

# *The University of Porto in the path of European Science: innovations, exchanges and resistances during World War II*

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## **Abstract**

A worldwide reconfiguration of Science was boosted by II World War. In spite of its neutrality, Portugal has been involved in the advances and obstacles of the creation and transmission of knowledge. This essay takes the University of Porto as a case study and showcases the diversity of paths and efforts deployed towards the assertion of corporate identity and internationalization process: academic exchanges, conferences and events, research units, scientific publishing, etc. All these elements are within a political and ideological framework that defines the Portuguese dictatorial regime, which has created some resistances for innovation of the University and Science in mid-20th century.

**Keywords:** *Estado Novo* (1933-1974); University of Porto; History of science; History of education; Educational & science policies.

World War II (1939-1945) represented in the chapter of science a moment of great development of knowledge and technologies, in between the paradox of inhumanity and destructive chaos. As in other previous and current conflicts, the need to ensure greater effectiveness in the military operation, put new challenges to scientists and researchers from several countries, who responded with new theories of knowledge and innovations: nuclear fission, radar, computer, penicillin, the atomic bomb, etc. All this potential was encouraged

by major Nations at war, throughout setting up and funding of research programs, seeking superiority to defend their territory and society against the enemy...

However, due to the war's global dimension, the international networks of Science ceased to feel the constraints imposed and were forced to make various reconfigurations for its continuity. Universities, institutes and laboratories sought to tackle a whole new context and international order: escape from eminent personalities, review of financial budgets, political coercion on its activities or restriction to personal and institutional exchanges abroad. Once again in a Europe stage of major clashes, for better or for worse, belligerence would interfere in academic and scientific ways.

The *Estado Novo*<sup>1</sup> in Portugal (1933-1974), despite having declared its position of neutrality, was able in different areas to handle this diplomatic position in favor of the national cause. The friendly political and scientific relationships with the Axis and Allies forces, forged into an ambiguity of a non-intervention defined by António de Oliveira Salazar<sup>2</sup>, could contribute to new directions of a scientific modernization as many Portuguese believed. The focus on a new emphasis on the phenomenon of internationalization of national Science and University, narrowing the Iberian peripheral isolation, might fight its cultural and technological backwardness and a closer approximation to international standards.

If we were not dealing with an autocratic regime, in which the political and ideological reasons assumed a decisive weight in many such claims of academic and scientific communities. The complex system of management of Portuguese Science between many departments subordinate to the central Government – *Ministério da Educação Nacional*, *Junta Nacional de Educação*, *Instituto para a Alta Cultura* and universities – established some barriers to scientific research and cultural relations by deciding evaluation and financing for individual and institutional projects. College professors and scientists were submitted to official surveillance, while applying for their integration and recognition in global programs and research networks, protecting the *Estado Novo* against the dangers of democratic and communist principles.

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<sup>1</sup> The *Estado Novo* or *New State* was a authoritarian regime that presented itself as the 2nd Republic, inspired by some fascist ideals and that promoted typical values within the range of conservative, nationalist, corporatist and authoritarian ideologies. Despite being anti-liberal, the soviet threat after II World War allowed a certain diplomatic benevolence from the Western Block, irretrievably lost by its refuse to recognize the independence of the overseas colonies that led to the Portuguese Colonial War (1961-1974).

<sup>2</sup> António de Oliveira Salazar (1889-1970), former professor of the Faculty of Law of the University of Coimbra, was invited to Finance minister in 1928 and started a long-term political career. Thanks to his controlling of public debt and economic development, he assumed a increasing power inside government that was consolidated with the Constitution of 1933, that gave birth to the *Estado Novo*. Till 1968, Salazar served as prime minister and was the major figure on regulate and deciding the guidelines of Portuguese politics, always aiming to keep peace, social order and conservative values.

Taking University of Porto (*U.Porto*) as a case study, the single university in the north of the country, it is intended to draw a picture about the status and functioning of science and its relationship with the European scenario of 1939-1945. In a diachronic and summarized vision of its role and contribution, with some parallels to the situation in Portugal, the analysis on three major fields – innovations, exchanges and resistances – offers some relevant and unique outcomes concerning the development and internationalization, as well as political interference, of the academic and scientific process in war times.

### **I. Science in the *Estado Novo*: an international bet?**

The promotion and internationalization of science in Portugal, in the mid-20th century, held a number of peculiarities that went back to the *1.ª República* (1910-1926). The momentum of expansion and modernization of the Portuguese University had been marked by the establishment of new institutions in Lisbon and Oporto<sup>3</sup>, creating competition to secular educational monopoly of Coimbra, and many reforms to the improvement of the education system. New curricula, increase of the teaching staff, scholarships abroad or installation of scientific institutes and laboratories, amongst others; were some of the proposals implemented with the aim of struggle the scientific and cultural national delay, without reaching their full potential due to the constant shortages of budgetary funds.

Since this republican period Science and University were linked together, sometimes in a hegemonic synergy, with this last one emerging as a privileged space for intellectual and pedagogical renewal, within a centralizing spirit of the state in their management and financing. At the same time, it was also influenced by the Spanish model of the *Junta para Ampliación de Estudios y Investigaciones Científicas* (1907-1939), with the foundation of the *Associação Portuguesa para o Progresso das Ciências* (1917-c.1974) and the cooperation between the two countries into events like the “Congressos Luso-Espanhol para o Progresso das Ciências”, whose first edition took place in 1921 at the *U. Porto*.

The same paradigm was preserved by the *Ditadura Militar*<sup>4</sup> (1926-1933), with the creation of the *Junta de Educação Nacional* (1929-1936) for the promotion of science, culture

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<sup>3</sup> However, the new political regime was limited to promote the existing higher education institutions - *Escola Politécnica de Lisboa*, *Academia Politécnica do Porto*, *Escolas Médico-Cirúrgicas* in both of those cities and the *Curso Superior de Letras* - only established the Faculty of Law in Lisbon as a new school from scratch.

<sup>4</sup> The *Ditadura Militar* was established by a military coup against the 1st Republic, with the goal to restore the social and political order in Portugal, as well to resolve the economic and financial crisis. After several governments in exercise, the entrance of Salazar in the power circles promoted its transformation into the *Estado Novo*.

and arts in Portugal. Through scholarships in the country and/or across borders, grants for laboratories and scientific publications, prop up academic missions and scientific conferences or the establishment of research centers which sponsor the researches of the academic community. Nevertheless, the meddling of this dictatorial regime at this panorama, privileging certain personal calls and projects and scientific areas considered capital to economic growth.

In 1936, the political control was accentuated within the corporatist logic of the *Estado Novo*, when this public body had lost its legal and administrative autonomy, according to the reform of the *Ministério da Educação Nacional* by minister Carneiro Pacheco. As a result it was replaced by *Instituto para a Alta Cultura* (until 1952), aggregate as 7th section of the new *Junta Nacional de Educação* (till 1977), who took over as technical and advisory body the new guidelines for scientific research policies and cultural relations<sup>5</sup>. In practice retained the same primordial objectives of its predecessor with the same limitations in terms of financial capacity. Although the network of studies centers (research units), connected with the universities of Coimbra, Lisbon, Oporto and Technical of Lisbon, has expanded considerably.

In correlation, the cultural and scientific exchanges between Portuguese universities and abroad met a revival to new horizons, beyond traditional and strong contacts with Spanish, Brazilian, English and French institutions, as new cultural and scientific treaties were signed with other countries. For example with The Alexander von Humboldt-Foundation (Germany) or The Rockefeller Foundation (U.S.A.), that granted scholarships to Portuguese students and researchers for pursuing international studies and funds to institutes and studies centers<sup>6</sup>.

The validation of the policy of neutrality during World War II by the *Estado Novo*, despite having raised a greater political control on these external relationships, allowed the continuity of scientific collaboration with many of the countries that have turned into belligerents. The new international dynamics had its effects on the management of the *Instituto para a Alta Cultura*, with a new steering committee elected in 1942, which included

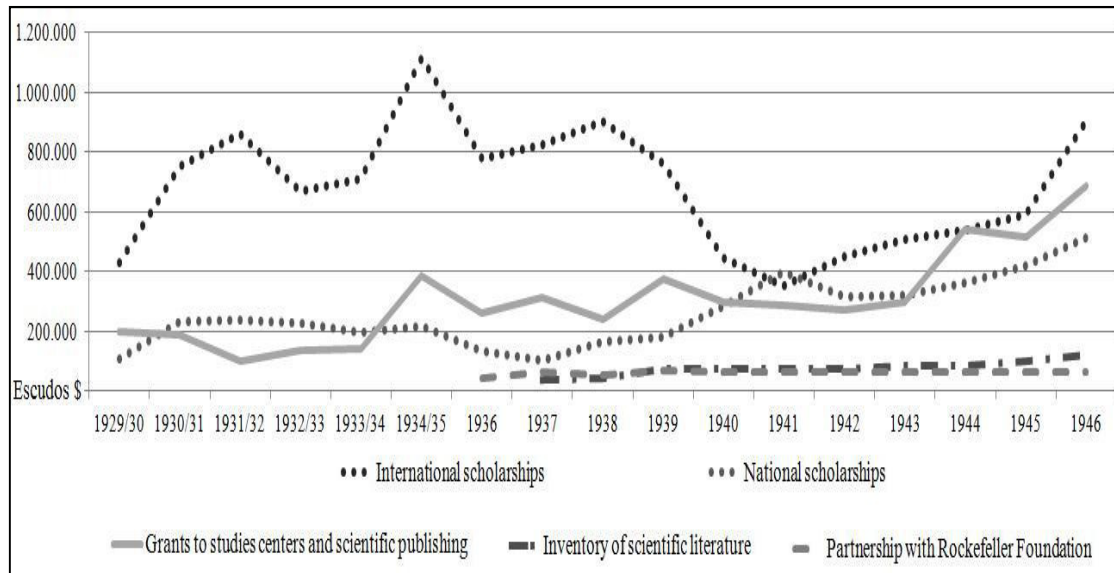
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<sup>5</sup> The *Instituto de Alta Cultura* (1952-1976) who succeeded him recover part of that management autonomy, but always struggling against the limited recourse finance entered in state budgets. See ROLLO, Maria Fernanda; QUEIROZ, Maria Inês; BRANDÃO, Tiago; SALGUEIRO, Ângela - *Ciência, Cultura e Língua em Portugal no século XX: da Junta de Educação Nacional ao Instituto Camões*, p. 49-190.

<sup>6</sup> See SCHWARZ, Reinhard - *Os Alemães em Portugal (1933-1945)*, p. 208-209.

Amândio Tavares, professor of Medicine in *U.Porto*, as vice-president for Scientific Research<sup>7</sup>.

**Figure 1 – Scientific Research Service in Portugal (annual budget)**



Source: TAVARES, Amândio - *O Instituto para a Alta Cultura e a Investigação Científica em Portugal*, p. 14-17.

Until the extinction of the *Junta de Educação Nacional* in 1936, the sum of annual budget for the scholarships abroad were highlighted in the totality of costs – about 4.500.000\$00 thousand escudos (approximately 22.601,76€) in a total of close to 6.900.00\$00 escudos (around 34.417,46€) – apparently a strong investment on the internationalization process of portuguese Science and University. This figure was probably a result of the difference between the national currency and the foreign exchange rates, forcing a greater investment in that segment, more than triple given to national scholarships and grants to studies centers and scientific publishing.

The trend seems to have maintained in the first two years of *Instituto para a Alta Cultura*, subscribing then the beginning of the collaboration with The Rockefeller Foundation and a new service for inventory of scientific literature, until the outbreak of II World War. From this moment, the general budget was gradually reduced, in the transition from 1939 to 1940 and during the three years following, the financial cut represented approximately 300.000\$00 escudos less (1.500€). Only after the global conflict this numbers would suffer an

<sup>7</sup> Amândio Joaquim Tavares (1900-1974), professor at the Faculty of Medicine of the *U.Porto*, he developed a important scientific research in the domains of Pathology Anatomic and Oncology, with various publications in internacional journals. Founder and director of the *Centro de Estudos de Anatomia Patológica e de Patologia Geral (U.Porto, 1941-1970)* and dean of *U.Porto* (1946-1961), would occupy this position in *Instituto para a Alta Cultura* until 1967.

increase, finally overcoming the barrier of 2.000.000\$00 escudos each year (around 10.000€)<sup>8</sup>.

An exclusive regard to scholarships perspective shows that the decrease concerning researchers abroad has not withdrawn its supremacy to those who stayed in Portugal, only lost in 1941 by a small discrepancy of barely 5.000\$00 escudos (250€). But these last ones were slowing starting to grow up during this interlude, some of which were granted to foreign students and researchers in Portuguese Universities, strengthening the scientific and technical teaching of a new generation. The paradox was that, tricked by the analysis of figure 1, there wasn't any proportionality relating the annual budget and the number of the two types of scholarships' awarded!

Between 1936-1939, the ratio of scholarship holders abroad was slightly higher, a total of 197 studentships (61,76%) against 122 national (38,24%) , but all through the years of war this scenery was totally subverted: 389 national scholarships (72,71%) to 146 international (27,29%). Note that the average number of studentships across borders shows a reduction of almost half its sampling, from 48 individuals in 1939 to less than half the following year, never achieving the annual mark of thirty people until the end of fight. Meanwhile, the average of their opponents in 1939-1945 had turn into double fixed in around 60 new national scholarships.

The reasons can be directly charged to the II World War context and consequent changes of diplomatic policies in Europe nations – international insecurity, economic and financial crisis, currency's devaluation and limitations to academic and scientific relationships – that forced the return of many of our international studentships and a new orientation in the granting of this kind of support. Interestingly, the direction of the *Instituto para a Alta Cultura*, at its meeting on September 6, 1939, even suggested the temporary suspension of such funding. This proposal was refused by the minister of Education, arguing the neutrality of *Estado Novo* and the eventual openness from foreign institutions to host those candidates<sup>9</sup>.

Another detail that must be taken into account in this internationalization is the inevitable political connotations that could be nourished by these Portuguese citizens, especially by the impact it might have on the external image of the regime, with a advise for choosing preferably nations with stronger diplomatic relations or also neutrals. If not in countries with economies more equal to the national standards, which would allow to better

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<sup>8</sup> Since 1944, by decision of the Faculty of Medicine of *U. Porto*, were also associated the Assis Vaz and Nobre funds to the annual budget of *Instituto para a Alta Cultura*, on the value of around 225€.

<sup>9</sup> See ROLLO, Maria Fernanda; QUEIROZ, Maria Inês; BRANDÃO, Tiago; SALGUEIRO, Ângela - *Ciência, Cultura e Língua em Portugal no século XX: da Junta de Educação Nacional ao Instituto Camões*, p. 164.

control the values to pay during those stays, that validates a European preponderance among grantees abroad. Countries like France, United Kingdom, Germany, Spain, Switzerland and Italy, in the gap of 1929-1950, were the only ones who receive more than half a hundred of candidates selected for this scientific exchange<sup>10</sup>.

Not surprisingly, in the early years of 1940s, this financial confinement has favoured an endogenous growth of Portuguese Science. The deviations of those specific budgetary funds were applied into the expansion of scientific and technological infrastructure, with the inauguration of 24 new studies centers in 1940-1945. The same happened within the rising of national scholarships, above all amongst recent graduates and assistant professor to advance for doctoral degrees and later careers in teaching and scientific researches.

This investment in new research projects in a variety of scientific fields for students and other notable personalities, as a matter of fact not always in transparent processes<sup>11</sup>, won some international projection by original and groundbreaking results presented in publications and conferences. And that were somehow integrated to an improvement and updating of the Portuguese University, exploring new scientific, educational and laboratory approaches in the post-war period against the national systemic delay...

## **II. Innovations in the *U.Porto*: academic and organizational dynamic**

Compared to the other three universities, during the *Ditadura Militar*, the *U.Porto* went back to a functional structure once held in the 19th century and a typical identity for scientific and technology education goals. Its establishment in 1911 had been a fusion of two higher education schools in the city – *Academia Politécnica do Porto* (1837) and *Escola Médico-Cirúrgica do Porto* (1836) – resultant in Sciences, Medicine, Engineering and Pharmacy faculties with absence of Law and Arts<sup>12</sup>. This last one was created in 1919 and closed in 1931 for political and educational reasons, a first school with many controversies surrounding its education model and academic promotion of its professors<sup>13</sup>.

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<sup>10</sup> TAVARES, Amândio - *O Instituto para a Alta Cultura e a Investigação Científica em Portugal*, p. 19.

<sup>11</sup> There are some reported cases of a clearly favoritism and external influences during the course of that process of selection in this kind of scientific research projects, as many others that were refused once their curators didn't offered entire guarantees of respect to official intellectual and political guidelines. See, for example, FIOLEAIS, Carlos - *A Ciência em Portugal*.

<sup>12</sup> See, among others, SANTOS, Cândido dos - *The University of Porto: roots and memories of the institution* or ALVES, Luís Alberto; ARAÚJO, Francisco Miguel - *Rumos da Internacionalização na História da U.Porto*.

<sup>13</sup> See ARAÚJO, Francisco Miguel - *Faculdade(s) de Letras do Porto: da (re)criação à revolução*, p. 41-92.

Until the early 1950s, this local university framework has become entrenched in its original design, which contributed to a certain subordinate role facing Lisbon and Coimbra<sup>14</sup>. Therefore, the main attraction of the *U.Porto* near the student community were the areas of Engineering, in competition to *Instituto Superior Técnico de Lisboa*, as well as Pharmacy, the exclusive national college granting bachelor's and doctoral degrees. But, in order to offer some intellectual culture to students in a wide formation of the missing Social Sciences and Humanities, an original compromise solution was found.

The signing of cultural agreements with the consulates in the city and its cultural bodies – *Instituto Francês em Portugal*, *Instituto Alemão de Coimbra*, *Instituto de Cultura Italiana* and British Council – created inside *U.Porto* the “Salas de Cultura Estrangeira” (Foreign Culture Rooms), reinforcing the political and diplomatic connections of Portugal with other European nations. The first to be launch was the “Sala de Cultura Italiana” (1934) in the Faculty of Science, by initiative of Alberto Tuozzi, Italian ambassador in Lisbon. This school also hosted the “Sala de Cultura Francesa” (1938), with the support of the French ambassador and the *Instituto Francês em Portugal*.

During the II World War, it was created the “Sala de Cultura Inglesa” (1940) in the Faculty of Engineering by the British ambassador and the British Council, followed up by the “Sala de Cultura Alemã” (1941) in agreement with III Reich's ambassador and *Instituto Alemão de Portugal*<sup>15</sup>. Everyone of them had the mission to build up cultural relations of *U.Porto* in an outside dimension, anticipating even approval of the *Estado Novo* cultural treaties with those and other nations from the mid of 1950s<sup>16</sup>. Academically, these cultural spaces involved an important pedagogical mission, providing students access to updated knowledge to complement their undergraduate studies. Native speaker teachers were hired to give language courses and their private's libraries received books, scientific magazines and journals from all over the world.

The cultural exchange were much emphasized in the programming of activities by the “Salas de Cultura Estrangeira” directors, backed up by *Instituto para a Alta Cultura*, as an effective way of bringing to Portuguese public their national contributions: conferences, artistic exhibitions, music concerts, movie sessions, theatrical plays, etc. Obviously, during II

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<sup>14</sup> At the insistence of the dean Amândio Tavares and the academic authorities of *U.Porto* along the government, finally were established the faculties of Economy (1953) and 2<sup>nd</sup> of Arts (1961), a singular achievement in the history of the University in Portugal within the *Estado Novo*.

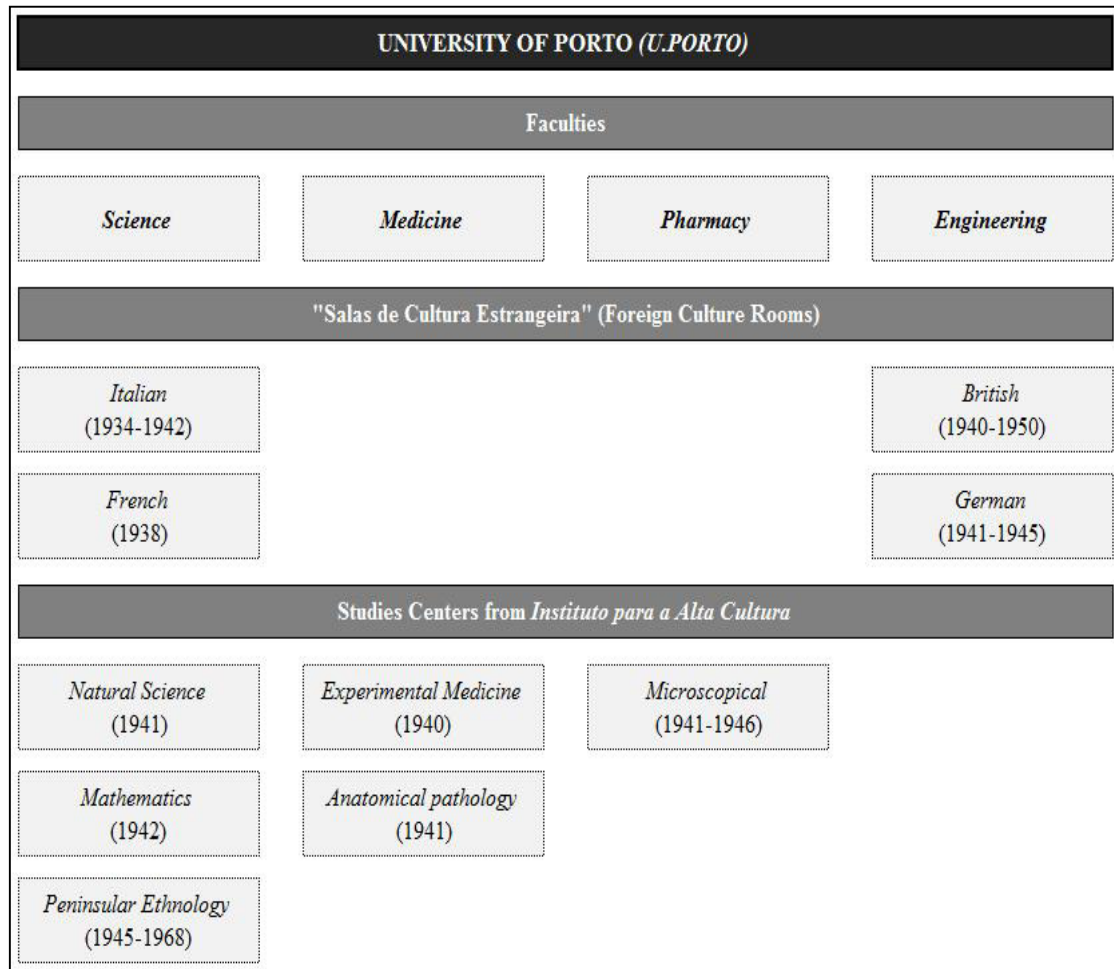
<sup>15</sup> See UNIVERSIDADE DO PORTO - *Actas de sessões solenes da Universidade do Porto (1934-1947)*.

<sup>16</sup> The first explicit "Acordo Cultural" (Cultural Agreement) ratified by the *Estado Novo* was with United Kingdom (1954), followed up by Belgium (1955), Federal Republic of Germany (1965), Brazil (1966) and France and Spain (1970). See MATOS, Vera - *Portugal e Itália: relações diplomáticas (1943-1974)*, p. 85.



World War, they too were used for propaganda with nationalist intents, promoting sympathies regarding the war effort, in a disguised outline before the *U.Porto* rectory. Generally, some movies and public events that took place and had a political-ideological connotation, like the symbolic visit of British ambassador Sir Ronald Campbell, on June 4, 1942, to an exposition about United Kingdom living and resistance under the Blitz.

**Figure 2 – Structural model and organization of the *U.Porto* (1939-1945)**



Nonetheless, it seems that the hostilities opposing Allies and the Axis powers were handled with care in the Oporto academia, whilst always respecting Portugal neutrality. These foreign representations remained open during the conflict, like the French and British rooms, while the closure of the remaining two was based on their national states resolution due to external policies adjustments. The Italian ambassador in Portugal decided to suspend all

cultural services in 1942, including the local “Sala de Cultura Italiana”, and the defeat of Nazi Germany implied a similar decision for the “Sala de Cultura Alemã”<sup>17</sup>.

Following the restructuring of the *Instituto para a Alta Cultura* and its new scientific strategy in early 1940s Portugal, the *U.Porto* managed to extend the scientific net with the approval of its first studies centers, public organizations for scientific research under the guidance of its professors:

– Faculty of Medicine: *Centro de Estudos de Medicina Experimental* (Experimental Medicine) to Hernâni Monteiro<sup>18</sup> (1940) and *Centro de Estudos de Anatomia Patológica* (Anatomical Pathology) to Amândio Tavares (1941);

– Faculty of Pharmacy: *Centro de Estudos Microscópicos* (Microscopical) to Aníbal do Amaral e Albuquerque<sup>19</sup> (1941);

– Faculty of Science: *Centro de Estudos de Ciências Naturais* (Natural Science) to Américo Pires de Lima<sup>20</sup> and Manuel Joaquim Ferreira<sup>21</sup> (1941), *Centro de Estudos Matemáticos* (Mathematics) to Ruy Luís Gomes<sup>22</sup> (1942) and *Centro de Estudos de Etnologia Peninsular* (Peninsular Ethnology) to António Mendes Corrêa<sup>23</sup> (1945).

Coexisting with the previous institutes and laboratories, these new research units brought a renewal to scientific internal overview, provided with financial and material resources for the production and broadcasting of Portuguese Science. In addition, the purchase of new technological equipment was important to laboratory works on teaching and Portuguese and foreign scholarships were accepted to develop their researches. An international impact was also gained with their doctoral theses and articles publishing, attached with the participation at international conferences and quotes in scientific papers.

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<sup>17</sup> Both of them would be retrieved to *U.Porto*: the Italian was re-opened in 1949 and the German gave its place to *Instituto de Cultura Alemã* in 1957. The British example was closed for the 1950-1951 academic year, in obedience to the reformulation of The British Council Portugal.

<sup>18</sup> Hernâni Bastos Monteiro (1891-1963), professor at the Faculty of Medicine of the *U.Porto*, he developed scientific works on Anatomy, Experimental surgery and Medical History, member of renowned national and international societies.

<sup>19</sup> Aníbal do Amaral e Albuquerque (1894-1957), professor at the Faculty of Pharmacy of the *U.Porto*, whose scientific research was most focused in pharmacology studies.

<sup>20</sup> Américo Pires de Lima (1886-1966), professor at the Faculty of Sciences of the *U.Porto*, with scientific works covers fields like Botany, Anthropology, Medicine, Prophylaxis and History, among others.

<sup>21</sup> Manuel Joaquim Ferreira (1890-1963), professor at the Faculty of Sciences of the *U.Porto* within the Botany studies section.

<sup>22</sup> Ruy Luís Gomes (1905-1984), professor at the Faculty of Sciences of the *U.Porto* and outcast for political reasons in 1947, became famous for his research in Mathematics, Theoretical Physics and Astronomy. Later he was elected as dean of *U.Porto* (1974-1975).

<sup>23</sup> António Augusto Esteves Mendes Corrêa (1888-1960), professor at the Faculty of Sciences of the *U.Porto*, former Geography professor at the 1<sup>st</sup> Faculty of Arts. He was one of the best-known Portuguese scientists abroad thanks to his scientific research in Anthropology and was appointed head of the *Escola Superior Colonial* of Lisbon (1946-1959).

The exception had been the Faculty of Engineering, although its professor Antão de Almeida Garrett launched here the first Urbanization course in the country, in January 1945.

Finally, it is mandatory to mention the first women who received a PhD degree at *U.Porto*, a signal of a shy openness of the national mentality of that time, after the groundbreaking example of Lisbon a few years earlier<sup>24</sup>. In the Faculty of Science, Leopoldina Paulo Ferreira, PhD in Biological Sciences, with the thesis *Alguns caracteres morfológicos da mão nos portugueses* (1944) and Judite dos Santos Pereira, PhD in Geological Sciences, approved with *Formações portuguesas com haloisite, caulinite ou montmorilonite* (1945). In the summer of 1945, in a public ceremony held at the rectory, both were among the seven students to receive the doctorate degree from *U.Porto*<sup>25</sup>.

### **III. Exchanges on *U. Porto*: education and science internationalization**

Adversities caused by the II World War in external relations and foreign affairs had its impact in traditional and academic exchanges that *U.Porto* had been developing with other universities and institutes worldwide. Contrary to what one might assume, the phenomenon of internationalization would not be interrupted, if some contacts were most limited with nations at war, others were reinforced and new destinations were explored, in articulation with *Instituto para a Alta Cultura* and international cultural organizations established in Portugal.

In Oporto, for example, public figures such as Gino Saviotti, Leo Pessina or Simone de Beauvoir, were welcomed and attended conferences set by their national embassies. Moreover, the year of 1940 was engaged to the commemoration of the double centenary – foundation of the Portuguese state and restoration of independence after the Castilian domination – and several foreign dignitaries took part in initiatives promoted all over the country. From 8 to 24 June 1942, the city was chosen to host the “IV Congresso Luso-Espanhol para o Progresso das Ciências”, a scientific meeting of Portugal and Spain universities.

For the academic community, discussing a variety of cultural and scientific themes, other speakers were received in *U.Porto*: William Ormsby-Gore and René Leriche (1940), Júlio Palácios and Emmanuel de Martonne (1944), Lluís Pericot García, Martín Almagro

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<sup>24</sup> In the University of Lisbon the first ladies taking PhD's dates back to the 1930s: Elza Paxeco (1938), Cesina Bermudes or Virgínia Rau (1947), etc. In 1956, at University of Coimbra, Maria Helena da Rocha Pereira was the first to accomplish that degree, after a scholarship from the *Centro de Estudos Humanísticos* (1947) of *U.Porto*.

<sup>25</sup> See SANTOS, Cândido dos - *A mulher e a Universidade do Porto*, p. 45-46.

Basch, Ramón San Martín Casamada, Gregório Maraion, René Neeser and William Lawrence Bragg (1945)<sup>26</sup>. In reciprocity, a few professors of Oporto received invitations for field trips and lectures abroad, standing out Mendes Corrêa honorary doctorate by the University of Montpellier (1941), Adriano Rodrigues with Spanish civil order “Orden de Alfonso X, el Sabio” (1943) and Hernâni Monteiro honorary lecturer by the University of Salamanca (1945).

However, the main bonds of internationalization until this date were focused mainly on two other neutral states: Switzerland and Spain. In June 1945, the "Exposição Suíça" a large cultural and technological event, which has extended to the local university with lectures from Swiss professors and scientists. As for the neighbouring country, after the damage of Spanish Civil War (1936-1939), in particular the faculties of Medicine and Pharmacy had a significant role in its recovery. Scientific equipment was borrowed or sent to the universities of Santiago de Compostela, Madrid and Barcelona, as well as some professors and assistants offered their services teaching in Easter and Summer courses. Long-term initiatives until of the mid-1940s, by some means enrolled in the treaty of Friendship and Non-Aggression “Pacto Ibérico” (1939), linking the two Iberian dictatorships and on which General Franco would recognize as crucial to the improvement of Spanish universities.

This parallel is likely to be seen in two of the most relevant scientific journals of *U.Porto* – *Anais da Faculdade de Ciências do Porto*<sup>27</sup> and *Anais da Faculdade de Farmácia do Pôrto*<sup>28</sup> – that offers an image of scientific research, both at mainland and outside, as well its international projection within the contributions received from well known personalities and institutions. The first publication of Faculty of Science can be traced back to the famous *Annaes Scientificos da Academia Polytechnica do Porto* (1905-1920), which had more than two hundred exchanges with European, Asian and South American journals, and was directed by Mendes Corrêa since 1933<sup>29</sup>. The second one was first printed in 1939 to showcase works and projects undertaken at the Faculty of Pharmacy under the supervision of Aníbal do Amaral e Albuquerque.

From 1939 to 1945, seven volumes of the *Anais da Faculdade de Ciências do Porto* were published, organized in four fascicles each year, with the numbers XXIV to XXX. Its Committee would accept any papers for evaluation and publishing, sometimes making

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<sup>26</sup> See UNIVERSIDADE DO PORTO - *Recortes de Imprensa (1919-1987)*.

<sup>27</sup> This title was published in a grand total of 52 volumes, between 1927 and 1986.

<sup>28</sup> The *Anais da Faculdade de Farmácia do Pôrto* has been published in 27 volumes from 1939 to 1967.

<sup>29</sup> See ALVES, Luís Alberto; ARAÚJO, Francisco Miguel - *Rumos da Internacionalização na História da U.Porto*, p. 118.

invitation for certain international contributions, but some Portuguese authors usually wrote in French. Since we can't analyze all the 115 articles, most of them individual entries, we can focus in its classification by major scientific areas that covers different themes<sup>30</sup>.

Several titles could cause some awkwardness concerning learning experiences in a Faculty of Science, such as Social Sciences (Biological Anthropology and Economics, 4 - 3,48%), Medical and Health Sciences (Anatomy and Embryology, 7 - 6,09%) or Humanities (Archaeology, History of Science, Biographies and History, 16 - 13,91%). Many of these articles are derived from investigations at *Instituto de Antropologia* of this college, academic conferences and funeral eulogies of professors. More than half of this bibliometric analysis represents its most important fields of study: Exact Science (34 - 30,43%) with Pure and Applied Mathematics (Algebra and Geometry), Physics (Kinematics and Mechanics) and Chemistry; even as Natural Science (54 - 46,09%) with Earth Sciences (Geology, Mineralogy, Paleontology and Meteorology) and Biological Sciences (Botany, Zoology and Genetics).

**Figure 3 – Articles published in *Anais da Faculdade de Ciências do Porto* (1939-1945)**

Vol. (Year)	Authors	Major Scientific Areas				
		Exact Sciences	Natural Sciences	Medical and Health Sciences	Social Sciences	Humanities
XXIV (1939)	Portuguese	1	4	—	1	1
	Foreign	4	1	—	—	1
XXV (1940)	Portuguese	—	6	1	—	2
	Foreign	3	3	1	1	—
XXVI (1941)	Portuguese	3	7	2	—	2
	Foreign	3	2	—	1	—
XXVII (1942)	Portuguese	1	6	1	1	4
	Foreign	2	1	—	—	1
XXVIII (1943)	Portuguese	3	4	1	—	3
	Foreign	3	1	—	—	—
XXIX (1944)	Portuguese	7	11	—	—	1
	Foreign	2	—	—	—	—
XXX (1945)	Portuguese	1	4	1	—	1
	Foreign	1	4	—	—	—

Source: FACULDADE DE CIÊNCIAS DO PORTO - *Anais da Faculdade de Ciências do Porto*.

We can check this when examining the profile in a universe of 63 authors identified, the great majority is associated with *U.Porto*, mainly male (61 - 96,83%) and coming from its

<sup>30</sup> This bibliometric analysis draft was arranged according to the “Fields of Science and Technology (FOS) – Classification in the *Frascati Manual*”, with a particular distinction among the most representative scientific areas. On the counting of total number of articles published was taken into account its reference in each annual volume, including some that had been divided into several parts along these years.

faculties: Science (29 - 46,03%) and Medicine (4 - 6,35) inside a national perspective. Professors, assistants, researchers and students working in its establishments – *Instituto de Botânica, Instituto de Zoologia Marítima, Laboratório de Química, Laboratório de Física, Laboratório de Mineralogia e Geologia, Centro de Estudos Matemáticos* and *Centro de Ciências Naturais* – Côrrea Mendes, Luís de Pina, Ruy Luís Gomes, J. Carrington da Costa, Arnaldo Rozeira, J. Bethencourt Ferreira, Carlos Teixeira, J. M. Coteló Neiva, Amílcar de Magalhães Mateus, Joaquim Sampaio, Miguel Montenegro de Andrade or Judite dos Santos Pereira, among others.

On the other hand, the presence of foreign citizens (26 - 41,27%) implies a relationship with various nations, a few ones already living in Portugal and taking part on national research programs at *Instituto para a Alta Cultura*: Henrique Vitor Ziller Perez, Guido Beck and Georges Zbyszewski. The more representative nationalities came from France (9 - 14,29%), Spain (5 - 7,94%), Italy and Belgium (3 each - 4, 76%), Germany (2 - 3,17%) and singular ones from Sweden, Czech Republic, Soviet Union and Switzerland. While Spanish and Italian authors published articles in their native language and only one presents a paper in English, French prevailed as the main scientific international language in the journal.

The French Republic also assured its leadership when it was possible to link these authors to their institutional affiliation with universities, museums and laboratories across borders (13 - 50%), a reality of the strong exchange between Luso-French academia since the 19<sup>th</sup> century. Professors Louis Baudin and Yvette Cauchois (University of Paris), the eminent Henri Breuil (Collège de France), Émile Turrière (University of Montpellier), Albert Vandel (University of Toulouse) or Max Vachon and René Jeannel (National Museum of Natural History).

In addition to others prominent names of European Science, particularly in the areas of Exact and Natural Sciences: Gino Loria, Eugène Pittard, Carl Rudolf Florin, Vincenzo Giuseppe Cavallaro, Pierre Birot, Letterio Toscano, Lucien Godeaux, etc. Still it should be noted that between 1942-1944, in a international dimension, these specific articles had been decreased throughout those years. The number of foreign authors published went from an average of six to merely three annual entries! Consequence of the instability in Europe caused by the II World War, with restrictions to University and Science connections worldwide, pushing Portugal to find new partners in these circumstances.

As for *Anais da Faculdade de Farmácia do Pôrto*, established only in 1939 and publishing six volumes till 1944, its bibliometric analysis is necessarily more limited. This

editorial project started as a repository for professors and graduates to display their scientific research articles, with a total of 76 entries signed by the Pharmacy academic community, and after 1941 also to the *Centro de Estudos Microscópicos*. The histological and embryological studies of its principal researchers – Abel Salazar<sup>31</sup> and Adelaide Estrada<sup>32</sup> – represent even half of the global scientific production, which may explain the interruption of the title in 1945 when the research unit was closed by governmental decision.

**Figure 4 – Articles published in *Anais da Faculdade de Farmácia do Pôrto* (1939-1944)**

Vol. (Year)	Authors	Major Scientific Areas			
		Biological Sciences	Chemistry	Medical and Health Sciences	Humanities
<i>I</i> (1939)	Portuguese	1	4	—	1
	Foreign	—	—	—	—
<i>II</i> (1940)	Portuguese	2	—	4	2
	Foreign	—	—	—	—
<i>III</i> (1941)	Portuguese	18	1	1	1
	Foreign	—	—	—	—
<i>IV</i> (1942)	Portuguese	7	3	—	1
	Foreign	—	1	—	—
<i>V</i> (1943)	Portuguese	9	1	—	—
	Foreign	1	1	—	—
<i>VI</i> (1944)	Portuguese	11	3	—	2
	Foreign	1	—	—	—

Source: FACULDADE DE FARMÁCIA DO PORTO - *Anais da Faculdade de Farmácia do Pôrto*.

In the allocation by major scientific areas, the Biological Sciences were predominant (Histology, Bacteriology, Mycology and Botany, 50 - 65,79%) comparing to Chemistry (Analytical and Food, 14 - 18,42%), Humanities (History of Science, Philosophy and Biographies, 7 - 9,21%) and Medical and Health Sciences (Pharmacology, 5 - 6,58%). Basically, these were areas that matched with their own school curricula and faculty work from all 25 authors enrolled in the publication (12 - 48%): Américo Pires de Lima, Manuel Augusto Pinto, Armando Laroze Rocha, Joaquim José Nunes de Oliveira, Violeta Castelo-Branco da Cunha, Artur Marques de Carvalho, Joaquim José Nunes de Oliveira, Abel da Silva Pereira, etc.

<sup>31</sup> Abel de Lima Salazar (1889-1946), professor at the Faculty of Medicine of the *U.Porto* and internationally recognized for his scientific research's in Histology, Embryology and Cytology.

<sup>32</sup> Adelaide Augusta Fernandes Estrada (1900-1979), principal collaborator of Abel Salazar's research projects during several years, she was never granted with a position to become a professor at *U.Porto* due to her role in political and civic opposition movements.

The foreign exchange was very small, the exceptions were the Spanish authors Ramon San-Martin Casamada (University of Barcelona) and three entries from Colonel Joaquín Mas-Guindal (Royal Academy of Pharmacy of Spain). And because of that, the national cooperation had a preferential role: Schools of Pharmacy and Faculties of Medicine of Lisbon and Coimbra, Faculty of Science of Porto and Institute of Tropical Medicine of Lisbon. Unlike a student community mostly female in its indoor, the male hegemony reigned within research activities and journal publishing, very similar too the pursuit of this kind of PhD degrees<sup>33</sup>.

Nonetheless, the international reputation of *Anais da Faculdade de Farmácia do Pôrto* was assured by the *Centro de Estudos Microscópicos*, all the scientific documents were written in French, providing an open access to these pioneering techniques and results. Abel Salazar turned into a highly referenced name and his work was translated in several scientific journals. The “Método tano-férrico de Salazar” method was deployed by many laboratories and earned praise of scientists like Josef Wallraff, H. Beckert or George Gomori<sup>34</sup>.

#### **IV. Resistances in *U.Porto*: political and military tensions**

One cannot neglect the constraints of II World War in the activity of European Science and University. The warfare and the military occupation of many countries have postponed many of these institutional contacts and long-established academic and scientific exchanges programs. Some of the financing was transferred for other services and organizations were temporarily closed, for different and personal reasons, and a great number of scientists decided to leave Europe too. This escape of human capital towards mostly north and south American countries, in search of a peace and democratic living and better working conditions, left somehow a void in the search for knowledge at the old continent.

This global framework would reflect on nations that had always declared it to be neutral. For example, Luís de Pina<sup>35</sup> from *U.Porto* has later regretted about losing some important official invitation caused by the instability over those years. First being forced to give up a call from Benigno Di Tullio (University of Rome) to established in Portugal a delegation of the “Fédération Internationale des Sociétés d'Anthropologie Criminelle”, then

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<sup>33</sup> See ALVES, Luís Alberto; ARAÚJO, Francisco Miguel - *Rumos da Internacionalização na História da U.Porto*, p. 135.

<sup>34</sup> See, among others, COSTA, A. Celestino da - *Abel Salazar: histologista*.

<sup>35</sup> Luís José de Pina Guimarães (1901-1972), professor at the Faculty of Medicine and later of the 2<sup>nd</sup> Faculty of Arts of the *U.Porto*, became famous for his Portuguese History of Medicine works.



renouncing to his participation in a transnational research led by Egon Freiherr von Eickstedt (University of Breslau)<sup>36</sup>. And the foreign policy set out by the *Estado Novo* ought to be a major obstacle to some of these claims for external horizons. Its economic and national security obsession in order to avoid diplomatic incidents and outsider propaganda, dangerous enough on some values to the dictatorial regime ideology, has caused this state of affairs...

One of the most relatable political meddling in Portuguese universities was the ministerial decree of May 1, 1943, relating to their right to grant honorary degrees, whereas for foreign citizens it would imply a previous government approval. In the *U.Porto* that instruction must had been asked to Gregorio Marañón, Spanish professor and honorary doctorate by the Faculty of Medicine (1945). Previously, in 1942, the same honor was assigned to Rev. Fr. Alphonse Luisier by the Faculty of Science, a Swiss professor and botanist settled in Portugal, and the Faculty of Pharmacy as nominated Jose Casares Gil, Galician professor at the University of Madrid. All the above mentioned professors have citizenship from neutral countries<sup>37</sup>!

The process of recognition of academic qualifications and degrees abroad was was restricted to many bureaucracies: equivalence of diplomas by the *Conselho Permanente da Acção Educativa* of *Junta Nacional de Educação*, ultimate ratification by *Ministério da Educação Nacional*. Numerous students and fellows went to international universities and laboratories to carry out curricular and research programs, only then returning to Portugal to present PhD thesis for defense in a public exam near their alma mater. Some even with doctoral dissertation approval would apply to a new exam at national universities to hasten its equivalence.

To the same extent, the studies centers of *Instituto para a Alta Cultura* didn't had a real freedom of action or scientific management, subordinated to public financing and annual reviews, as the *U.Porto* would soon realize. The *Centro de Estudos Microscópicos* had an ephemeral existence of only five years, despite the strong projection achieved by its laboratory chief and head researcher. Abel Salazar, who has been expelled from the Faculty of Medicine in 1935, for alleged pernicious influence on students, made his return to this section at the Faculty of Pharmacy. He had the help of a small research team – Adelaide Estrada,

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<sup>36</sup> See ARAÚJO, Francisco Miguel - *Luís de Pina*, p. 391.

<sup>37</sup> See ALVES, Luís Alberto; ARAÚJO, Francisco Miguel - *Rumos da Internacionalização na História da U.Porto*, p. 142.

Corino de Andrade<sup>38</sup> and Alberto Correia da Silva – and they carried on developing relevant researches in the fields of Histology, Cytology and Hematology.

All of the extensive scientific work which included conferences, free courses, publications and the book *Hematologia: ideias e factos novos* (1945), was jeopardized by the civic position of his mentor. A critical voice in Portugal post-war demanding the political openness of *Estado Novo* dictatorship, Abel Salazar had joined the *Movimento de Unidade Democrática* (MUD), an opposition political organization demanding free elections. As a result of this, in late 1945, public funds for this study center were cancelled, forcing the interruption of its activities and closure<sup>39</sup>. In April 1946, for the first time, the *Junta Nacional de Educação* has decreed its extinction and a new scientific body, the *Centro de Estudos Farmacológicos*, took over its facilities. Some members of the team were not reappointed in their functions and Abel Salazar, already seriously ill, would die in Lisbon at the end of this year.

Another case involved the *Centro de Estudos Matemáticos*, officially established in 1942, which already had started a few initiatives within “Movimento Matemático Português”, promoted by Ruy Luís Gomes, Bento de Jesus Caraça, António Aniceto Monteiro among others<sup>40</sup>. The guidelines of its thematic project approved by the *Instituto para a Alta Cultura*, like Theoretical Physics and Quantum Mechanics, approach to new updates in international research lines at Exact Sciences: theory of relativity, linear algebra, kinematics, etc. Taking advantage of the stay of Guido Beck in Portugal, its director Ruy Luís Gomes invites him to teach a course of “Introduction to Quantum Mechanics” in the summer of 1942<sup>41</sup>.

In the academic year 1942-1943, for a "Theoretical Physics Seminar" at the researchers and students of the Faculty of Science, which Guido Beck taught during three months, replaced in January for equal time by Alexandru Proca (Institut Henri Poincaré), sponsored by *Instituto para a Alta Cultura* and The Rockefeller Foundation. Guido Beck was compelled to move to the city of Caldas da Rainha, while he was waiting for official permission to immigrate to Brazil. António Aniceto Monteiro was responsible for the educational program of the study center until 1945, but he too decided to leave Portugal

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<sup>38</sup> Mário Corino da Costa de Andrade (1906-2005), neuroscientist who first described the familial amyloidotic polyneuropathy (FAP) syndrome that later came to be associated with his name.

<sup>39</sup> See COIMBRA, António - *A carreira universitária de Abel Salazar*, p. 14-15.

<sup>40</sup> See MORGADO, José - *O Professor Ruy Luis Gomes e o Movimento Matemático Português*, p. 129-138.

<sup>41</sup> See FITAS, Augusto; VIDEIRA, António - *Cartas entre Guido Beck e cientistas portugueses*.

finding hard to access an academic career, in spite of recommendations from Albert Einstein and John von Neumann<sup>42</sup>.

Finally, the dynamism and renewal brought by *Centro de Estudos Matemáticos* would be deeply affected by the new wave of political expulsion in Portuguese universities during 1947, once again due to subversive personal actions against *Estado Novo*. The resignation of Ruy Luís Gomes and his following of the Faculty of Science – Alfredo Pereira Gomes, Jorge Alberto Delgado de Oliveira and Laureano Barros – and other individuals who took part in its activities, left it without the main team for a few months. Thanks to the new management of Augusto Queirós and Jayme Rios de Sousa, this research unit had survived, but followed different lines of research in Mathematics, certainly more appealing for its new directors...

## V. Conclusion

Despite the general constraints during II World War, the case study of the *U.Porto* as a paradigm of the History of Science in Portugal allows assessing elements such as innovation and exchanges at universities had been enhanced. The connections with other academic and scientific institutions in Europe and worldwide provided an update and modernization to learning models and scientific research, able to overcome some of the national points stagnation and backwardness that have been announced, mainly with a local international projection in scientific domains such as Pathologic Anatomy, Medical Surgery, Anthropology, Cytology and Histology.

The phenomenon of internationalization was duly seconded by the *Instituto para a Alta Cultura*, main organization for the promotion of cultural and scientific relations, and conquered in some in some of its lines: international scholarships academic exchanges, research centers sponsor, events and conferences, scientific publishing, etc. Thus ensuring a relative prestige to Portuguese University and Science abroad, that consolidated the national presence of professors and scientists in global scientific research networks in post war era.

In correlation, the diversity of knowledge and pedagogical innovations had some impact in this academia then. Many of its members in addition to strengthen institutional cooperation and in contact with emerging theories and empirical perspectives, also seek to implement it in classrooms, laboratories and research units to development the educational system of a new generation. If this turning point was not fully exploited, as many of these

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<sup>42</sup> See RIBEIRO, Rosa Maria; MIRRA, Maria Elisa; RIBEIRO, Maria de Fátima; SILVA, Maria do Céu - *Algumas histórias do Centro de Estudos Matemáticos do Porto*, p. 79-105.

public figures had advocated, somehow, was due to the *Estado Novo* political interference and its fears of political-ideological nature concerning foreign diplomacy.

The management of *Instituto para a Alta Cultura* over 1939-1945 reveals the authoritarian character of the regime, if not a politicization of scientific research, struggling with budgets far from corresponding to its mission and programs. Ideological criteria and personal favouritism that has overlapped to intellectual merit, well-known in certain individual cases, were decisive into the selection of agents and units dedicated to knowledge construction process. Ambiguities in the external diplomacy with the belligerent nations have promoted a new national guidance over the definition of the new political map of Europe, with great emphasis in Spanish relationship, which reconfigured the Portuguese role in the path of European Science.

These dualities have also emerged in the workings of the *U.Porto*, when the academic community tried to maintain and reinforce the links with several international institutions. The *U.Porto* hosted "Salas de Cultura Estrangeira" official ceremonies, scientific and cultural meetings or the international reputation of its professor, studies centers and scientific publishing. Additionally, it faced challenges posed by the Government in this particular context that sometimes were not entirely fair to its identity and structure, as many innovation projects and researchers have been cut off for not offering guarantees towards the desirable political and civic "submission".

As Ruy Luís Gomes would later say, those were the reasons for Portugal have lost a golden opportunity to eventually welcome some of the emblematic names in European "brain drain" phenomenon at the time. The bureaucratic obstacles raised by *Estado Novo* led many fugitives' scientists on giving up their intentions to settle here, aware of the lack of financial and material support to proceed with their researches or the difficulties to being integrated in teaching and research positions in universities. Who knows if the presence of these leading figures and their scientific and technological inputs could have taken Portugal to a higher level in Science and Culture of the 20th century?!

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