

Fundação para a Ciência e a Tecnologia

Evaluation Research Unit 2013

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1. IDENTIFICATION OF THE R&D UNIT

1.0 Reference

286

1.1 Name of the R&D Unit

Interuniversity Center for the History of Science and Technology

1.2 Acronym

CIUHCT

1.3 Coordinator

Ana Isabel da Silva Araújo Simões

1.4 Multidisciplinary/interdisciplinary R&D Unit

No

Scientific areas

History(**Main Scientific Area**)

1.5 Profile of the R&D Unit

100% Basic research

0% Applied research and/or Experimental development

1.6 Keywords

History of Science and Technology

Instruments, techniques and material culture

Experts, Institutions and Globalization

Circulation, appropriation and innovation

1.7 Link to the R&D Unit's page on the Internet

www.ciucht.com

1.8 Unit registration options

Keep

2. INSTITUTIONS AND THEIR ROLES

2.1 Main Host Institution

Fundação da Faculdade de Ciências (FFC/FC/UL)

2.2 Other(s) Host Institution(s)

Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa (FCT/UNL)

2.3 Participating Institution(s)

Institution Name Host Institution

2.4 Institutional commitment

CIUHCT is a interuniversity center associated with two institutions: University of Lisbon - Faculty of Sciences (FCUL) and the New University of Lisbon - Faculty of Sciences and Technology (FCT/UNL).

Both institutions FCUL and FCT/UNL supply space, general computing infrastructure, communications and administrative and financial R&D (research and development) management (FCUL through its foundation - FFCUL - Fundação da FCUL and FCT-UNL through its administrative unit).

CIUHCT is associated to FCUL and FCT-UNL departments, respectively Unit for the History and Philosophy of Science (SAHFC) and Department of Applied Social Sciences (DCSA), which are in charge of space and resource allocation and operational services. CIUHCT develops its activities at the campuses of the two universities. In what relates to the University of Lisbon it is located at FCUL - Campo Grande Campus, and at MUHNAC - Rua da Escola Politécnica; in what relates to the New University of Lisbon it is located at the Monte de Caparica Campus.

FCUL and FCT/UNL associated R&D units have natural access to all their labs, particularly teaching labs, and teaching areas to hold meetings, seminars and workshops, especially during non-academic periods. R&D units also benefit from IT services, enabling most of them to locate their internet sites within universities' servers. Legal, contractual and IP support is also directly provided by FCUL and FCT/UNL when requested by units. Both universities have libraries with a considerable number of books and periodicals in history of science and technology, including on-line access to JSTOR and B-ON, relevant for CIUHCT's research activities.

Administrative and financial management are provided on a rotating basis by FFCUL - presently the Main Host Institution for CIUHCT - and FCT/UNL. FFCUL is a non-profit organization recently reclassified as a public institution, and acts as the legal front institution of multiple research units. FFCUL provides the financial stability, the accounting support and the specialized human resources needed to comply with the overall project applications and financing programs and all different expenses reports required throughout project development. The same functions will be secured by FCT/UNL during the time-period in which this institution will act as the host institution.

CIUHCT's University of Lisbon group is located at Building C4 of FCUL campus, on floor 3, above the library, using a substantial part of the premises allocated to SAHFC, and profits from ample offices' space and a secretariat. A number of members of CIUHCT are located at the premises of MUHNAC, sharing office space, secretarial facilities, and having access to its scientific collections and instruments, library and archives. CIUHCT's New University of Lisbon group is located at Building 7 of Campus de Caparica, on floor 2, and uses the premises of the DCSA, profiting from its offices and secretariat.

3. R&D UNIT DESCRIPTION AND ACHIEVEMENTS

3.1 Description of the R&D Unit

The Interuniversity Center for the History of Science and Technology (CIUHCT: www.ciuhct.com) is a research unit created in 2007. Its mission is: 1) produce high-quality research in the history of science and technology and medicine (STM), 2) internationalization and networking of the Portuguese community of STM historians, including an increasing number of foreign scholars, 3) training of the new generation of young STM historians, and 4) research outreach to the

public at large.

CIUHCT resulted from the fusion of 2 FCT research units, affiliated to 2 higher education institutions: Centro de História e Filosofia da Ciência e da Tecnologia, affiliated to FCT-UNL, and Centro de História das Ciências da Universidade de Lisboa, affiliated to FCUL. In the period since its creation, CIUHCT's has gained momentum and achieved a critical mass. Scientific research areas and methodological approaches have concomitantly widened, turning CIUHCT into the reference research unit in the history of STM in Portugal, simultaneously tailored to inscribe the history of STM in the international landscape.

In the context of social sciences and humanities, and specifically of history, CIUHCT is a research unit central to broadening the scope of history as conceived by the Portuguese community of historians, by adding to it the fundamental STM dimension. Simultaneously, in order to inscribe the Portuguese history of STM in the international scholarly map, CIUHCT has addressed a significant number of case-studies, which unveil the changing status of Portugal as central and peripheral in the geography of nations, and contribute to enrich the notion of European identity. Input from the international networks Science and Technology in the European Periphery (STEP), Tensions of Europe (ToE) and International Network of Engineering Studies (INES) have been particularly relevant in framing and exploring this research agenda. Additionally, as far as material culture, collections-based history of STM, and specifically the role of university collections in Europe, the participation in the network of Portuguese and Brazilian Museums of Science has been of the outmost importance.

Paying heed to its interuniversity character, CIUHCT has included 2 groups associated with the 2 host institutions (FCUL and FCT/UNL). CIUHCT's coordinator, host institution and proponent institution alternate every 3 years, the vice-coordinator being associated with the other institution. A Scientific Committee has assisted the coordinator in planning research activities and monitoring their implementation. Foreign scholars have been part of CIUHCT's external evaluation panel (CEPAC) securing the unit's standards of excellence and proposing recommendations for its future development.

In the period under evaluation, CIUHCT's 2 groups shared similar designations, to stress a common research agenda but different research topics - UNL Group: Science and Technology (i). Historical and Interdisciplinary Studies, and UL Group: Science and Technology (ii). Historical Studies and Material Culture. The objectives pursued by both groups have contributed to unveil the role of STM in Portugal, from the 16th century onwards, bringing it simultaneously to the forefront of Portuguese History as well as to the international landscape. The privileged standpoint offered by Portugal, a center during the early modern period and a peripheral country since the 18th century, but a metropolis in relation to its empire, is particularly suited to enrich the on-going debate on changing centers and peripheries. Historical tools such as networking, circulation and appropriation of knowledge have proved instrumental in this endeavor. UNL Group has addressed specific topics on an interdisciplinary basis, by focusing on intersections with art, architecture, literature, cinema, ethics, philosophy, and UL Group has explored intersections with material culture, instruments and collection-based history of science.

The former organization has been considered appropriate to CIUHCT's first years of existence, as it gave visibility to former parents' units while enhancing collaboration across groups. It will be substituted by another one (see 6.3), which has been considered better suited to fulfill CIUHCT's vision for 2015-2020. In order to circumvent the geographical distance between the two groups' location, strengthen scientific cohesiveness and the unit's identity as more than the sum total of its two groups, CIUHCT has regularly organized activities in which all members participate, and which are advertised to the community at large. They include the monthly CIUHCT's series of conferences, HoST conferences, Seminars of Material Culture, Seminar of Ancient Scientific Texts, as well as yearly workshops such HoST workshop, Seminar of Ancient Books, Seminar of Cartography, the Spring Lectures on the History of Cartography. HoST seminars and annual workshops are associated with the on-line open access international journal HoST, founded by CIUHCT's members. PhD students and Post-Docs have regularly organized the Journal Club, in which selected papers and books are discussed, and have been in charge of maintaining CIUHCT's website and the weekly newsletter. Projects funded by the FCT as well as CIUHCT's book series have also strengthened members' ability to collaborate fruitfully.

CIUHCT's association with the only graduate programs existing in Portugal in the period under scrutiny (one MSc graduate program in history and philosophy of science at FCUL, and two PhD graduate programs, one at FCUL and the other at FCT-UNL), has secured CIUHCT's involvement in the steady training of a young generation of historians of STM (see 5), including 5 PhD and 14 MSc dissertations defended.

Internationalization has been secured by the participation in international networks and projects, mentioned above, regular attendance of mainstream meetings, including those organized by important scientific societies, and publication in reputed foreign outlets. Attraction of foreign peers and post-docs as well as prizes awarded to CIUHCT's junior members, materialize CIUHCT's scientific expertise and ability to network. On average, CIUHCT secured that members, especially junior ones, present their research results abroad in reputed forums at least once a year. This simple but efficient organization enabled to fulfill CIUHCT's main objectives. We are proud to announce that the combined success of CIUHCT's scientific options, management and strategic agenda has been confirmed by the leveraging of scientific synergies among members (1,02 WoS publications per member) and corroborated by independent evaluations: a) CEPAC and b) bibliometric study ordered by the FCT to the CWTS-University of Leiden (2007-2011). Reinforced in the years 2012-14, the latter positions CIUHCT as the top unit among FCT research units in social sciences and humanities (see <http://www.ciuhct.com>)

3.2 Major achievements

CIUHCT's research work has focused, but has not been restricted to, history of STM in Portugal, and has highlighted a conception of the field encompassing both traditional and recent approaches, including material culture, instrumentation

and collection based STM history, material reconstructions, and technoscience actors and practices. In what relates to research on local case studies, it has been especially attentive to their communication to international specialized audiences, through publications, organization of meetings, and participation in networks, some founded by CIUHCT members.

CIUHCT has articulated discussions at the conceptual and methodological levels with research on specific topics on the history and material culture of STM, all framed in the context of methodological pluralism, and spanning periods from the 16th to the 20th century.

Especially important has been the input from the framework developed within the international group STEP (Science and Technology in the European Periphery site) and ToE (Tensions of Europe site). This input is behind the move from relying on the concept of transmission and the perspective of the centre to the concept of appropriation and the perspective of the periphery, as well as the articulation of local case studies in writing a global history of Europe, in which STM play a leading role. It has provided the rationale behind collective projects, both involving CIUHCT's two groups as well as other international groups or networks, dealing with: 1) circulation of STM knowledge; 2) local embedding of STM practices; 3) history of STM based on crossing cultures: printed, manuscript, oral, and material sources; 4) history of STM in an interdisciplinary context - art, architecture, literature, cinema, ethics, philosophy. One should highlight the unusual broadness of CIUHCT's areas of research, including history of science (physics, chemistry, mathematics, astronomy, geology, meteorology), technology and engineering, medicine, and instruments, collections and material culture, ranging from the early modern period to contemporary history, and including Portugal and its empire. CIUHCT has specifically addressed: (i) intersections of history of STM with the history of books and of education; (ii) history of institutional spaces; (ii) emergence and development of scientific disciplines, professionalization and circulation of knowledge; (iii) popularization of STM using both traditional sources (books and periodicals on popularization) as well as novel ones, including generalist newspapers; (iv) historiographical considerations on STM in the European Periphery; (v) scientific heritage, material culture and collection based history of STM.

The broadness of areas, periods, and methodological interests covered by CIUHCT's members does not result from lack of specialization and professionalization, but from the belief that a young and continually growing community of historians of STM should be as encompassing as possible.

The strategy to inscribe the history of STM in Portugal in the international context has been anchored in: 1. Publications in international volumes, edited volumes and peer-reviewed journals; 2. Presentation of papers in international conferences; 3. Organization of sessions and conferences on topics related to the Portuguese case; 4. Active participation in international research projects and networks; 5. Central involvement in the HoST project (on-line journal, annual workshops, monthly conferences); 6. Participation in STEP, ToE, Making Europe, INES, and on-going involvement with the activities of the Max Planck Institute for the History of Science, Berlin; 7. Participation in boards of societies following peer election, book series and journals; 8. Refereeing for WoS journals.

The following activities, covering research, training and outreach, both in national and international forums, should be highlighted:

- Publications in journals indexed in WoS, achieving an average of 1.02 per member, the highest in the humanities in Portugal (FCT bibliometric study), (See Key Publications K5 to K10);
- Publication of books in major academic publishers abroad (MIT and University of California Berkeley) (K1, K2);
- Scientific coordination of the Complete Works of Pedro Nunes, with introductions, notes and critical comments (K4);
- CIUHCT's commitment to the history of scientific instruments, collections and material culture of STM materialized in the participation in the first inventory of Portuguese scientific heritage, the development of innovative collaborative projects with Brazil, and finally a project to launch a national survey of scientific collections;
- 6 FCT Projects coordinated by CIUHCT's members, and participation in 3 international ones;
- Two researchers hired under *Compromisso com a Ciência* 2008, one having won an Principal Investigator FCT position in 2013;
- Organization of II Encontro Nacional HCT (2010) and international meetings, including the 50th annual meeting of the Society for the History of Technology (SHOT - 2008), and History of European universities. Challenges and transformations (2012), XXVII Symposium Scientific Instruments Commission (2008), Board Game Studies Colloquium (2008), and I Encontro Luso-Brasileiro de História da Medicina Tropical (2012). CIUHCT is organizing STEP, 2014 and European Society for the History of Science, 2014;
- Participation of CIUHCT members in the on-line journal HoST, reinforced in 2012 with a chief-editor from CIUHCT.
- Scientific coordination of two important book series, *Coleção Ciência e Iluminismo*, and *Coleção História e Filosofia das Ciências*, Porto Editora. These collections are re-known abroad, especially in Spain and Brazil, and prized for excellence in translation.
- Participation in the scientific committees for the commemorations of the 100th anniversary of the University of Lisbon and of the Faculty of Sciences of the University of Lisbon (CIUHCT's involvement materialized in 2 books, 1 long chapter, organization of international meeting, edition of a journal's special issue, and 1 exhibition);
- CIUHCT book series, recently being published by Colibri Publisher (example K3).
- Training of graduate students (MSc and PhD) and supervision of post-docs, including foreign ones (14 MSc, 5 PhD defended, 12 Post-Docs supervisions). Note that 2 PhD theses have been awarded prizes: *jeune historian* of the Académie Internationale d'Histoire des Science, and "Prémio Cultura 2012" by the Sociedade de Geografia de Lisboa.
- Role of CIUHCT's web-site and e-mail weekly newsletter in conveying to peers and population at large news, varied information, digitization or transcription of sources, etc.;
- Outreach activities, including regular organization of exhibitions in which research work is presented to the public at large. We highlight the preparation of the national exhibit 360º- *Ciência Descoberta*, Fundação Calouste Gulbenkian, held in 2013.

Key Publications

- K1- Kostas Gavroglu, Ana Simões, Neither Physics nor Chemistry. A History of Quantum Chemistry, MIT Press, 2012
- K2 - Ana Simões, Maria Paula Diogo, Ana Carneiro, Citizen of the World. A Scientific Biography of the Abbé Correia da Serra, IGS Press/University of California, Berkeley, 2012.
- K3 - Maria Paula Diogo, Isabel Amaral (eds.) A outra face do império: ciência, tecnologia e medicina (sécs. XIX e XX), Edições Colibri, Coleção CIUHCT, 2012
- K4 - Henrique Leitão, ed., Complete Works of Pedro Nunes, vols IV, V, VI, 2008, 2010, 2011, Academy of Sciences of Lisbon, with introduction and critical notes by Henrique Leitão.
- K5 - K. Gavroglu, M. Patiniotis, F. Papanelopoulou, F., A. Simões, A. Carneiro, M. P. Diogo, J. Ramon Bertomeu-Sánchez, A. Garcia Belmar, A. Nieto-Galan, "Science and technology in the European periphery. Some historiographical reflections", History of Science, vol.46, 152 (2008), 153-175.
- K6 - Jorge Nuno Silva, "On Mathematical Games", Journal of the British Society for the History of Mathematics, Vol 26 (2), 2011, 80-104.
- K7 - M. C. Lourenço, S. Gessner, 2012. Documenting collections: Cornerstones for more history of science in museums. Science & Education DOI 10.1007/s11191-012-9568-z.
- K8 - P. Fontes da Costa, "Secrecy, Ostentation and the Illustration of Exotic Animals in Sixteenth-Century Portugal", Annals of Science, 66 (2009) 59-83.
- K9 - M. Macedo, "Port Wine Landscape: Railroads, Phylloxera, and Agricultural Science", Agricultural Science, 85, 2 (2011), 157-173
- K10 - Ana Carneiro, Marianne Klemun, eds., Seeing and Measuring, Constructing and Judging: Instruments in the History of the Earth Sciences, Centaurus, special issue, 53 (May 2011), 77-189.

3.3 External Advisory Committee Reports

R&D Unit File

CIUHCT [CEPAC Report 2010.pdf](#)

CIUHCT [Ccepac Report 2011-2012.pdf](#)

3.4 Composition of the External Advisory Committee

R&D Unit

R&D Unit	Member Name	Institution
Department of History and Philosophy of Science	Kostas Gavroglu	University of Athens - Greece
Department d' Enfermeria Comunitaria, Medicina Preventiva i Salut Publica i Historia de la Ciencia	Antonio Garcia Belmar	University of Alicante - Spain
Catedra UNESCO de Tecnica i Cultura	Antoni Roca-Rosell	Polytechnic University of Catalonia
Institut fur Geschichte	Marianne Klemun	University of Vienna, Austria

3.5 Brief description of the output indicators 2008/2012 of the research team of the new unit that support the vision and objectives of the strategic program

CIUHCT's new organizational profile proposed for the period 2015-2020 embodies a new research design for the unit, aiming at better reflecting CIUHCT's national and Iberian leadership and enabling a more interventionist role in the international and European spheres by specifically addressing a set of key topics within the Horizon 2020 agenda. The objectives proposed by CIUHCT for 2015-2020 meet both the vision and the mission of the unit and are designed to profit from and to enhance the work already done, by embodying it in a set of reference works directed both for the national and international communities of historians of STM. Moreover, the two new groups take into account the growing need for an historical perspective in European policy making. Adding to the 10 key publications, we single out: Group 1. Instruments and Practices, Visual and Material Cultures (IPVMC) materializes a research line that has emerged in CIUHCT as a result of an international movement towards an increasingly use of objects as primary sources. Instruments, collections, spaces and iconography are essential to understand the complex and sophisticated dynamics between practices and knowledge, at local and global levels. Moreover, these dynamics are not time-contingent because they can be identified, described and examined for each historic period; that is why IPVMC has such a broad time span, covering the 16th to the 20th century. In the past decade, CIUHCT has been preparing for this approach, by i) delivering the first publications of this type in Portugal; ii) providing training to young STM historians and building critical mass, iii) establishing and collaborating in

international networks and iv) identifying the most important clusters of coherent material and visual sources (collections of instruments, naturalia, drawings, maps, books, as well as historical spaces such as astronomical observatories, chemistry laboratories, etc) in Portugal, Spain, Brazil, Portuguese-speaking Africa and other countries. Besides major editorial and textual work, as well as the completion of specialized monographs (example is Key Publication K4), artisanal epistemologies and the relation between craftsmen practices and scientific knowledge in Iberia has began to be investigated: "Los artifices del 'Plus Ultra': pilotos, cartógrafos y cosmógrafos en la Casa de la Contratación de Sevilla durante el siglo XVI", *Hispania*, 70 (2010): 607-632; "Maritime discoveries and the discovery of Science: Pedro Nunes and Early Modern Science", in V.N. Brotóns, W. Eamon (eds.), *Más allá de la Leyenda Negra: España y la Revolución Científica*. (Valencia, 2007), pp. 89-104. Maps and globes were investigated with state-of-the-art approaches, leading to startling results and opening new vistas: "Blunders, Errors and Entanglements: Scrutinizing the Cantino Planisphere with a Cartometric Eye", *Imago Mundi*, 64 (2012), 181-200; The notion of scientific instruments and their relation with specific local practices was analyzed: "The conception of a mathematical instrument and its distance from the material world: the 'pantometra' in Lisbon, 1638", *Studium: Revue d'Histoire des Sciences et des Universités*, 4, 2011, 210-227. Collections of scientific objects were discussed both as valuable assets for today's universities as well as historical repositories of scientific history: "Est-ce qu'elles le méritent? Les collections d'instruments scientifiques dans les universités européennes", in A. Rasmussen, S. Boudia, S. Soubiran (eds.), *Patrimoine et communautés savants* (Rennes, 2009), pp. 113-122.

Group 2: Experts, Institutions and Globalization, draws on a decade of previous work by CIUHCT's members on personalities and institutions that shaped Portuguese STM, enabling to design a new integrative theoretical grid that was already in place by the end of 2010s. This theoretical grid integrates international historiographical perspectives on moving centers and peripheries, on the building of a contemporary European identity, on the role of empires in globalization, on the notions of circulation, appropriation, and mediators, and CIUHCT's own research.

Experts and Institutions have a long tradition of a close relationship with political power. However during the Enlightenment expertise was brought to the forefront of the political chessboard. CIUHCT's members have worked on this topic on a national basis - see for example Key Publication K2 and "The Eclipse, the Astronomer and his Audience: Frederico Oom and the total Solar Eclipse of 28 May 1900 in Portugal", *Annals of Science*, 69, 2 (2012), 215-238, and edited volume on *Travels of Learning*, Springer, 2003. The 19th century placed expertise at the center of imperial power as a tool for worldwide control. CIUHCT's members have addressed this topic extensively, covering disciplines such as engineering and infrastructures, agriculture, urban policies, medicine, astronomy, and geology. See edited volume K3, which includes 8 chapters by CIUHCT's members; and "Domesticating the wilderness", in *The Quest for a Professional Identity* (Colibri, 2009), "Building Tropical Medicine in Portugal - The Lisbon School of Tropical Medicine and the Colonial Hospital (1902-1935)", *Dynamis*, 2008, 28, 299-336). CIUHCT is involved in an international book series, which re-analyses European History through the lens of history of technology, being responsible for the volume on Europe and the Global World (2015).

Expertise continues to be critical in the 20th century. CIUHCT has researched extensively on the agency and structure of scientific and technical professional identities and institutions, as well as individual scientists, engineers and physicians "Going Public: The 1st Portuguese National Engineering Meeting and the Popularization of the Image of the Engineer as an Artisan of Progress", *Journal of Engineering Studies*, Oct, 2012, 1-20; *Projectar e construir a Nação. Engenheiros, ciência e território em Portugal no séc. XIX* (ICS, 2012); *Uma História da Faculdade de Ciências 1911-74* (FCUL, 2013); "A time for engineers and a time for geologists: scientific lives and different pathways in the history of Portuguese geology", *Earth Sciences History*, 32 (2013), 23-38; "Physics on the Periphery: A Research School at the University of Lisbon under Salazar's Dictatorship (1929-1947)", *Historical Studies in the Natural Sciences*, 41 (3) (2011), 303-43). Popularization of STM has also been under CIUHCT's scrutiny (Halley turns republican, How the Portuguese press perceived the 1910 return of Halley's comet", *History of Science*, 51 (2013), 199-219; *Saúde Pública e Higiene na Imprensa Diária em Anos de Epidemias* (Colibri: 2013). Finally, CIUHCT's bid on interdisciplinarity has materialized on the exploration of themes such as innovation, risk and authority ("Boosting Innovation in Europe: USA-EU Why the innovation gap?," Eurocase platform).

4. FUNDING 2008/2012

4.1

Description	2008	2009	2010	2011	2012	TOTAL (€)
Pluriannual Programme/Strategic project	66825	77810	55500	78040	79536	357711
FCT-funded projects	21153	132064	132193	19469	83283	388162
European Commission-funded projects	0	0	0	0	0	0
Other international projects	2000	6500	16110	3500	3500	31610
Other national projects	3000	0	15000	0	0	18000
National industry projects	0	0	0	0	0	0
International industry projects	0	0	0	0	0	0

5. GENERAL INDICATORS 2008/2012

5.1

Description	2008	2009	2010	2011	2012	TOTAL ()
No. of researchers	42	41	48	50	52	233
No. of integrated researchers	21	20	27	28	32	128
No. of technicians and administrative staff	2	2	2	2	2	10
PhD theses under the supervision of integrated members	2	1	0	0	2	5
Publications in international peer reviewed journals	13	16	14	21	43	107
Books and chapters of international distribution	17	31	25	47	56	176
Models	0	0	0	0	0	0
Patents	0	0	0	0	0	0
Prototypes	0	0	0	0	0	0
Industry research contracts	0	0	0	0	0	0
Research contracts with national or international bodies	0	0	0	0	0	0
MSc Theses under the supervision of integrated members	2	2	0	4	6	14
Compromisso com a Ciência Researchers	2	2	2	2	2	10
Publications in national peer reviewed journals	14	16	21	22	17	90
Organization of international meetings or sessions in meetings	15	23	22	32	32	124
Exhibitions	4	6	2	2	4	18
Communications delivered at national and international meetings	121	151	160	190	164	786
Books and Chapters of national distribution	14	21	16	28	42	121

5.2 Overall description of indicators and research outputs/Highlights

We proceed to analyse the results listed in 5.1.

- One should highlight CIUHCT's steady membership growth, including a 50% increase in integrated researchers with PhD, some of whom are foreigners; and a 25% increase in the number of graduate students. While the increase in integrated researchers reflects in part the results of completed PhD dissertations, it also reveals that many Post-Docs have been hired (some of them foreigners - 3), and new senior researchers have been invited (or have asked) to enrol in CIUHCT. According to FCT standards, CIUHCT is a small size unit, however from the point of view of the community of historians of STM, CIUHCT is a fairly large unit. In fact, CIUHCT includes a number of historians of STM, which surpasses that associated with many important European universities.
- The number of PhD dissertations completed (5) and the number of MSc theses completed (14) shows the importance devoted to graduate training by CIUHCT's members. We should note that 2 PhDs have been awarded prizes, one nationally and the other internationally (see 3.2). It should also be emphasized that even MSc theses have given way to international publications in WoS journals. (Examples are: "Giving with one hand and taking away with the other: the automobile assembly industry in Portugal (1960-1988)", *Revista de Historia Industrial*, 48: 1 (2012), 155-181. "The Portuguese Popularizer of Science Teodoro de Almeida: Agendas, Publics, and Bilingualism", *History of Science*, 1 (2012), 93 - 122; "Physics on the Periphery: A Research School at the University of Lisbon under Salazar's Dictatorship (1929-1947)", *Historical Studies in the Natural Sciences*, 41 (3) (2011), 303-43; "Einstein in Portugal. Eddington's 1919 expedition to Principe and the reactions of Portuguese astronomers (1917-1925)", *British Journal for the History of Science*, 42 (2) (2009), 245-73).
- Special attention should be given to international publications in peer reviewed journals. The 300% increase (from 13 in 2008 to 43 in 2012) denotes the steady and growing internationalization of this research unit and its bid on the importance of publishing research results in peer reviewed journals, including WoS and SCOPUS publications. This output accounts for CIUHCT's excellence in research. The last 5 selected Key Publications (K5 to K10) exemplify the different range of topics addressed, from historiographical considerations (K5, K10) to case-studies, from early modern science to science in the 20th century (K8, K9), including collections, mathematical games and material culture (K6, K7, K10), as well as the ability to publish with foreign colleagues (K5, K10) and coordinate special journal issues (K10).
- The total number of publications in international peer reviewed journals, books and chapters in the years under

evaluation has been steadily increasing (30, 47, 39, 68, 99), and again denotes CIUHCT's recognition abroad. Special attention should be given to selected Key Publications K1 and K2 which illustrate the ability of CIUHCT's members to publish books with foreign colleagues (on topics other than Portuguese case studies) in reputed international academic publishers (K1) and their ability to steadily collaborate and make known case-studies from Portugal in book form in reputed foreign publishers (K2).

- Internationalization is also visible from the high number of international meetings and sessions of meetings organized by CIUHCT's members (15,23,22,32,32). One should highlight the organization of large meetings from reputed societies such as SHOT, and Symposium of the Scientific Instruments Commission.
- The number of publications in national peer-reviewed journals (14, 16, 21, 22, 17) shows that albeit CIUHCT's option for publication in international forums, the visibility and importance of CIUHCT in the national context continues to be an important component of CIUHCT's publication strategy.
- The sheer number of national publications, including books and chapter of books should also be highlighted (14,21,16,28,42) denoting CIUHCT's bid on inscribing the History of STM in the national scenario, namely through its book series (of which one example is K3) and by means of ambitious publication ventures associated with reputed institutions such as the Calouste Gulbenkian Foundation and the Academy of Sciences of Lisbon (of which an example is K4).
- The sheer number of communications delivered at national and international meetings (121,151,160,190,164) pictures an extremely active community, both nationally and internationally, encompassing junior members and graduate students.
- The Unit's commitment to the organization of exhibitions making known the Unit's research to the public at large, and involving reputed institutions such as National Museum of Natural History and Science (MUHNAC), National Library of Portugal and Calouste Gulbenkian Foundation, should also be noted (4,6,2,2,4).

6. SCIENTIFIC COMPONENT - STRATEGIC PROGRAMME 2015/2020

6.1 Abstract in Portuguese for publication

Em 2015-2020, o CIUHCT pretende consolidar a sua posição na área da história e cultura material da ciência, da tecnologia e da medicina (CTM) em Portugal, como centro liderante, na Península Ibérica, como um dos 3 melhores, e na Europa como parte dos top 10, assegurando, portanto, a sua posição privilegiada no diálogo interpares no contexto internacional. Tem por objetivos inscrever a história e a cultura material da CTM: 1) na história de Portugal e da Europa; 2) no contexto historiográfico internacional, salientando a importância da CTM na construção do espaço europeu e participando nos debates sobre centro (s) e periferia(s) e sobre agência e estrutura (perspectivas top-down e bottom-up). Com base na sua actividade de investigação, o CIUHCT contribuirá para: 1) promover e consolidar a construção de conhecimento de base científica, alargando os públicos da história e da cultura material da CTM, através de atividades de divulgação e extensão cultural; 2) avaliar temas da atualidade, propondo recomendações para as políticas em CTM desenvolvidas pela União Europeia e assumindo-se como um parceiro activo nos debates sobre o papel da CTM nos desafios postos às democracias contemporâneas e aos estados democráticos europeus, nomeadamente nas áreas da ética, da memória civilizacional e das singularidades tecnológicas.

Os grupos do CIUHCT são: Grupo 1, Instrumentos e Práticas, Cultura Visual e Material; Grupo 2, Peritos, Instituições e Globalização.

O Grupo 1 foca a sua atenção em atores, práticas e objetos de CTM e suas representações, contribuindo para a discussão historiográfica atual e para uma história renovada do conhecimento, em que se inclui as suas versões mais académicas e as abordagens mais recentes ligadas à epistemologia artesanal, capaz de ultrapassar as tradicionais barreiras conceituais, socioprofissionais e disciplinares. Partindo do estudo dos objetos, artefactos e espaços da cultura material da CTM desde o século XVI, o objetivo do Grupo 1 é determinar as práticas subjacentes e os modos como foram moldadas por esses mesmos objetos e lugares, incluindo, pois, uma dimensão geográfica e os efeitos da contingência geopolítica. Assim, por exemplo, o Grupo 1 contribuirá para a clarificação da noção de "Ciência Ibérica", examinando em detalhe os seus conteúdos históricos e relevância historiográfica.

O Grupo 2 centra-se na construção de uma narrativa histórica integrada em torno da produção de conhecimento em CTM, das suas formas de circulação e apropriação e da relação entre agência e estrutura nos vários regimes políticos que governaram Portugal e as suas colónias a partir do século XVIII. A presença da CTM como elemento activo na História portuguesa encontra-se por explorar de modo aprofundado e sistemático. O Grupo 2 propõe-se preencher esta lacuna, reanalisando a História de Portugal a partir da dimensão crítica da CTM que, nas últimas décadas, tem sido tomada como certa, mas não escrutinada em profundidade. Estarão no centro da análise as seguintes questões: qual o papel dos peritos e das instituições, analisados individualmente e como parte de redes internacionais e de agendas de poder? Como é que as agendas locais contribuíram para a construção de um espaço global de CTM? Qual o papel da CTM nas sucessivas agendas governamentais e, ao invés, como é que estas foram moldadas por opções em CTM? Focando-se numa compreensão alargada do conceito de produção de conhecimento, que engloba o ensino, a investigação e a comunicação endereçada a especialistas e ao público geral e a participação em redes internacionais, o Grupo 2 debruça-se sobre a construção do conhecimento de CTM na metrópole e império ultramarino português, a partir de uma metodologia inovadora que combina as abordagens top-down e bottom-up.

Ambos os Grupos exploram ferramentas metodológicas ancoradas nos conceitos de circulação, apropriação e inovação, trilogia intimamente ligada aos temas da sociedade do conhecimento e inovação, que estão na base das políticas europeias da Agenda de Lisboa e da Agenda 2020. Se, até agora, as perspetivas económica e política têm

dominado a análise destes tópicos, um ponto de vista histórico, que permita a comparação na *longue-durée*, torna-se agora imperativo. O CIUHCT contribuirá, pois, para a nova narrativa europeia que introduz a dimensão histórica, filosófica e sociológica da CTM no debate contemporâneo, pretendendo-se reinterpretar os próprios conceitos e contribuir para a construção de uma visão mais ampla que interligue identidades nacionais e europeia e o conhecimento de CTM e as suas práticas, lançando uma nova luz nas presentes questões políticas.

Ambos os grupos do CIUHCT contribuirão para os atuais estudos comparativos internacionais que envolvem países onde a CTM esteve fortemente interligada às agendas políticas, substituindo a noção monolítica de CTM europeia por um conceito mais rico e plástico, em que se cruzam o local e o global. Embora o caso português seja privilegiado na investigação desenvolvida no CIUHCT, temas sobre outros países, desde que integrados nos objectivos do CIUHCT, são bem-vindos e contribuem para uma maior amplitude da agenda análise. Numa perspectiva histórica, os grupos 1 e 2 exploram questões de grande relevância para a contemporaneidade, particularmente tendo em conta a presente fuga de cérebros da periferia para o centro da Europa e deste para os EUA e para os BRIC, pondo em causa o papel europeu como eixo de inovação. A compreensão dos processos de circulação e apropriação da CTM e suas relações com o poder e do desenho das assimetrias de acesso aos meios de produção de conhecimento, numa perspectiva de longo termo, permitem melhorar, com bases firmes, as políticas de decisão do presente.

6.2 Abstract in English for evaluation

In 2015-2020, CIUHCT will consolidate its position as the leading research centre on the history and material culture of science and technology and medicine (STM) in Portugal, as one of the top 3 in Iberian Peninsula and one of the top 10 in Europe, and recognized by the European international STM community as its best Portuguese interlocutor, and thus the better positioned to play an increasingly relevant role in the international scenario. Its goals are: to inscribe the history and material culture of STM both 1) in Portuguese and European history, as well as 2) in the international map of the history and material culture of STM, by unveiling the importance of STM in the construction of the European space from a top-down and bottom-up perspective. At the same time, 3) it will commit itself to enlarge the audience for the history and material culture of STM through outreach activities, thus promoting a scientific-based knowledge. Finally, 4) it will use the history and material culture of STM to assess contemporary topics bringing its input to their tentative solutions, as well as 5) participate in the recent debates on the role of STM in the challenges faced by democracy and European democratic states, proposing recommendations informing European Union's STM policies. CIUHCT's groups are: Group 1, Instruments and Practices, Visual and Material Cultures and Group 2, Experts, Institutions and Globalization.

Group 1 will address STM actors and practices, objects, and their representations, including but not restricted to instruments, with a view to contribute to a renewed history of knowledge, encompassing scholarly and artisanal forms, bridging traditional conceptual, socio-professional and disciplinary barriers, and contributing to recent historiographical debates. The general goal of Group 1 is to study the objects, artifacts and spaces of STM as well as their visual representations, and their mutual influence in shaping practices and circulation, from the 16th century onwards. Special attention will be given to the effects of geographical and geo-political contingency. Thus, for example, it will be an objective of Group 1 to clarify the notion of "Iberian Science", by examining in detail its historical content and its historiographical relevance.

Group 2 aims at building an integrated historical narrative by focusing on the co-production of STM knowledge and its various forms of circulation and the political agendas of the various political regimes in Portugal and its colonies since the 18th century. Despite the extant scholarship on Portuguese political and economic history, its ties with STM have been scarcely explored in a deep and systematic way. Group 2 proposes to cross traditional borders and readdress Portuguese history by bringing to center-stage this critical connection, and answering the following questions: what was the role played by experts and institutions, individually and as part of national and international networks? how have local agendas contributed to the construction of a global STM space? what is the role played by STM expertise in successive governmental agendas and how have state policies been informed by STM choices? By focusing on a broad understanding of the concept of production of knowledge, embracing training, communication among experts, but also addressed to wide-audiences, as well as participation in extended networks, Group 2 will look at the making of knowledge in the mainland and the overseas empires, building on a bottom up and top-down approach, in order to unveil the role of experts and institutions aimed at both teaching and research, and of relevant national and international networks. All offer important tools to understand the circulation and appropriation of STM, often providing the solution of immediate problems of interest to the State, as well as the solution of pressing social needs, and bearing additionally the potential to inform present and future STM policies and programs of action.

Both groups' agendas are complementary, mutually reinforcing, and united by the exploration of common methodological tools anchored on the core concepts of circulation, appropriation and innovation. This overarching trilogy relates smoothly with the issues of knowledge and reflexive society and innovation that are at the core of both the Lisbon and the 2020 agendas for Europe. Although this trilogy of concepts has been addressed massively from the economic and the political standpoints, they have been seldom placed in a historical perspective. CIUHCT's goal is to contribute to a new narrative by introducing a historical STM dimension in the ongoing European debate. We strategically aim at better understanding the concepts themselves, and to contribute to a more comprehensive narrative of the relationship between national and European identities and STM knowledge and practices, shedding a new light on present political issues.

Additionally, CIUHCT's research groups draw attention to the heterogeneity of geographically dispersed contributions to what came to be seen as European STM, usually taken as rather monolithic in content and form, and contribute to the ongoing international comparative studies involving other countries where STM has been strongly intertwined with

political agendas. Complementing CIUHCT's core topics, CIUHCT accommodates research on topics not restricted to the Portuguese case, but still smoothly included into the trilogy circulation, appropriation and innovation. Finally, both groups explore historical questions relevant to contemporaneity: having in mind the present mediatization of brain-drain, the understanding of circulation and its impact on peripheral societies in a long-term perspective enables to tackle present policy decision making on solid ground.

6.3 Strategy and vision of the unit and future management

CIUHCT's vision for the period 2015-2020 is to consolidate its national and international recognition, contributing to enlarging the scope of the History of Portugal as well as European and World History with the input from History and Material Culture of STM (Science, Technology and Medicine). From the national standpoint, traditional history does not still acknowledge the relevance of STM contributions to modern and contemporary societies, CIUHCT's approach being a surplus to the History of Portugal. From the international standpoint, CIUHCT integrates recent scholarly trends on the building of European identity, highlighting across time and place the dual role of Portugal as center and as periphery.

The implementation of this vision lead to a reorganization of the Unit. In its first years of existence, CIUHCT was organized in 2 research groups: Science and Technology (i). Historical and Interdisciplinary Studies, associated with the New University of Lisbon, and the Science and Technology (ii). Historical studies and material culture, associated with the University of Lisbon. Today CIUHCT's scientific cohesion and maturity no longer depends on such organization and, in fact, calls for a new one, which will give way to two transversal thematic groups, encompassing members from both the University of Lisbon and the New University of Lisbon.

The new groups are: Group 1, Instruments and Practices, Visual and Material Cultures and Group 2, Experts, Institutions and Globalization. Group 1 includes presently 9 integrated members, 6 PhD students and 6 researchers with doctorates; and Group 2 includes 15 integrated members, 12 PhD students and 8 researchers with doctorates. This new organizational profile optimizes scientific interactions among members associated with both institutions, evinces the strength and originality of CIUHCT's scientific profile, and in particular thematic options and methodological approaches developed within CIUHCT. Moreover, it explicitly encourages a direct response to the thematic call of Horizon 2020 on European values and identities (Part 6. Call 5).

The emphasis of Group 1, Instruments and Practices, Visual and Material Cultures, on objects-based research and the interbreeding of STM practices with material culture will enable to address the globalization of European culture from the standpoint of early modern Iberian contributions and offers a privileged standpoint to scrutinize the European notion of innovation and its difference from dissimilar notions behind the organization of non-European empires. Group 2, Experts, Institutions and Globalization offers a comparative assessment of the co-construction of STM knowledge-in-motion and the political agendas of the various political regimes that ruled Portugal and its colonies since the 18th century. It is particularly suited to enlighten contemporary hot topics such as innovation, knowledge and reflexive societies, through the seldom used, but extremely useful, lenses of STM history, philosophy and sociology of STM.

Both groups count on the interaction between senior and junior doctorate members as well as PhD students to continue hosting a space of lively scientific debate which is fundamental for the maturation of younger historians strongly committed to the future of this research community.

Paying heed to its truly interuniversity character, CIUHCT's coordinator, host institution and participating institution will continue to alternate every 3 years; while CIUHCT's coordinator will be associated with the host institution, its vice-coordinator will be associated with the other participating institution. This organization has been successfully implemented since 2007.

From the scientific point of view, CIUHCT will be governed by a Scientific Council, chaired by CIUHCT's Coordinator, and including the Vice-Coordinator, coordinators of each group, plus a maximum of two extra members elected by integrated members. The Scientific Council will meet every 2 months to monitor the on-going implementation of CIUHCT's strategic program and operational plans, and will issue a brief report every six months on the basis of the informal reports delivered by group coordinators. Groups' involvement in CIUHCT's activities will be secured by a proposal of a detailed plan including task lists, concise descriptions, members involved, expected scientific results, and time-lines. The coordinators of each Group will report to the Scientific Council, following meetings with all group' members. Annual Reports, issued by the Scientific Council and made public in CIUHCT's web-page will be presented to all members, in order to discuss past activities, and plan future ones, based on a SWOT analysis and other assessment tools. CIUHCT will also be monitored by CEPAC (Permanent External Scientific Advisory Board) on a yearly basis, and by additional consultants who will be called for specific recommendations. Members of CEPAC will discuss with CIUHCT's members, Scientific Council and Coordinator, and will issue a report with recommendations, made available to the public on CIUHCT's web-page.

CIUHCT is pro-active in securing and promoting the regular interaction of members located at different institutions (FCUL, FCT/UNL, MUHNAC/UL). Several activities are organized to secure cohesion and build the unit's common identity. These activities include several series of seminars, workshops and conferences, and a journal club promoted and managed by Post-docs and PhD students, taking place in CIUHCT's locations on a regular basis (bi-weekly, monthly and yearly). They are capped by CIUHCT's book series, as well as the participation in the international on-line open-access journal HoST (whose present editor is a member of CIUHCT, but whose advisory board includes members from other FCT units and reputed foreign scholars). HoST plays a fundamental binding role among CIUHCT's members and acts as a major connecting link with the international landscape.

The former activities will second CIUHCT's individual and collective research plans materialized by its groups' outputs.

Furthermore, building on previous work (see Part A: on-line biographical database and Bibliographic Guide 2000-2004), in the period 2015-2020 CIUHCT proposes to implement the following multidisciplinary scientific projects

- 1) A multi-volume Dictionary of Biographies of Portuguese scientists, engineers of physicians or STM scholars working in Portugal, edited by CIUHCT's members, encompassing c. 1000 entries..
- 2) A Bibliography of the History of STM in Portugal listing publications on the history of STM in Portugal.
- 3) An edited volume of History of STM in Portugal, including publications by CIUHCT's members (Portuguese and English version).
- 4) Publication of HoST international e-journal on a regular basis, securing its inclusion in a reputed database (see www.johost.eu)

6.4 Laboratory intensity level of the unit

Low or absent

Laboratory intensity level Justification

No laboratory intensity having in mind the Unit's area - history of science, technology and medicine - and the absence of laboratory equipment, public archives, and database infrastructures, according to FCT regulations.

6.5 General objectives

CIUHCT's vision is to become a leading European research unit in the field of STM (Science, Technology and Medicine) studies. For 2015-2020 CIUHCT's mission is to continue producing high quality research in the history and material culture of STM, contributing to its establishment as a solid scientific field in Portugal, fully integrated in the international community. For this purpose, three main scientific goals are put forward: 1) to inscribe STM in Portuguese and European history, by unveiling the importance of STM in the construction of the European space; 2) to increase the presence of Portuguese studies in the international map of the history and material culture of STM; 3) to foster a multidisciplinary STM approach, by bringing together scholars of different branches of the social sciences and humanities. These goals meet FCT's objectives in the humanities of promoting "research that significantly adds to knowledge and critical understanding of the arts and humanities, exploring interdisciplinary and trans-disciplinary approaches" and "enhancing the study of Portugal's history, language, arts, and culture, in a comparative and global frame". They will be developed concomitantly with CIUHCT's participation in the training of a young generation of scholars through the MSc and PhD programs existing at the two host institutions (see 6.8); CIUHCT's bid on the importance of outreach activities addressed to the public at large; and on the integration of its outputs into the regional strategy designed for the Lisbon region (see 6.7).

CIUHCT's goals will materialize in the Unit's productivity, and will be monitored by its governance bodies, which will secure that CIUHCT's predicted outputs will be attained, if not bypassed. In what relates to CIUHCT's international agenda, 1) and 2) will be monitored by peer-reviewed publications in international outlets, with emphasis on publications indexed in the WoS and SCOPUS, and communications in international congresses organized by reputed international societies. In what concerns CIUHCT's national agenda, 1) and 2) will be monitored by peer-reviewed publications, including CIUHCT's series, dictionary entries and bibliographic guide, and outreach activities, including exhibitions and scientific tourism. The journal HoST and the English version of the edited volume on the Portuguese History of STM will bridge the national and international dimension of CIUHCT's research agenda. Its multidisciplinary hallmark will be primarily secured by CIUHCT's membership profile, which includes collaborative research involving STM historians, philosophers and sociologists, and will be fostered by research activities and networking.

One should have in mind that CIUHCT is already the leading STM research centre in Portugal and the better positioned to dialogue with scholars in the international scenario. In fact, FCT's bibliometric study commissioned to the University of Leiden (2013) shows CIUHCT's clear leadership role (with 1.02 papers per doctorate member published in WoS journals, against the national average of 0,2 in the STM research field). This performance, combined with the strong CIUHCT's international presence undoubtedly attest to CIUHCT's ability to consolidate its future leadership status on an international basis. In fact, CIUHCT aims at going beyond the traditional comparative studies, based mostly on additive perspectives, and contribute to build a global picture that integrates national narratives in a transnational framework. Although CIUHCT's internationalization agenda is anchored in Europe, it is not exclusively European. Brazil and the Community of Portuguese-Speaking Countries (CPLP) are particularly important partners, as well as the USA (see 6.9).

In addition, CIUHCT will commit itself to enlarge audiences for the history and material culture of STM through its outreach activities, thus contributing to "develop a more general scientific culture - inspired by scientific criteria, rigorous methods of inquiry, and creative attitudes of innovative discoveries" (see FCT's goals for humanities) and building a reflexive public sphere (see EU recommendations, Horizon 2020).

Finally, CIUHCT also considers part of its mission to assess contemporary issues through the STM lenses, using the history and material culture of STM as basis for policy-making, and as a showcase for European citizenship and identity building across time and space. In this context CIUHCT aims to actively engage in the on-going discussion "Unity in Diversity" (see Call 5 of Horizon 2020), on the meaning(s) and practice(s) of knowledge societies, and on the role of STM in the challenges faced by democracy and European democratic states.

The overarching theme of CIUHCT's research project - Circulation, appropriation and innovation - is tailored to meet

both its mission and objectives for the next six years, to encompass the expertise already developed during the past decade, and to bring new insights into CIUHCT's topics. The trilogy to circulate, to appropriate and to innovate is at the core of the European history and continues to be a hot topic in contemporary societies. CIUHCT's diverse expertise enables wide and innovative approaches to the topic, by using both humans (experts as individuals and as networks, and experts in institutions) and nonhuman objects (institutions as policy makers, books, instruments, collections, scientific heritage, spaces of scientific, technological and medical practices) in a extended timeline (16th to 20st centuries) and in a diversified geography (Europe, Portugal and the Portuguese Empire). By bringing together in the same research unit, and under the same conceptual umbrella, an array of diversified topics, CIUHCT will be a hub for new perspectives on the role of STM in a globalized world, both from a national and an international standpoint, and a potential think tank for innovative political and governmental responses, thus responding to the challenges laid by the European Community on the need for a "reflective reappraisal of Europe's intellectual foundation" (Call 5, Horizon 2020).

CIUHCT's goals will be consubstantiated in four flagship outputs, strengthening its identity and mission:

- A Dictionary of Biographies of Portuguese scientists, engineers of physicians or working in Portugal (paper version and online database), edited by CIUHCT's members, with around 1000 entries, of three different lengths (short, medium and large), authored by CIUHCT's members and invited authors.
- A Bibliography of the History of STM in Portugal listing publications since 2005 on the history of STM in Portugal, and by Portuguese scholars.
- An edited volume of History of STM in Portugal, including publications by CIUHCT's members and other scholars (Portuguese and English version).
- Publication of HoST international e-journal on a regular basis, securing its inclusion in a reputed database, such as SCIMAGO.

6.6 Implementation

CIUHCT plans to implement its objectives by supporting on-going research and by encouraging new approaches and new topics within the unit's scope of interest, and within a truly international arena. This strategic aim will be secured by CIUHCT's research output, networking, teaching activities, and training of junior scholars.

CIUHCT's senior researchers' long experience and international networking will be an important asset to achieve the unit's goals. The implementation plan is designed as a long-term program that profits from previous expertise and knowledge largely developed within research projects and grants, funded by FCT/MEC, and that is feasible in 6 years with the proposed budget (see 11). The flagship outputs, mentioned above (6.3 and 6.5) are innovative and will generate a capital of knowledge on STM in Portugal that is indispensable to the national community of STM historians and will secure a sustainable participation in international forums. The groups' outputs will not only contribute to the flagship outputs but also to specific topics within their agendas.

The Group Instruments and Practices, Visual and Material Cultures will address how scientific and technical practices interact with material culture, by looking at a set of objects including manuscripts, books, instruments, collections, mathematical games, maps, and globes, and institutions and sites of knowledge, including royal courts, universities, artisan's workshops, arsenals, trading houses, procurement agencies and governmental institutions. The Group Experts, Institutions and Globalization will address the role of experts and institutions in a growing global world, analyzing the nature of the interactions between STM and political regimes. It will pay attention to biographies of scientists, engineers and physicians; to institutions of higher education and research, including Polytechnic Schools, Army and Naval Schools, Universities, and national laboratories; to infrastructures, agriculture, astronomy and medicine in colonial spaces; technocratic thinking and STM expertise; popularization of STM by means of outlets including newspapers; and political agendas and techno-scientific practices. These outputs will obviously enrich STM history, but will also contribute both to Portuguese history by adding STM protagonists to the standard narrative, and to European scholarship, by contributing to a renewed vision on Europe's identity.

CIUHCT subscribes the need for a greater accountability of internationalization of research units in the humanities, as a necessary part of their publication record, thus encouraging its members to enhance their publications in international indexed peer-reviewed journals (WoS and SCOPUS), and to reinforce formal institutional protocols with international research and training units, besides stimulating personal and informal relations.

CIUHCT's Scientific Council (see 6.3.), and CEPAC (Permanent External Scientific Advisory Board) are responsible for monitoring the implementation of CIUHCT's objectives and expected outputs (see 7), and together with the coordinators of each Group, for introducing corrective measures in case of deviations. CIUHCT's governance bodies are responsible for designing the best strategy to fulfill its goals and outputs, including eventually the request of additional recommendations to foreign outstanding scholars, who will act as consultants. Both research groups will contribute to the common flagship outputs (see 6.5), which will secure the unit's common identity and mission.

The implementation of CIUHCT's objectives will be materialized into three sets of outputs:

- High scholarly research level: original research knowledge will be available to the community through peer-reviewed publications in international outlets, with emphasis on publications indexed in the WoS and Scopus, books, edited volumes, chapters of books, and communications in international congresses organized by reputed international societies in the field; peer-reviewed publications in national journals, books, including CIUHCT's series, edited volumes, chapters of books, dictionary entries and bibliographic guide. At least a meeting of a major STM scientific society is to be organized by CIUHCT in Portugal every 3 years.
- Heritage level: STM spaces and heritage play also an important role in CIUHCT's agenda. In this area, the unit will actively collaborate in designing and scientifically supporting the Museum of Natural History and Science (MUHNAC)'s

permanent exhibition program, will engage in the restoration and design of the museological program of the Astronomical Observatory of Lisbon (OAL), and will propose new exhibition programs both in private and public institutions, including the possibility of new museums.

- Training level: The participation in 1 MSc and 2 PhD programs in History and Philosophy of STM, the supervision of new Post-Docs, the application for a FCT Doctoral Program and international doctoral programs will secure the training of new generations (see 6.8).

- Outreach level: exhibitions, talks for a wider interested audience, namely high school teachers and students, and crossover books. Specific strategies to meet the interests of a younger public, which have already been deployed concerning history of mathematics, through the history of games across the world, will be encouraged in order to cover other areas.

The Scientific Committee will be responsible for validating the timeline and the specific tasks concerning the flagship outputs, as well as for coordinating and supervising human resources and general outputs: (i) Dictionary of Scientists, Engineers and Physicians in Portugal; (ii) Bibliography of the History of STM in Portugal; (iii) Edited volume of History of STM in Portugal; (iv) Indexation of HoST to SCIMAGO. To secure these ambitious common outputs, and additionally to CIUHCT's researchers, a reinforcement of human resources is indispensable, including Research (2 BI), PhD (6 BD) and post-doc grants (6 BPD) (see budget and justification of human resources). All four outputs are long term and time consuming projects, thus needing, both from an organizational and research perspective, a minimum of fully dedicated staff. However, taking into account the value of these initiatives in terms of providing new knowledge, the costs are minimum. Although very ambitious, these projects are feasible, building on CIUHCT's past activities and relying on members' expertise and training of junior scholars. Common activities will also include the continuation of three initiatives already in place, which secure the unit's cohesion, its relationship with other national and international researchers and its role in promoting a wider audience for STM research: CIUHCT book series, CIUHCT workshops and conference series, and HoST conferences and annual meetings.

CIUHCT will continue to strengthen its international networks (see Internationalization). CIUHCT members also participate in international projects funded by private and public institutions of other EU countries, such as Spain and the Netherlands. The next step, which is already underway, is to participate in competitive EU funded projects: the unit has already participated in exploratory meetings to propose a international project within the Horizon 2020 framework to be presented in the 2015 call.

CIUHCT is closely involved in one MSc and two PhD programs, and applied, within the FCT/MEC doctoral programs, to a new PhD program that will unify the existing ones. Although this proposal was not funded, CIUHCT will continue its efforts to present a winning proposal. Bearing in mind the need for junior researchers to establish their own networks, CIUHCT plans to organize three Summer Schools (bi-annual) covering the unit's main topics of interest and engaging PHD students and Post-doc researchers. The choice of speakers will rely both on the members of CEPAC and on CIUHCT's vast international networking. Additionally, CIUHCT will continue to be an active partner in international training initiatives, such as Inventing Europe Education Environment and Exhibit and Erasmus program, and will engage in new international projects, namely the Marie Curie Actions (PhD and post-doctoral grants).

CIUHCT's involvement in the training of a young generation of scholars is also to be secured by allocating a substantial part of CIUHCT's budget to human resources, and specifically to award 6 PhD scholarships and 6 Post-Doc scholarships. They will be integrated in CIUHCT's groups and work on the following topics: instruments and collections; construction of scientific spaces; history of natural history and medicine; STM popularization; case-studies on the role of STM actors in different political contexts, and on the role of Portuguese imperial STM in a globalized framework of circulation of knowledge and practices.

On the border between training and outreach, CIUHCT will develop, based on its outputs, an e-learning strategy that includes teaching tools for high school teachers, and will have as benchmarking coursera.org. In this context, for example, the edited volume on STM will team with a set of conferences on some of the several topics (addressed in the book) that will be available online to be used in classrooms, and the Dictionary of Biographies of Portuguese scientists, engineers of physicians will also be available in an on-line database.

Finally, as far as general audiences are concerned, CIUHCT will continue to secure a vast number of seminars mainly in an educational context. We plan to encourage crossover books, based on high-level academic research and written in an accessible style, and to contact private and public institutions promoting events, such as temporary exhibitions and short courses on STM (such as Fundação Calouste Gulbenkian, El Corte Inglés, Biblioteca Nacional).

6.7 Contributions for the regional strategy

CIUHCT's research agenda and outputs fit nicely the regional strategy designed for the Lisbon region.

The understanding of the concepts of expertise and knowledge society, as well as the way they were deployed in different historical moments, are topics to be explored by CIUHCT's research groups, and are critical to the implementation of smart strategies of growth.

Specific initiatives will benefit from CIUHCT's research agenda, mainly:

- Scientific consulting to support urban regeneration, including the preservation of sites closely related to the production of STM knowledge and STM practices in Lisbon, and scientific tourism, an emergent market niche. CIUHCT members have participated in funded research projects on Lisbon as a STM capital and have already published the article "Physical Tourist in Lisbon" in *Physics in Perspective*. Several CIUHCT's members have already experience in leading scientific tours in Lisbon, both within academic meetings and for foreign students, and have also worked closely with municipalities in the southern bank of the river Tagus in order to give visibility to the industrial heritage of decommissioned plants.

In the same context, and responding to the Lisbon municipality Call for Ideas for the Team Mission Lisbon/Europe 2020, CIUHCT proposed a plan to secure a dynamic conservation of the 19th and 20th centuries industrial area and sites of Alcântara (including the harbour), once the most important industrial hub in the Lisbon region.

CIUHCT's members are also engaged in promoting an international Network of Telegraphs aiming at enhancing the importance of telegraphs as a globalizing and imperial tool and to protect its material heritage. In this context, CIUHCT is in touch with the municipality of Cascais and protocols with foreign universities have already been designed and will continue to be developed.

- Scientific consulting to support: (i) new and more attractive and updated exhibition programs in museums closely related to STM, such as the Museum of Natural History and Science (MUHNAC) and Maritime Museum; (ii) the restoration and design of museological programs of STM sites neglected due to the lack of funds (OAL); (iii) new museums related to STM funded by private institutions, namely a Museum of Plastics (supported by Baquelite Liz) and a Museum of Games in Lisbon.
- Outreaching cultural activities aimed at contributing to a more efficient relationship between academic knowledge and lay public. CIUHCT will embrace both the more traditional outreaching activities (talks, exhibits, guided tours, etc.) and innovative cultural and entertainment initiatives, such as plays on STM themes followed by short open discussions on their historical context.

All these activities are closely related to, and deeply interact with, local authorities, mainly in the Greater Lisbon area, as well as with entrepreneurs.

6.8 Opportunities for advanced training

As CIUHCT's senior members are simultaneously professors and researchers at the Unit of History and Philosophy of Science (Department of Applied Social Sciences), FCT/UNL, and at the Autonomous Unit of History and Philosophy of Science (SAHFC), FCUL, they have been involved in the graduate programs offered by these educational units. In fact, they have promoted the creation of the first graduate programs in history and philosophy of STM in the Portuguese scenario, and their involvement has been the result of their vision for the creation and consolidation of a community of historians of STM, able to secure successful generational reproduction through high-quality training, a necessary pre-requisite to build a community eager to sustain competitive research at the national level, and to dialogue with peers at the international one (CIUHCT's members have supervised 14 MSc and 5 PhD students since 2007).

Furthermore, CIUHCT has been able to attract many Post-Docs, including a growing number of foreign ones, which have been collaborating in the various activities organized by CIUHCT in order to complement and enrich the training of MSc and PhD students.

Specifically, CIUHCT has been associated with a MSc graduate program in history and philosophy of science at FCUL, and two PhD graduate programs, one at FCUL and the other at FCT-UNL. Erasmus protocols have been signed with reputed European universities (Universities Autonomous of Barcelona, Athens, and Eindhoven) and new protocols are envisioned with other universities (University of Paris/Sorbonne, and of Lithuania). Furthermore, they have been enriched by the participation of reputed foreign scholars (two Gulbenkian Professors, director of the Templeton Project (2012-13), and a Fulbright Professor (2013-2014), have received graduate students from abroad (Europe and Brazil), and some PhD students have been supervised in the "co-tutela" regime. The process of examination by the agency of validation of higher-education courses (A3ES) of the former three graduate programs has given way to the recent public announcement of their approval (November 2013) on the basis of a very positive assessment of their organizational structures, high quality of professorial staff, and training results, including the relevance of theses produced and the publication of their research results in reputed international forums. This educational context will secure the training of incoming MSc and PhD students during the period 2015-2020.

Additionally, CIUHCT plans to submit an application to the next call for FCT Doctoral Programs, including the participation of foreign universities, and to organize 3 international summer-schools (see budget justification), which will offer graduate students an extra possibility of interaction with other foreign students and international scholars. Both these ventures have already been included in the context of previous applications, but were unfortunately not put yet in practice.

6.9 Internationalization

Since its inception, internationalization has been at the core of CIUHCT's vision. It will continue to be. In accordance with its vision, objectives and implementation plan, internationalization will be expanded and reinforced through operational plans that emphasize the following actions:

Research

- (i) international publications in WoS indexed journals (sustaining CIUHCT's position as the leading FCT unit in the social sciences and humanities according to the results of the bibliometric study ordered by the FCT to the CWTS-University of Leiden);
- (ii) other publications in reputed international forums;
- (iii) communications in reputed international conferences (1-2 per member and year);
- (iv) organization of sessions in international conferences abroad;
- (v) organization of international conferences in Portugal (examples are the 2014 STEP and ESHS meetings);
- (vi) sustained participation in international networks, such as STEP, Tensions of Europe and INES;
- (vii) establishment of protocols enhancing scientific collaboration involving institutions such as MAST and FIOCRUZ (Brazil), MPIWG (under discussion);
- (viii) participation in a project to be submitted to the Horizon 2020, call 5, together with the Institute for Contemporary History (IFZ), Munich;
- (ix) participation as partners in international research programs such as the Making Europe book series, and Engineering and Scientific Culture in Catalonia and Spain;

members belong to international scientific councils, advisory boards, act as referees, and as consultants.

Training

(i) increasing attraction of MSc and PhD foreign students, including but not restricted to Brazilian students (renewal of Erasmus protocols are taking place as well as implementation of 1 Brazilian PhD sandwich program); (ii) increasing attraction of foreign Post-Docs and FCT researchers; (iii) submission of a FCT Doctoral Program in History and Material Culture of STM involving foreign higher-education institutions (conversations with the Autonomous University of Barcelona are already taking place); (iv) sustained participation of senior CIUHCT members and Post-Docs in higher-education programs abroad (Universidade Federal da Bahia, FIOCRUZ, UNIRIO, Brazil, and Cabo Verde (starting in 2014); (v) organization of three international summer schools (see opportunity for advance training and budget justification); (vi) short courses on STM material culture for professionals of different provenances (Brazil); (vii) participation in the Inventing Europe educational environment (<http://www.inventingeurope.eu/education/>); (viii) participation in the application for a Marie Curie excellence in training PhD (with IFZ).

Outreach

(i) Under discussion is the possibility to bring the exhibit "360° Ciência Descoberta" conceived entirely by CIUHCT members and organized by Calouste Gulbenkian Foundation (2013) to Brazil and Spain.

6.10 Knowledge transfer

does not apply

6.11 Ethical issues

does not apply

7. EXPECTED INDICATORS OF THE STRATEGIC PROGRAMME 2015/2020

7.1

Description	2015	2016	2017	2018	2019	2020	TOTAL ()
Publications in peer-review international journals	22	22	22	22	22	22	132
Patents and performing patents	0	0	0	0	0	0	0
Books and chapters of international distribution	17	17	17	17	17	17	102
PhD theses under the supervision of integrated members	6	6	3	0	0	0	15
Conference proceedings	0	0	0	0	0	0	0
New materials, devices, products and processes, software, computer codes and algorithms	0	0	0	0	0	0	0
Books, including single-authored works (including scholarly editions of oral or written texts and translations with introduction and commentary)	5	5	5	5	5	5	30
Edited special issues of journals, with substantial research input on the part of the researcher	2	2	2	2	2	2	12
Chapters in books, including contributions to conference proceedings, essays in collections	25	25	25	25	25	25	150
Creative writing (to the extent that it embodies research)	0	0	0	0	0	0	0
Dictionary entries (forming part of investigation)	100	100	100	100	100	100	600
Encyclopedia entries (to the extent that they embody research)	0	0	0	0	0	0	0
Audio/visual and electronic/digital materials	0	0	0	0	0	0	0
Other categories, including web-based resources; video and audio recordings (to the extent that they embody research)	0	0	1	0	0	1	2
Performances and exhibitions to the extent that they embody research	3	3	3	3	3	3	18
Industrial research contracts	0	0	0	0	0	0	0
Research contracts with national or international bodies	0	0	0	0	0	0	0
Publications in peer-reviewed national journals	15	15	15	15	15	15	90
Organization of international meetings and sessions in meetings	32	32	32	32	32	32	192

8. PROPOSED RESEARCH TEAM

8.1 Criteria adopted by the R&D unit for the definition of integrated member, if different from FCT reference table

The minimum criteria defined by FCT were the following:

For members whose PhD was awarded before 31 Dec 2009:

4 publications in the last 5 years (2008-2012)

For members whose PhD was awarded after 31 Dec 2009:

2 publications, including PhD dissertation

CIUHCT has imposed more stringent criteria, bearing in mind the unit's bid on internationalization (in the various manifestations commonly accepted in the humanities), impact and outreach:

For members whose PhD was awarded before 31 Dec 2009:

5 publications, including at least one of the following listed items:

1 paper listed in Scimago (Q1 or Q2)

1 authored/ edited volume in a international academic publisher

1 book chapter in a reputed international publisher

1 organization of an exhibition in a reputed institution

2 books/book chapters in national publishers, including popularization.

2 papers in Scimago (Q3 or Q4)

2 papers Latindex

For members whose PhD was awarded after 31 Dec 2009:

Membros com PhD posterior a 31 Dez 2009:

2 publications, including PhD dissertation, one of which has to be in an international outlet.

8.2 List of Integrated Members / 10 nuclear CVs

Name	Nuclear CV
Ana Isabel da Silva Araújo Simões (Coordinator)	Yes
ANTONIO SÁNCHEZ MARTÍNEZ	Yes
Ana Maria Oliveira Carneiro	Yes
Ana Paula Lopes da Silva	No
Christopher Damien Aurette	No
Davide Scarso	No
Dr. Thomas HORST	No
Henrique José Sampaio Soares de Sousa Leitão	Yes
Isabel Maria da Silva Pereira Amaral	Yes
Joaquim Filipe Figueiredo Alves Gaspar	No
Jorge Nuno Monteiro de Oliveira e Silva	No
Jose Luis Toivola Câmara Leme	No
João Carlos dos Santos Garcia	No
Luana Giurgevich	No
Maria Paula Pires dos Santos Diogo	Yes
Marta Catarino Lourenço	Yes
Marta Coelho de Macedo	Yes
Palmira de Jesus Fontes da Costa	Yes
Paula Cristina Gonçalves Dias Urze	No

Paulo Nuno Torrão Pinto Martins	No
Pedro Miguel Pinto Raposo	No
Ricardo José Lopes Coelho	No
Samuel GESSNER	No
Teresa Salomé Alves da Mota	Yes

9. PROPOSED RESEARCH GROUPS

Reference	Name	Principal Investigator
RG-286-1328	Experts, Institutions and Globalization	Maria Paula Pires dos Santos Diogo
RG-286-2500	Instruments and Practices, Visual and Material Cultures	Henrique José Sampaio Soares de Sousa Leitão

(RG-286-1328) Experts, Institutions and Globalization

9.1. IDENTIFICATION OF THE RESEARCH GROUP

9.1.1 Reference of the research group

RG-286-1328

9.1.2 Name of the Research Group in portuguese

Peritos, Instituições e Globalização

9.1.3 Name of the Research Group in English

Experts, Institutions and Globalization

9.1.4 Keyword(s)

History of Science, Technology and Medicine

Scientific and Technological Expertise

Scientific and Technological Institutions

Globalization/Centre(s)/Peripherie(s)

9.1.5 Existed in 2008/2012

No

9.1.6 Participating Institution(s) to which the Research Group belongs

Fundação da Faculdade de Ciências (FFC/FC/UL)

Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa (FCT/UNL)

9.2. RESEARCHERS IN THE GROUP

9.2.1 List of Integrated Members / 3 nuclear CVs

Name	Principal Investigator	Nuclear CV
Maria Paula Pires dos Santos Diogo	Yes	Yes

Ana Isabel da Silva Araújo Simões	No	Yes
Ana Maria Oliveira Carneiro	No	Yes
Ana Paula Lopes da Silva	No	No
Christopher Damien Aurette	No	No
Davide Scarso	No	No
Isabel Maria da Silva Pereira Amaral	No	No
Jose Luis Toivola Câmara Leme	No	No
Marta Coelho de Macedo	No	No
Palmira de Jesus Fontes da Costa	No	No
Paula Cristina Gonçalves Dias Urze	No	No
Paulo Nuno Torrão Pinto Martins	No	No
Ricardo José Lopes Coelho	No	No
Pedro Miguel Pinto Raposo	No	No
Teresa Salomé Alves da Mota	No	No

9.2.2 List of current PhD students

NAME

Maria Júlia Neto Gaspar
Francisco Maria de Sousa de Macedo Malta Romeiras
Catarina Marques Madruga
Maria da Conceição da Silva Tavares
José Alberto Teixeira Rebelo da Silva
nuno manuel castanheira de figueiredo
Denise Maria Borrega pereira
Bruno José Navarro Marçal
Hélio de Jesus Ferreira de Oliveira Pinto
Heitor Miguel Prata e Matos
Luis Manuel Neves Costa
Daniel de Brito Candeias Gamito Marques

9.2.3 List of other researchers of the Research Group

NAME

Ana Patricia Morais da Fonseca Martins
Maria Luísa de Castro Coelho de Oliveira e Sousa
Isabel Maria Teiga Zilhão
Hugo José Silveira da Silva Periera
Ana Rita Merelo Lobo
CLÁUDIA SOFIA ORVALHO DA SILVA CASTELO
José Carlos Barros Rodrigues
jaume valentines alvarez
Antonio Manuel Dias de Sa Nunes dos Santos

9.5. ORGANISATIONAL STRUCTURE AND OBJECTIVES OF THE RESEARCH GROUP 2015/2020

9.5.1 Structure of the Research Group

The research group Experts, Institutions and Globalization (EIG) is organized in a single scientific program, within which a set of objectives (see 9.5.2) are interrelated and mutually reinforcing. This option is based on four main reasons: (1) the topics encompassed by this research group, although extending over several subtopics, are deeply entangled, thus imposing a research strategy based on a permanent dialogue, which benefits substantially from an homogeneous group; (2) the research group agenda is built on a *longue-durée* approach, ranging from the 18th to the 20th century, which hardly fits the partitioning into different thematic lines; (3) the possibilities of using the different expertise in the group - history, philosophy and sociology of STM - is more effective in an unified structure that can adopt different geometries according to the needs of the researchers; (4) the dialogue between this group and the other CIUHCT's research group will be more fruitful if organized in a single voice, albeit with different tones.

This organizational structure will undoubtedly enhance the synergies of the research group, encouraging both long-term collaborations (during the six years of the project) and more specific ones ("pop-up" collaborations) built around particular events, such as an article, a meeting or an exhibit, or events involving both research groups of the unit.

The team is composed by senior researchers, all of them with international curricula in the field of the project, young researchers (post-docs) in an early stage of their careers, and PhD. students. This balanced structure (15 integrated members, 12 PhD students and 8 researchers with doctorates) allows the group to continue previous research funded by FCT/MEC, and to engage in a sustained research in the future.

From the scientific point of view, EIG's Coordinator is assisted by 2 core CV members in the development of the implementation plan and in the monitoring of objectives. She will report directly to CIUHCT's coordinator and Scientific Council, following meetings with all group' members. EIG's coordinator will benefit from the recommendations of members of CEPAC, and eventually consultants, in order to correct possible deviations to the plan.

EIG group will continue to entertain strong international connections with institutions and networks including: Max Planck Institute for the History of Science (Berlin), Institute for Contemporary History (Munich), Universities of Valencia, Alicante, Barcelona (Autonomous and Polytechnic), Eindhoven, Athens and Sorbonne, Centre de Recherche Maurice Halbwachs, Centre de Recherche en Histoire de l'Innovation, Centre d'Història de la Ciència, History of Technology Foundation, Fundação Oswaldo Cruz (Fiocruz) and the networks Science and Technology in the European Periphery, Tensions of Europe, and International Network of Engineering Studies.

9.5.2 Objectives of the Research Group

The research group Experts, Institutions and Globalization (EIG) will pursue three objectives that are relevant challenges for the EU - Innovation, Knowledge Society and Reflexive Society, to be tackled in the period ranging from the 18th to the 20th century. The group will foster multidisciplinary in History, Philosophy and Sociology of STM, and its results will contribute to enlarge the basis for a scientific driven EU policy-making.

Our proposal brings to the forefront the role of experts and institutions in a growing global world, analyzes the nature of the interactions between STM and political regimes to ascertain how scientific and technological practices are loaded with political values, and how policy makers and decisions are shaped by STM expertise. This agenda contributes to CIUHCT's overall strategy of including the STM dimension in the History of Portugal and Europe. Although EIG does not circumscribe its research to the Portuguese case, Portugal offers a particularly stimulating standpoint, by focusing on a peripheral country with a long lasting overseas empire, which experienced three political regimes - monarchy, republic and dictatorship. Its large time frame enables a comparative perspective critical to the project and to its ambition of presenting a reflexive perspective, useful for informing contemporary policy-making.

To understand the processes of innovation and knowledge-creation in STM we use a common ground for STM historians, philosophers and sociologists -- the actor-network theory (ANT) -- considering both humans (experts) and nonhumans (institutions and outputs) as able to act or participate in networks, and paying special attention to mediators' role. Jointly with other theoretical resources from Science and Technology Studies, Large Technological Systems, and Oral History, ANT provides the tools to analyze the group's agenda: (i) semiotic relationality; (ii) heterogeneity of actors; (iii) materiality; (iv) time, space and scale (the importance of the process and its precariousness); (v) power as the result of a network configuration.

We take experts and institutions as main actors in order to unveil the complex relationship between state policies and individual endeavors. In this framework researchers will pay special attention to: (i) biographies of scientists, engineers and physicians, as well as the history of a set of institutions of higher education and research; (ii) colonial STM and their relationship with both the "center of the empire" and other empires; (iii) technocratic thinking, STM expertise, progress, authority; (iv) professional elites; (v) popularization of STM; (vi) political agendas and techno-scientific practices.

The conceptual and methodological option of the EIG group bridges in a very natural way the other CIUHCT group's rationale: on the one hand, the emphasis on Portuguese and Iberian modern STM builds the necessary counterpoint to the historical periods tackled within EIG, and substantiates the discussion on moving center(s) and peripherie(s); on the other hand, as ANT is a material-semiotics approach, material culture studies are part of its territory.

The EIG group actively contributes to the general research agenda and outputs of CIUHCT on circulation, appropriation and innovation by exploring how specific actors - experts and institutions - develop their leadership strategies and establish their professional and political networks during a time span that goes from the Republic of Letters and the building of the liberal state based on a scientific and technological rationality to the rise and development of expert culture. We thus respond to the calls for broadening the scope of Portuguese and European history, by providing new

knowledge on the intellectual landscape that shaped Europe.
Finally, EIG's outputs will be available to a wider audience through dissemination tools, such as lectures, scientific tourism, exhibitions, and cross-over publications.

(RG-286-2500) Instruments and Practices, Visual and Material Cultures

9.1. IDENTIFICATION OF THE RESEARCH GROUP

9.1.1 Reference of the research group

RG-286-2500

9.1.2 Name of the Research Group in portuguese

Instrumentos e Práticas, Culturas Visual e Material

9.1.3 Name of the Research Group in English

Instruments and Practices, Visual and Material Cultures

9.1.4 Keyword(s)

Instruments and Collections in STM

Material and Visual STM Cultures

Cosmography and cartographic knowledge

Iberian science and early modern STM

9.1.5 Existed in 2008/2012

No

9.1.6 Participating Institution(s) to which the Research Group belongs

Fundação da Faculdade de Ciências (FFC/FC/UL)

Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa (FCT/UNL)

9.2. RESEARCHERS IN THE GROUP

9.2.1 List of Integrated Members / 3 nuclear CVs

Name	Principal Investigator Nuclear CV	
ANTONIO SÁNCHEZ MARTÍNEZ	No	No
Dr. Thomas HORST	No	No
Henrique José Sampaio Soares de Sousa Leitão	Yes	Yes
Joaquim Filipe Figueiredo Alves Gaspar	No	Yes
Jorge Nuno Monteiro de Oliveira e Silva	No	No
João Carlos dos Santos Garcia	No	No
Luana Giurgevich	No	No
Marta Catarino Lourenço	No	Yes
Samuel GESSNER	No	No

9.2.2 List of current PhD students

NAME

Jose manuel Malhao pereira

Luís Artur Marques Tirapicos

Inês Duarte Aleixo Lourenço de Oliveira Gomes

Ana Carina da Silva Romão

Cristina Isabel de Caré Picanço

Wellington Bernardelli Silva Filho

9.2.3 List of other researchers of the Research Group

NAME

Cristina Maria dos Santos Luís

Maria Elvira Callapez

Bruno Jose Mendes Gregorio Pereira de Almeida

António José Duarte Costa Canas

Maria Teresa Homem Ferreira Martins da Cunha Nobre de Carvalho

CÂNDIDO MARCIANO DA SILVA

9.5. ORGANISATIONAL STRUCTURE AND OBJECTIVES OF THE RESEARCH GROUP 2015/2020

9.5.1 Structure of the Research Group

The Research Group Instruments and Practices, Visual and Material Culture (IPVMC) is a well focused research group with a very agile structure. It is designed to engage in project-based research activities at the same time it will be able to sustain long-term research commitments and participate in the CIUHCT flagship outputs. This Group is headed by a Principal Investigator (PI) and it presently has 9 integrated members, 6 PhD students and 6 other researchers with doctorates. The Group is very international with members coming from Switzerland, Germany, Italy, Spain and Brazil and collaborations with university and research institutions in many countries.

The Group has a strong trans- and interdisciplinary approach to research topics and sources. It directly addresses a worldwide emerging trend in the historiography of STM: the need to approach instruments, collections, practices, and material and visual culture from different points of view. Hence, members contribute to a common research effort by bringing together diverse skills, innovative methodologies and multiple points of departure, aiming at the construction of an overall coherent picture. This is the reason why the Group has no thematic lines which, in this case, would tend to create disciplinary or methodological divisions. Furthermore, the Group's size is perfectly manageable with no need for a subdivision in Research Lines.

The size and structure of IPVMC Group allow for a regular functioning enhanced by the members's ability to work together. Periodic meetings, working seminars and joint collaborations will guarantee the necessary coherence of the group's activities. From the scientific point of view, IPVMC's Coordinator is assisted by 2 core CV members in the development of the implementation plan and in the monitoring of objectives. He will report directly to CIUHCT's coordinator and Scientific Council, following meetings with all group' members. IPVMC's coordinator will benefit from the recommendations of members of CEPAC, and eventually consultants, in order to correct possible deviations to the plan. The Coordinator will make sure that the group's research is focused on its objectives and proceeding at the planned pace. He will also make sure that the Group's activities fit coherently with the overall objectives of CIUHCT and with the activities of the other Research Group, Experts, Institutions and Globalization. Besides research, the members of the IPVMC Group will also engage in the various outreach activities promoted by CIUHCT.

9.5.2 Objectives of the Research Group

This group aims to provide a high level, innovative and transdisciplinary approach to the construction of STM knowledge mostly (but not exclusively) in the early modern period.

For the period 2015-2020, the Group will address the following research questions: how do STM practices and ideas emerge from material culture, more specifically from its instruments, and how are they shaped by objects? Although traditional approaches have imposed a clear-cut distinction between objects and practices, in recent decades STM historians have challenged this idea by presenting a more sophisticated description of these complex relations. Today, the relation between instruments and practices is perceived in more subtle terms. Bi-directional phenomena are clearly recognized: not only specific practices require certain instruments but also, perhaps more interestingly, instruments shape specific practices, theoretical speculation, experimental enquiry and knowledge construction. These arguments have very recently been expanded to the social and political realms. Recently some STM historians have been discussing the establishment of 'artisanal epistemology' from the practice of craftsmen, others challenge traditional

Overheads	27060	26860	29460	32260	24660	22460	162760
Equipment	10670	0	10670	0	10670	0	32010
TOTAL (€)	174830	162960	189230	195360	160430	136560	1019370

Other institution's budget

Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa (FCT/UNL)

Description	2015	2016	2017	2018	2019	2020	TOTAL (€)
Human Resources	90000	90000	102000	102000	78000	68000	530000
Missions	21000	21000	21000	21000	21000	21000	126000
Consultants	0	1000	0	1000	0	1000	3000
Service Procurement and Acquisitions	7500	22500	7500	7500	7500	22500	75000
Patent Registration	0	0	0	0	0	0	0
Adaptation of Buildings and Facilities	500	500	500	500	500	500	3000
Overheads	23440	26640	25840	26040	21040	22040	145040
Equipment	0	7000	0	7000	0	7000	21000
TOTAL (€)	142440	168640	156840	165040	128040	142040	903040

Overall budget

Description	2015	2016	2017	2018	2019	2020	TOTAL (€)
Human Resources	189600	189600	213600	213600	165600	145600	1117600
Missions	53000	53000	53000	53000	53000	53000	318000
Consultants	1000	1000	1000	1000	1000	1000	6000
Service Procurement and Acquisitions	11500	26500	11500	26500	11500	26500	114000
Patent Registration	0	0	0	0	0	0	0
Adaptation of Buildings and Facilities	1000	1000	1000	1000	1000	1000	6000
Overheads	50500	53500	55300	58300	45700	44500	307800
Equipment	10670	7000	10670	7000	10670	7000	53010
TOTAL (€)	317270	331600	346070	360400	288470	278600	1922410

12. STRATEGIC PROGRAMME AND BUDGET RATIONALE 2015/2020

12.1 Overall budget rationale

The budget reflects CIUHCT's strategic aim of excellence in STM research by means of: 1) internationalization; 2) consolidation of the area of History of STM in Portugal through the training of young scholars; 3) flagship outputs which will continue to affirm CIUHCT as the reference research unit in history of STM; and 4) dissemination activities.

The budget considers a team including presently 24 integrated members and 29 PhD-students and other researchers (overall 53 members), and allocates a substantial part to training of incoming young scholars (PhD students and Post-Docs). Excluding Human Resources (2 BI, 6 BD, 6 BPD) - 60% of budget - the requested budget is of about 130,000 euros per year, which corresponds to around 2500 euros/member/year. This "individual" average has to finance various common activities (secretariat, CIUHCT's book series, HoST journal and annual workshop, and invited speakers for CIUHCT annual cycles of conferences), and thus clearly invests on the training of an active community of young scholars.

In what relates to internationalization, the budget includes:

- 1000 euros per year per member to secure one to two trips to international reputed conferences with presentation of papers and subsequent submission in journals or books or proceedings, in Europe or USA, visits to archives deemed crucial to on-going research. - funds for the organisation of 3 summer-schools (15000 euros per summer school to be organised in 2016, 2018 and 2020)
- expenses for travel and accommodation of consultants (1000 euros per year, 2015-2020), including members of CIUHCT's external evaluation panel (CEPAC) who will be invited to participate in the summer-schools, delivering invited talks. Consultants may also include scholars, other than CEPAC members, who will be invited to give feedback on specific CIUHCT's activities.
- Funds to secure the regular publication of the international on-line journal (open access) HoST, the only journal of history of science and technology in Portugal. Funds include web-site maintenance, copy editing by a native English speaker, and eventually payment of translations from Portuguese to English (4500 euros per year). These last two items are a sine qua non condition to apply for the indexation of the journal HoST in database such as SCIMAGO or WoS.

In what relates to the consolidation of the Portuguese STM community, the budget includes:

- Budget for human resources (6 PhD scholarships, 6 Post-Doc scholarships and 2 Research Grants) (see justification in 12.2).
- Organization of 3 summer-schools, as indicated above. They will be 4 days long, will include 3 international invited speakers, and are expected to pay accommodation and meals for 20-25 foreign students and national students (non-Lisbon residents) (15000/summer-school). They will count on the active participation of CIUHCT's graduate students and senior researchers (some of whom will deliver classes). CIUHCT commits itself to raise additional funds (both national and international) to cover space, secretariat and lecture materials.
- Budget for publishing CIUHCT's Book Series (2 books - 4000 euros per year) as well as to the acquisition of books, microfilm copies or copies of manuscripts (3000 euros per year).

In what relates to flagship outputs (Dictionary of STM biographies; Bibliographic Guide; Edited Volume; HoST) (see 6.5), CIUHCT's commitment is strictly dependent on the concession of the human resources requested, notably in what relates to the 2 research grants (BI). Both the Dictionary of Biographies and the Bibliographic Guide are extremely time consuming. The Dictionary and the Edited Volume require constant contacts, supervision of all tasks being accomplished by authors, control of deadlines, and copy-editing. The Guide depends on the availability of a researcher wholly dedicated to the survey of all publications in history of STM in Portugal since 2005. The tasks and budget associated with HoST has been already referred above.

Besides the above mentioned items, closely related to CIUHCT's research activities, the life of any research unit depends on secretarial support. Having in mind that CIUHCT involves two host institutions (FC-UL and FCT-UNL), secretarial efficiency depends on having two secretaries, one at each institution, both working on a part-time basis. Each secretary will receive half the salary of a BGCT for a person holding an undergraduate degree (around 400 euros per month during 12 months). Additionally, the budget includes 500 euros per year for the maintenance of CIUHCT's web-page.

In what relates to equipment, the budget includes the acquisition of one computer per person during the time period of the strategic plan (1000 euros per person), to secure the minimum level of computer equipment up-dating. Finally, a residual part of the budget (1000 euros per year) is allocated to infra-structures, having in mind desks and chairs to accommodate in-coming members.

12.2 Human Resources rationale

The human resources budget corresponds to 60% of the total budget. This high percentage reveals CIUHCT's commitment to reinforce the community of STM historians, in the framework of an outstanding active research center recognized as such by the international community, and to secure a set of flagship outputs which will become a working reference for national history and for bringing the Portuguese case to the international arena.

Apart from the secretariat (referred in 12.1), research will depend on three types of scholarships designed to meet three specific needs:

- 2 Research scholarships (2 BI - 5 years) will secure the back-office work necessary to the success of CIUHCT's flagship outputs (Dictionary of STM biographies; Bibliographic Guide; Edited Volume; HoST) (see 6.5). All outputs are extremely time consuming.

The Dictionary and the Edited Volume require constant contacts, supervision of all tasks being accomplished by authors, control of deadlines, and copy-editing.

The Guide depends on the availability of 1 researcher wholly dedicated to the survey of all publications in history of STM in Portugal since 2005.

Finally, CIUHCT aims at publishing two issues per year of the international on-line journal (open access) HoST, the only journal of history of science and technology in Portugal written in English, and to secure its indexation to SCIMAGO and/or WoS. A BI scholarship holder will assist the journal's chief-editor in all tasks.

- 6 PhD scholarships (6 BD - 4 years each). 3 BD will start in 2015, and the other 3 will be awarded in 2017, securing a continuous training of PhD students. 3 PhD scholarships will be associated with each Research Group: In the Group Instruments and Practices, Visual and Material Cultures (IPVMC) they will work on Instruments and Collections; Construction of Scientific Spaces; and History of Natural History and Medicine. In the Group Experts, Institutions and Globalization (EIG), they will work on STM popularization; on case-studies on the role of STM actors in different political contexts; and on the role of Portuguese imperial STM in a globalized framework of circulation of knowledge and practices.

- 6 PhD scholarships (6 BPD - 3+3 years each). The Post-doc grants will follow the same rationale and will benefit from the growing corpus of knowledge produced by CIUHCT. As far as the IPVMC is concerned, Post-docs will embrace the topics referred above, that is, Instruments and Collections; Natural History, Texts and Images; and History of Medicine, practices and texts. In EIG, Post-doc scholars will enlarge the perspective of the topics mentioned above, framing them in an international comparative framework. This will imply a close relationship with other partners of CIUHCT's research networks, thus profiting from the previous effort in consolidating an international agenda. This research allows to better understand the European intellectual landscape and its role in building the European identity.

12.3 Equipment rationale

CIUHCT is a research unit in the area of humanities, and as such does not involve laboratory equipment. CIUHCT's activities depend mostly on archival and bibliographic research, and thus need the support of computers (desktops and portables). Accessories such as USB memory sticks, printers, paper and toners, were not included in the budget as they were considered to be covered by the core funding. Having in mind this rationale, the present budget includes the acquisition of 1 computer per person during the time period of the strategic plan, corresponding to about 1000 euros per person, to secure the minimum level of computer equipment up-dating.

13. REVIEWERS PROPOSED BY THE R&D UNIT(S)

13.1

Name	Institution	Email	Scientific Areas
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Helmuth Trischler	Deutsches Museum, Munich	H.Trischler@deutsches-museum.de	Heritage and Museology, History