offering of the Uranium Series Laboratory.

A.8. Implement the “Miami” procedure for determining the isotopic ratios of U and Th in the laboratory.

Over the course of 2023, a new procedure will be adopted for determining the isotopic ratios of U and Th, for dating speleothems or other materials of calcium carbonate. The method is known informally as the “Miami method”, as it was developed principally at the University of Miami. It was originally described in a paper by Pourmand et al. (2013) and it would represent an optimization of the time and resources employed in obtaining dates. Basically, the uranium and thorium are separated quantitatively from the elements of the matrix by a single pass of U/TEVA extraction chromatography. For calibration, it is possible to use standard CRM-112A and IRMM-035 solutions, doped with a “double peak” IRMM-3636a $^{233}\text{U}/^{236}\text{U}$ to take into account the bias of the mass of the instrument and deviations in the isotope proportions measured from the certified values.

During the year 2023, a document explaining the process will be compiled, to include sample preparation, measurement, and data processing.

- *Indicator: "Miami" procedure implemented in the laboratory (Yes/No).*

O.2.1.4. Improve and update the capacities and offering of the Cosmogenic Nuclides Laboratory.

The Cosmogenic Nuclides Laboratory, through its collaboration with another ICTS, the Centro Nacional de Aceleradores (CNA) in Seville, is leading an innovation project with methodological tuning for this technique. Through this agreement, the two institutions hope to offer the complete sequence of sample preparation and measurement for ^{10}Be and ^{26}Al within Spain. For its part, the CENIEH continues to devote efforts to methodological innovation and autonomy in developing the analysis procedures. In 2022, the Center's laboratory tuned the protocol for measuring meteoric ^{10}Be , which is useful for analyzing erosion and stability of surfaces and soils in a wide range of natural environments, and this line of research is the only one of its kind in the country. For 2023, this laboratory aspires to improve its capacities to offer additionally the final sample preparation step before dispatch to the AMS.

A.9. Establish the final sample preparation step for AMS analysis in the laboratory.

This final step includes calcination and preparation of the cathodes of the sample for AMS analysis. This requires creating a semi-closed area in which amounts of less than 1 mg of Be and Al oxide powder can be manipulated. It will be necessary to acquire a hood equipped with an air filter and a hydraulic/mechanical press to compress the powder in the AMS sample holder.

- *Indicator: Acquisition and installation of a hood and a hydraulic/mechanical press in the Cosmogenic Nuclides Laboratory (Yes/No).*

O.2.2. Increase the capacities of the Transversal Laboratories to meet the demand from the scientific and technological community.

A.10. Acquisition and commissioning of a multirotor UAS (Unmanned Aircraft System) in the Digital Mapping and 3D Analysis Laboratory.

Since 2015, the Digital Mapping and 3D Analysis Laboratory has provided services related to the generation of 3D models and cartography from photogrammetric reconstruction with UAS (usually known as "drone systems"). The CENIEH is registered as a drone operator and the Laboratory has pilots who are certified under current legislation, as well as photogrammetry software for processing and analysis of these images. However, the Laboratory does not currently have a drone fleet capable of capturing quality data securely and effectively, due to wear or obsolescence of the Center's drone systems. The acquisition of a multirotor UAS would not only renew the

fleet, but it would permit aerial work that is safer, of better quality, and more efficient. Anticollision proximity sensors, more powerful cameras, precise positioning systems and greater autonomy, are among the features of current amateur and professional UAS: the Laboratory's current equipment does not have these due to faults, or simply never had them. The acquisition of a UAS implies continuing to provide 3D mapping and aerial reconstruction services to the users of our ICTS, as well as making work in new scenarios possible thanks to how these systems have come on technologically.

- *Indicator: Acquisition and operability of the UAS (Yes/No)*

A.11. Commissioning the FTIR microscopy equipment in the Archaeometry Laboratory.

During 2022, an FTIR unit (Fourier transform IR spectrometry) was acquired, which permits analyzing the composition of a wide variety of materials in the fields of biology, archaeology, pharmaceuticals, and food, to extract their molecular “fingerprints” (organic and inorganic compounds). The objective during 2023 will be to commission this equipment, which will include testing and the associated documentation.

- *Indicator: Documentation accrediting the commissioning of the equipment (Yes/No).*

A12. Commissioning the high-speed camera in the Experimental Archaeology and Taphonomy Laboratory

The PHOTRON FASTCAM NOVA R2 type 100K-C-64GB high-speed camera can record videos of up to 100,000 fps, and it is especially useful for recording and measuring hammering gestures in actions such as fracturing bones and knapping. Its software makes it possible to measure angles and trajectories, as well as to record how fast a fracture propagates. This camera would also permit the development of different use protocols for actions as varied as perforation with a stone tool, fracturing of projectile points in firing impacts, breaking large herbivore bones, production of diverse types of knapping products through direct, indirect and pressure percussion, and recording engraving and grooving gestures with a burin. In 2023, the Laboratory proposes to develop the technical instruction to offer this camera within the ICTS service portfolio.

- *Indicator: Document accrediting the commissioning of the high-speed camera (Yes/No).*

O.2.3. Improve and enhance the capacities of the Collections, Conservation and Restoration Area.

A.13. Inventory, order and condition the collection of Prof. Nina Jablonski

In 2022, a valuable collection of more than 200 replicas of Old World monkeys (*Cercopithecidae*) was donated to the CENIEH by Professor Nina Jablonski, codirector of the Center for Human Evolution and Diversity at the University of Pennsylvania. This was compiled over her career at the National Museums of Kenya, the Wenner-Gren Foundation, and personal donations from researchers such as Gerald Eck, Eric Delson and David Pilbeam. Apart from the Cercopithecoid replicas, the collection includes an important number of replicas of Strepsirrhine dentition. The volume and importance of this magnificent collection means that efforts will be required to condition it and make it available to the wide scientific community which could benefit from consulting it. In 2023, work will take place on ordering and physical and climatic conditioning of the Jablonski collection for storage in an ad hoc space.

- *Indicator: Conditioning of the storage space for the Jablonski collection, with ordering and inventorying (Yes/No).*

A.14. Expand the LITHO and CET collections

With the Experimental Archaeology and Taphonomy Laboratory in full operation, it is now possible to take on expanding the Center's own collections, in particular the Mineral Collection (LITHO) and the Experimental Traceology Collection (CET). This action requires planning both the samples to be collected and localizing outcrops on the map for collection, as well as the corresponding experiments to document and catalog traces of use.

- *Indicator: Expansion of the LITHO (Yes/No) and the CET (Yes/No).*

O.2.4. Enhance the capacities of the CENIEH by augmenting the R+D+I areas where it works.

A.15. Tendering for the work to build the Paleoproteomics and Ancient DNA Laboratory.

In 2021, the CENIEH tendered the doubling work for the 4th and 5th floors of the central block of the Center building, as a preliminary to creating the space to house the new Paleoproteomics and Ancient DNA Laboratory. However, the awardee company finally withdrew after signature and declined to perform the work: this has prompted a long chain of administrative acts leading to the launch in 2022 of the contract termination procedure on the grounds of renunciatory breach by the contractor. In parallel, the contract was offered for tender again in 2022, with the most advantageous bid being selected, and which will be formally awarded by the Executive Committee following the approval given in December by the Consejo de Estado. All of this has delayed the doubling work, and therefore also the construction of the Laboratory which is to be located upon the new floor. Once this contract has finally been awarded, it is hoped to

finally commence execution in 2023, as well as to tender the work for the Paleoproteomics Laboratory. Executing both projects simultaneously and in synergy would represent a considerable saving on costs and time.

- *Indicator: Tender the construction work for the Paleoproteomics and Ancient DNA Laboratory (Yes/No).*

O.3. Expand and diversify the community to which the CENIEH offers its R+D+I capacities and services.

In addition to opening its laboratories in the competitive access mode, the CENIEH is involved proactively in developing advanced infrastructure networks which enhance the value of its facilities and expand the range of potential users of our laboratories by helping to attract excellent projects.

O.3.1. Promote the participation of the CENIEH in infrastructure networks.

The Center belongs to several European infrastructure networks such as ARIADNEplus (Advance Research Infrastructure for Archaeological Dataset Networking in Europe) and IPERION HS (Integrating Platforms for the European Research Infrastructure ON Heritage Science), in which it plays a leading role. In particular, and at the last general assembly of IPERION held in Florence in October, the success of the CENIEH in both the strong demand for the use of its facilities, as one of the institutions receiving the most applications, and the organization and running of the Training Camp in July 2022, were specifically underlined. The Center's role in this network has two main aspects: managing bilateral access requests to European infrastructures (WP3), and teaching and research (Task 5.5 within WP5). Over 2023, the CENIEH will remain active in fulfilling its commitments for both aspects through the following actions

A.16. Manage the global reception of access requests to FIXLAB in relation to paleoanthropology/paleontology and archaeology (WP3). The CENIEH is currently offering the Geochronology and Micro-Computed Tomography laboratories on the service platform FIXLAB. Within FIXLAB, this is group C, which encompasses specialist platforms in archaeology and paleontology, as well as paleoanthropology.

- *Indicator: Manage the transnational access requests to the IPERION platform FIXLAB (group C) (Yes/No).*

A 17. Design and conduct an experiment within WP 5 Task 5.5: Advanced description of paleontological and palaeoanthropological specimens. The objective of this task is to develop and evaluate new image and spectroscopy methods for advanced documentation and conservation in paleontology and paleoanthropology

for measuring the impact of computerized axial microtomography (microCT) scanning in the carbon-14 dating technique. To do this, the Center will be responsible for coordinating the design and execution of an experiment to involve its own microCT and geochronology laboratories and the Oxford Radiocarbon Accelerator Unit (ORAU, United Kingdom).

- *Indicator: Design and conduct of the experiment (Yes/No).*

O.3.2. Promote the opening of all the essential laboratories to competitive access

The recognition of the Center as an ICTS places particular emphasis on offering laboratories recognized as essential ("outstanding facilities") transparently and competitively in pursuit of excellence. Currently, and referring to the latest ICTS map, all the CENIEH laboratories recognized as outstanding facilities are open to the scientific community in competitive access mode. We are talking about no fewer than seven laboratories with widely differing procedures, analyses, times and measurements, and this has entailed a major effort of adaptation and scheduling the work routines to accommodate this mode. In compliance with the demands of the ICTS mark, at the moment at least 20% of the infrastructure overall is offered to competitive access. To emphasize the value of the ICTS and promote its opening to the scientific-technical community, the objectives for 2023 will not just be to launch competitive calls for all seven facilities, but to increase the percentage offered in some of them above this minimum of 20%:

A.18. Launch at least one competitive access call for the Luminescence Laboratory.

Since its opening to competitive access in 2021, the highlights are a growing demand from the scientific community and the facility's ongoing efforts to tune its methods and capacities, such as the VSL procedure or core logging (see A.5).

- *Indicator: Launch at least one competitive access call for the Luminescence Laboratory (Yes/No).*

A.19. Launch at least one competitive access call for the Archaeomagnetism Laboratory.

This Laboratory has been open to competitive access since 2019. Adapting it to this has been a challenge in terms of organization because the competitive windows have to be molded to a demand clearly associated to the periods when excavations take place.

- *Indicator: Launch at least one competitive access call for the Archaeomagnetism Laboratory (Yes/No).*

A.20. Launch at least one competitive access call for the ESR Laboratory.

This Laboratory has been open in competitive access mode since 2021 and it offers diverse services such as measurements at low temperature (“Q-band”), ambient temperature (“X-band”), and sample irradiation, all of which are strongly demanded by users.

- Indicator: Launch at least one competitive access call for the ESR Laboratory (Yes/No).

A.21. Launch at least one competitive access call for the Computerized Axial Microtomography Laboratory.

This laboratory has been offered in competitive mode since 2019 and it hosts accesses of widely varying types due to its transversal nature. The acquisition of a new microtomography unit to enable biomechanical studies in situ and the tuning of the specific procedures for this type of test in 2022 have expanded what can be offered in these access windows.

-Indicator: Launch at least one competitive access call for the Computerized Axial Microtomography Laboratory (Yes/No).

A.22. Launch at least one competitive access call for the Uranium Series Laboratory.

This laboratory was opened to competitive access mode in 2021, thus completing the offering of all the outstanding facilities to this kind of call. The aim for 2023 will be to maintain the offering of these services using this system, including the implementation of the new “Miami” method, to be accomplished this year (see A.8).

-Indicator Launch at least one competitive access call for the Uranium Series Laboratory (Yes/No).

A.23. Launch at least one competitive access call for the Restoration and Conservation Laboratory.

This Laboratory is one of the two which embarked on competitive access mode in 2022. Its services include both the restoration and conservation of the Center's own collections, or those of the institutions so requiring.

- Indicator: Launch at least one competitive access call for the Restoration and Conservation Laboratory (Yes/No).

A.24. Launch at least one competitive access call for the Cosmogenic Nuclides Laboratory.

The opening of this Laboratory in 2022 completed the offering of all the laboratories specializing in dating in competitive mode, fomenting transparent access to our most

exotic equipment. The agreements reached between this facility and the ICTS CNA (Centro Nacional de Aceleradores) strengthen the excellent scientific and technical offering in the field of cosmogenic nuclides.

-Indicator: Launch at least one competitive access call for the Cosmogenic Nuclides Laboratory (Yes/No).

A.25. Offer more than 20% in competitive access mode for at least two of the outstanding facilities.

Currently, and in line with directives from the Ministry on how to quantify and evaluate the capacities and demand for the ICTS, the CENIEH is in the process of converting the "units of measurement" for that capacity, which was originally determined in terms of how many samples were analyzed, to other variables which depend on the diverse nature of the analyses among laboratories, and sometimes even within a single facility. Bearing in mind that this conversion and estimation of the capacities is still under way, we calculate that the total opening of the ICTS-CENIEH to competitive mode is around 27%, so that the minimum of 20% demanded for ICTS accreditation is exceeded. The objective for 2023 is that at least two of the outstanding facilities that are currently less than 30%-open should reach that percentage.

-Indicator: Offer at least 30% in competitive access mode for at least two of the outstanding facilities where the percentage is currently lower (Yes/No).

O.4. Increase the social impact and visibility of the CENIEH's activity.

Dissemination of its own scientific activity and of the principal discoveries in the world of human evolution has become a badge of identity for the CENIEH which is inseparable from its scientific and technical advances. This is combined with a sense of social engagement manifested in the development of programs and initiatives that promote inclusive transfer. The knowledge transfer vocation of the CENIEH is accompanied by social engagement that is seen in its pursuit of initiatives to make its work more inclusive. The objectives for 2023 are:

O.4.1. Promote the participation of the CENIEH in training and teaching programs.

As a living Center, it is important to work to attract staff with an interest in training who are committed to continuing the line of able specialists in this country. Internships and stays at the laboratories offer first-hand, authentic experience of incalculable value for integrating the next generation of technicians and scientists into the work and professional worlds. For 2023, it is hoped to:

A.26. Promote the supervision of interns and stays at the CENIEH laboratories.

The CENIEH assumes its commitment to training personnel and enriching the career experience of the generations that aspire to join the work and professional worlds.

- *Indicator: Capture at least 6 persons for internships and/or training stays (Yes/No).*

O.4.2. Enhance the engagement of the CENIEH in outreach.

The CENIEH works continuously on developing a 'Science with and for Society' program, aligning itself with the European Union by promoting projects that could be described as what is known today as "citizen science". In addition, the Center is engaged in an unstinting quest for formulas that expand the sectors of society that its message reaches, with special attention to minority groups and those with some form of disability, among which one highlight is the adaptation of contents for the hearing-impaired, and the launch of activities such as the podcast, that can also be enjoyed by the blind or the vision-impaired. Efforts in 2023 will center on expanding the audience for our activities in terms of age and geographical area:

A.27. Launch a CENIEH podcast for children. Following the launch of a podcast called "Sapiens Dialogs" in 2022, in an endeavor to use all the formats available today for communicating contents, a new podcast series aimed at children will be added in 2023. The idea is to spark curiosity about our origins and the culture of evolution among the very youngest.

- *Indicator: Create a CENIEH podcast for children (Yes/No).*

A.28. Start internationalization of the Ratón Pérez Collection project. The Ratón Pérez project is certainly one of the CENIEH's most unusual and characteristic outreach activities. The main purpose of creating this collection of deciduous teeth is to develop a comparative sample of milk teeth, of worldwide importance, which will assist with important investigations in the spheres of paleoanthropology, anthropology and forensics. Currently, no fewer than 9 different Spanish institutions are involved in the collection of teeth. The objective will be to promote and establish an agreement with some foreign institution that has expressed an interest in the project.

- *Indicator: Establishment of agreement with a foreign institution to collect teeth (Yes/No).*

Transversal objectives

The transversal axes are basic links that structure the main strategic lines of the Center, facilitate resource management, and channel information flows smoothly among all the areas of the institution. These axes act as connecting vectors that bring together work quality,

occupational safety, and excellence in resource management. For 2023, we highlight the following actions along three transversal axes:

O.T.1. Quality Management System (QMS).

A.29. Expand the scope of the QMS by implementing the requirements of the standard ISO 9001:2015 in new laboratories.

As part of its quality policy, the CENIEH aspires for all the processes impinging on the R+D+i services offered in the laboratories to be certified to ISO 9001:2015, as a preliminary step to including the requirements of ISO 17025:2017 that are specifically applicable to laboratories that perform analyses. To further implement the standard, in 2023 work will take place on including two more laboratories under the aegis of the QMS: the Cosmogenic Nuclides and Experimental Archaeology and Taphonomy laboratories. This implies that all the documentation about the procedures and processes relating to the services that can be offered within these laboratories should be integrated into the Center's QMS.

- *Indicator: Integration of the documents relating to the procedures and processes undertaken during 2023 for the laboratories of Experimental Archaeology and Taphonomy (Yes/No) and Cosmogenic Nuclides (Yes/No).*

O.T.2. Human Resources.

A.30. Devise an action plan to obtain the "HR Excellence in Research Award".

The CENIEH seeks to implement policies that promote equality and transparency in the course of its activity. Thus, and with a view to achieving the "HR Excellence in Research Award" by time horizon 2024, work will continue on the phases set out in the Action Plan submitted in 2022. This phase requires **compiling and registering the documentation formally according to the 4 templates** (Process description [Template 1]; GAP Charter and Code Checklist [Template 2]; OTM-R Checklist [Template 3]); Action Plan [Template 4]) **provided by the Euraxess platform HRS4R e-tools** by the deadline set by the European Commission to complete the initial phase, namely November 29th 2023.

- *Indicator: The four templates of the initial phase of HR Excellence in Research Award accreditation registered at Euraxess (Yes/No).*

III. Summary table of main investments planned for 2023.

Project	Related objective	Estimated cost
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Execute the doubling work for the 4th/5th floors	O.2.4 A.15	€800,000
Execute the Paleoproteomics Laboratory conditioning, which is dependent upon prior execution of the doubling	O.2.4 A.15	€825,000
Acquisition of 3D laser for Archaeometry*	-	€39,000

*This investment will be made in 2023 but it does not have any associated objective in the Annual Plan 2023.

IV. Summary table of objectives and indicators

Strategic objectives	Specific objective	Indicator
O.1. Enhance the quality of the scientific and technical production. (15%)	O.1.1. Promote the attraction of researchers and technicians. (4%)	- Hiring of at least six new researchers/technicians by participating in competitive talent attraction calls (Yes/No). 4%
	O.1.2. Promote publication in SCI impact journals. (5%)	- Maintain the new four-year average of SCI publications per researcher (Yes/No). 5%
	O.1.3. Promote leadership and participation in prestigious paleontological and archaeological excavations. (3%)	- Maintain the number of excavations and field interventions where the CENIEH participates, compared with 2022. (Yes/No). 3%
	O.1.4. Promote leadership in unique research projects. (3%)	- Submit at least four applications in project calls, at least one of which is international (Yes/No). 3%
O.2. Strengthen the uniqueness of the infrastructure. (42%)	O.2.1. Enhance the uniqueness of the Geochronology and Geology Program by expanding its capacities. (24%)	- Tuning the “MSCL Geotek” equipment (Yes/No). 5%
		- Develop a specific procedure for scanning fossils and control its impact on dating (Yes/No) 4%.
		- Develop a specific procedure for U-Th analysis by laser ablation (Yes/No) 5%.
		- Implement the “Miami” procedure in the U-Th laboratory (Yes/No) 5%.
		- Establish the final sample preparation step for AMS in the Cosmogenic Nuclides Laboratory (Yes/No) 5%.

Strategic objectives	Specific objective	Indicator
O.2. Strengthen the uniqueness of the infrastructure. (42%)	O.2.2. Increase the capacities of the Transversal Laboratories to meet the demand from the scientific and technological community. (10%)	- Acquisition and commissioning of a multirotor UAS (Yes/No). 2%
		- Commission the FTIR microscope (Yes/No). 4%
		- Commission the high-speed camera in the Experimental Archaeology and Taphonomy Laboratory (Yes/No). 4%
	O.2.3. Improve and enhance the capacities of the Collections, Conservation and Restoration Area (4%)	Inventory, order and condition the Jablonski collection (Yes/No) 2%.
		- Expand the LITHO and CET collections (Yes/No). 2%
	O.2.4. Increase the capacities of the CENIEH by augmenting the R+D+i areas where it works (4%)	- Tender the construction work for the Paleoproteomics Laboratory (Yes/No). 4%
O.3. Expand and diversify the community to which the CENIEH offers R+D+i (25%)	O.3.1. Promote participation in infrastructure networks (4%)	- IPERION HS: Manage the transnational access requests to the IPERION platform FIXLAB (group C) (Yes/No). 2%
		- IPERION HS: Design and conduct the experiment in Task 5.5 (WP5) (Yes/No). 2%
	O.3.2. Promote the opening of all the essential laboratories to competitive access (21%)	- Launch at least one competitive access call for the Luminescence Laboratory (Yes/No). 2%
		- Launch at least one competitive access call for the Archaeomagnetism Laboratory (Yes/No). 2%

Strategic objectives	Specific objective	Indicator
O.3. Expand and diversify the community to which the CENIEH offers R+D+i (25%)	O.3.2. Promote the opening of all the essential laboratories to competitive access (21%)	- Launch at least one competitive access call for the ESR Laboratory (Yes/No) 2%
		- Launch at least one competitive access call for the Computerized Axial Microtomography Laboratory (Yes/No) 2%
		- Launch at least one competitive access call for the Uranium Series Laboratory (Yes/No) 2%
		- Launch one competitive access call for the Conservation and Restoration Laboratory (Yes/No) 2%
		- Launch at least one competitive access call for the Cosmogenic Nuclides Laboratory (Yes/No) 2%
		Achieve opening of more than 20% (30%) in competitive mode at least two outstanding facilities where the percentage is lower (Yes/No). 7%
O.4. Increase the social impact and visibility of the CENIEH's training and teaching activity (10%)	O.4.1. Promote the participation of the CENIEH in training and teaching programs (5%)	- Capture at least 6 persons for internships and/or training stays at the Center (Yes/No). 5%
	O.4.2. Enhance the engagement of the CENIEH in outreach (5%).	- Launch a podcast for children (Yes/No). 3%
		- Start internationalization of the Ratón Pérez project (Yes/No). 2%
O.T.1. Quality Management System (QMS) (6%).	Expand the scope of the QMS to new CENIEH laboratories	- QMS integration of the laboratories Cosmogenic Nuclides (3%, Yes/No) and Experimental Archaeology and Taphonomy (3%, Yes/No).



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O.T.2. Human Resources (2%).	Accreditation for the “HR Excellence in Research Award”	- Submission and registration of the 4 templates for the initial phase in Euraxess (Yes/No). 2%
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