

The emergence of molecular genetics in Portugal: the enterprise of Luís Archer S.J.

Francisco Malta Romeiras*

Luís Jorge Peixoto Archer was born in Oporto May 5, 1926, into a distinguished catholic family with noble origins.¹ From the age of 10 and up to 1945, he studied piano, one of his many interests, as he confessed in his last interview, on the eve of his death.² His musical talent was used within the Society of Jesus and he was responsible for numerous choral groups, namely at the colleges of the Society in Lisbon (1954-1956) and Santo-Tirso (1961-1963).³

His former colleagues, students, employees and fellow Jesuits recall him as a meticulous and humble scientist, an affable companion, and a cheerful and diplomatic priest who was always keen to discuss molecular genetics, history and philosophy of sciences, bioethics and theology with the same enthusiasm that he played the piano or listened to classical music. Having collaborated with some of the most distinguished Portuguese personalities, Luís Archer was frequently portrayed as a serene priest who had decided to commit himself to molecular genetics and bioethics.

After having obtained his degree in biology with honours in 1947, for which he was awarded the Rotary Club medal for best student, Luís Archer was admitted to the novitiate of the Society of Jesus on December 7, causing general surprise and consternation amongst

* Francisco Malta Romeiras is an historian of science working at the Centro Interuniversitário de História das Ciências e da Tecnologia, at the University of Lisbon (CIUHCT-UL). Currently he is finishing his doctoral thesis, which focuses on the scientific activities of the Society of Jesus in Portugal in the 19th and 20th centuries.

I would like to acknowledge Henrique Leitão for his valuable comments on earlier drafts of this paper, Andy Anceriz for the English revision, Antonio Sánchez for the Spanish abstract and Fundação para a Ciência e Tecnologia for financial support - SFRH/BD/61883/2009.

- 1 Luís Jorge Peixoto Archer, * 5.V.1926 Oporto (Portugal), S.J. 7.XII.1947 Guimarães (Portugal), † 8.X.2011 Lisboa (Portugal) (Lisboa, Arquivo da Província Portuguesa da Companhia de Jesus, Archer's identification file)
- 2 Francisco MALTA ROMEIRAS, "A última conversa com o P. Luís Archer. Um concílio entre Fé e Ciência", *Brotéria* 173 (2011), pp. 239-245.
- 3 Lisboa, Arquivo da Província Portuguesa da Companhia de Jesus, *Luís Archer S.J., Curriculum Vitae*, 2008.

his former professors at the University of Oporto, who were expecting him to pursue a scientific career in biology. Following the novitiate he studied philosophy (Braga, 1951-1954) and theology (Frankfurt, 1956-1960) and was finally ordained on July 31, 1959.

Four years after obtaining his degree in theology, when he thought that he would stay in Portugal, he was sent to the United States to study molecular biology. It was a priority of the Portuguese Province of the Society of Jesus to make use of Archer's scientific talents, since there had been no Portuguese Jesuits devoted to scientific research since the late 1950s.⁴ On April 22, 1964 he arrived in Washington where he met Ernst Freese (1926-1990) with whom he was going to work at the National Institute of Health, Maryland. There was, however, a misunderstanding, and he only stayed in the laboratory for twelve days. Ernst Freese thought that Archer had already completed his doctorate, since the letters of reference from Portugal always mentioned the Jesuit priest as «Dr. Luís Archer». At that time, the NIH, Maryland, was not interested in providing the basic tools for the completion of Archer's doctoral work, and so he was told to return when he finished his doctorate.

Hence, on the eve of his 38th birthday, he was in Washington, with no laboratory to complete the research that the Portuguese Institute of High Culture had subsidized, granting him a doctoral scholarship. It was only in the fall of 1964 that Archer was finally accepted as a free student at Georgetown University where he studied biochemistry and molecular biology and started a research project on the effects of the anthrax toxin, publishing three scientific articles in 1966 and 1967.⁵ On May 4, 1966, exactly two years after being dismissed from the NIH, he presented his first scientific communication in Los Angeles.⁶ Moreover, his research on the anthrax toxin was acknowledged in Portugal, and he was granted the Prize of the Institute of High Culture in 1967 for the

4 António MARUJO, "Entrevista a Luís Archer. O padre que vestiu a bata de laboratório", *Público*, 8-X-2011. Available at: <http://www.publico.pt/sociedade/noticia/o-padre-que-vestiu-a-bata-de-laboratorio-1515566> (5 December 2013).

5 Irving GRAY, LUÍS ARCHER, "The effect of anthrax toxin on oxidative metabolism of lung tissue" *American Journal of Physiology* 210 (1966), pp. 1313-1315; LUÍS ARCHER, Irving GRAY, "Alterations in the activity of some oxidative enzymes by the action of anthrax toxin", *Brotéria-Ciências Naturais* 35 (1966), pp. 169-177; Irving GRAY, LUÍS ARCHER, "Metabolic changes in nicotinamide adenine dinucleotide in response to anthrax toxin", *Journal of Bacteriology* 93 (1967), pp. 36-39.

6 Irving GRAY, LUÍS ARCHER, "Effect of anthrax toxin on oxidative metabolism of rat lung", *Bacteriological Proceedings* 67(1966), p. 52.

paper he had published in the *Journal of Bacteriology*. The scientific research on the anthrax toxin, as he later declared «had brought him back to life».⁷

Following the success of this research on the anthrax toxin, Otto Landman (1925-2004) approached him and proposed to become his supervisor, and after a multidisciplinary exam, Archer was accepted at Georgetown University as a doctoral student.⁸ When he returned to Portugal, however, he still had to translate his thesis and submit it for evaluation because his doctorate was not acknowledged at the University of Oporto.



Luís Archer S.J.

After presenting a paper of Walter Bodmer (1936-) on recombination and integration of DNA molecules on bacteria at a doctoral seminar, Archer decided to start his research on DNA-mediated transformation on *Bacillus subtilis*.⁹ Soon he found that his results contradicted Bodmer's model, and perceiving the importance of his research, he presented his work at three international meetings in the United States.¹⁰ His research was now internationally recognized by his peers, especially after the confirmation of his results by Bodmer himself.¹¹

When he returned to Oporto, in 1968, genetics - a novel and tready

7 LUÍS ARCHER, "Vinte e cinco anos de Genética Molecular", *Memórias da Academia das Ciências de Lisboa (Classe de Ciências)* XXX (1989), p. 136.

8 LUÍS ARCHER, *Transport of transforming DNA into the cell interior in thymine-starved Bacillus subtilis with chromosomes arrested at the terminus*, PhD Thesis, Washington DC, Georgetown University, 1967.

9 WALTER BODMER, "Recombination and integration in *Bacillus subtilis*: involvement of DNA synthesis", *Journal of Molecular Biology* 14 (1965), pp. 534-557.

10 LUÍS ARCHER, "Transformation in thymine-starved *B. Subtilis* cultures", conference presented at the *Meeting of the Washington Branch of the American Society of Microbiology*, Washington, March 1967; LUÍS ARCHER, "Transformation of unlinked loci in *B. Subtilis* cultures with chromosomes arrested at the origin" presented at the *Annual Meeting of the American Society of Microbiology*, New York, May 1967; LUÍS ARCHER, "Transformation in synchronized cultures of *B. Subtilis* cultures", presented at the *Annual Transformation Meeting*, Colorado, June 1967.

11 ARCHER, "Vinte e cinco anos de Genética Molecular", p. 137; CHARLES D. LAIRD, L. WANG, WALTER BODMER, "Recombination and DNA replication in *Bacillus subtilis* transformation", *Mutation Research* 6 (1968), pp. 205-209.

field - was still completely unfamiliar to the Portuguese biologists. Therefore, upon his arrival, there were already high expectations concerning the future of genetics in Portugal. Indeed, three years before his arrival, in 1965, Flávio Resende (1907-1967), one of the most distinguished Portuguese geneticists, was already eager for his return because there were no molecular geneticists in Portugal, stating that Archer's arrival in Oporto would be «a great opportunity».¹² However, it was impossible for Archer to continue with his research without laboratories properly equipped and highly qualified molecular biologists. Hence, his first priority was to prepare a group of Portuguese scientists for the molecular turn in biology and in 1968 he established the first courses of molecular biology at the University of Oporto, for which he was responsible until 1970.¹³

Following the success of these courses in Oporto, Archer was invited to establish the first Laboratory of Molecular Genetics at the Gulbenkian Science Institute in 1971, a private scientific institution of the notable Gulbenkian Foundation and one of the most relevant centres of scientific research in Portugal.¹⁴ It was the dawn of scientific research on molecular genetics in Portugal. His pedagogical and

12 Flávio Resende, Letter to Luís Archer, May 16, 1965, Lisboa, Arquivo Português da Companhia de Jesus.

13 Some of the most important works produced during this period were: Luís ARCHER, M.C. REZENDE PINTO, "Les membranes végétales d'après les réactions tannoferriques de Salazar, *Brotéria-Ciências Naturais* 23 (1954), pp. 129-141; Luís ARCHER, "Pressure effects on DNA replication", *Brotéria-Ciências Naturais* 36 (1967), pp. 9-37; Luís ARCHER, Otto E. LANDMAN, "Development of competence in thymine-starved *Bacillus subtilis* with chromosomes arrested at the terminus, *Journal of Bacteriology* 97 (1969), pp. 166-173.

14 Some of the most important papers written in this period were: F. Gomes VIÑARAS, Luís ARCHER, "Termo-sensibilidade de *Bacillus subtilis* ao longo do ciclo celular", *Genética Ibérica* 24 (1972), pp. 251-261; Luís ARCHER, "Heat sensibility of competent and pre-competent cells of *Bacillus subtilis*" in: Luís ARCHER (ed.), *Bacterial Transformation*, Academic Press, 1973, pp. 45-63; M.L. HAMPTON, Luís ARCHER, "Binding of Exogenous DNA to Membrane Fractions from *Bacillus subtilis*", *Microbiology* (1976), pp. 101-104; Hermínia LENCASTRE, Luís ARCHER, "Transducing activity of Bacteriophage SPP1, *Biochemical & Biophysical Research Communications* 86 (1979), pp. 915-919; Hermínia LENCASTRE, Luís ARCHER, "Characterization of SPP1 Transducing Particles, *Journal of General Microbiology* 117 (1980), pp. 347-355; M. Cristina CARDOSO, Hermínia LENCASTRE, Rosa M. FERNANDES, M. Cândida LOPES, Luís ARCHER, "Restriction pattern analysis of the DNAs from temperate bacteriophages IG1, IG3 and IG4 of *Bacillus subtilis*", *Brotéria-Genética* 7 (1986), pp. 145-157; Graça VIEIRA, Hermínia LENCASTRE, Luís ARCHER, "Restriction analysis of PBS1-related phages", *Archives of Virology*, 106 (1989), pp. 121-126.

scientific efforts to establish molecular genetics in Portugal were highly praised by the Portuguese biologists. Aurélio Quintanilha (1892-1987), the dean of genetics in Portugal, at the age of 77, participated in one of his practical workshops on molecular genetics in 1969 at the Gulbenkian Science Institute and he was astonished at the molecular turn in biology and at the scientific and pedagogical skills of the Jesuit.¹⁵ When he returned to Mozambique, Quintanilha still performed some experiments using Archer's methods and scientific material, having encountered some difficulties due to the fact that his laboratory was not properly equipped.¹⁶

Despite being the first Portuguese molecular geneticist, Archer knew the importance of having scientific collaborations with other distinguished laboratories. Therefore, only one year after the foundation of the Laboratory of Genetics, in 1972, he organized the *First International Meeting on Bacterial Transformation*, thus beginning a network of scientific correspondence with the most prominent European molecular biologists that would benefit the development of molecular genetics in Portugal.

During the period that he directed the Laboratory of Molecular Genetics at the Gulbenkian Science Institute (1971-1991), he felt the need to continue his practical work in Portugal and abroad. Therefore, in 1973, from February to September, he worked with Maurice Sandord Fox (1924-) at the Massachusetts Institute of Technology (MIT) and in 1976 he collaborated with Frank Young (1931-) at the Department of Microbiology of the University of Rochester, where he learned new experimental procedures concerning genetic engineering, which he then brought to Portugal. This was another landmark for Portuguese geneticists. Genetic engineering was providing state-of-the-art techniques that were crucial for the basic research on molecular biology that would later be commonly used in the Human Genome Project.

Throughout his scientific career, Luís Archer had a major pedagogical agenda concerning the teaching of biology, being responsible for the establishment of the first university courses of molecular genetics in Lisbon, Oporto, Coimbra and Braga from 1968 onwards. Besides establishing these courses, he wrote the first manual of molecular genetics in Portuguese in 1976, which became

15 LUÍS ARCHER, "Mestre Quintanilha faz-se aluno", *Brotéria-Genética* 14 (1993), pp. 29-32.

16 Aurélio Quintanilha, Letter to Luís Archer, January 20, 1970, Lisboa, Arquivo Português da Companhia de Jesus.

the reference for biologists in the following years.¹⁷ A typical case of appropriation and circulation of scientific knowledge, one of his main scientific contributions was the establishment of a school of research on molecular genetics.¹⁸ His career is also an example of the social construction of scientific knowledge in the European periphery, a story that should be integrated in a more sophisticated and broader history of science. Having supervised only five doctorates, his pedagogical influence can be noted by the scheme, that his former students offered him in 2009, which represents a plasmid - a single molecule of DNA of bacteria. Analysing this scheme, one can easily perceive that there were already four generations of molecular biologists (a total of 91 researchers) in Portugal in 2009 that can relate to Archer's work.

In the Portuguese historical context, his pioneering contributions in the development of bioethics were without parallel nowadays. Along with his pedagogical and scientific aims, and especially since 1977, Luís Archer committed himself to bioethics, becoming a member of national and international committees such as the *Group of Advisors to the European Commission on Ethical Implications of Biotechnology* (1993-1997) and the *Comissão Nacional de Ética para as Ciências da Vida* (1996-2001), over which he presided, publishing 6 books and more than 100 papers in this area.

Moreover, he founded the *Sociedade Portuguesa de Genética* (1974) and was also a member of numerous national scientific societies such as the *Sociedade Portuguesa de Genética Humana* (1998) and the *Sociedade Portuguesa de Microbiologia* (2003). The most prominent societies, which Archer had the honour of being a member of, were the prestigious *Academia das Ciências de Lisboa* (1985), the *New York Academy of Sciences* (1995) and the *European Academy of Sciences and Arts* (1993).

In 1979, he was appointed full professor at the New University of Lisbon where he had several academic responsibilities. His major contributions for the emergence of molecular genetics in Portugal were greatly recognized and Archer was granted two honorary doctorates in 2007 (Catholic University) and in 2009 (New University of Lisbon). Nonetheless, the most important honour that was granted to him was the *Great Cross of the Military Order of Saint James of the Sword* in 1991, the greatest award for artistic, scientific or literary achievements in Portugal.

17 LUÍS ARCHER, *Genética Molecular*, Lisboa, Editorial Brotéria, 1976.

18 JAMES SECORD, "Knowledge in Transit", *Isis* 95 (2004), pp. 654-672.

Brotéria: The scientific journal of the Society of Jesus in Portugal

In addition to his pedagogical and scientific achievements, one of Luís Archer's main activities was the publication of the journal *Brotéria*, which he directed from 1962 to 2002.¹⁹ Established in Lourical do Campo by Joaquim da Silva Tavares, Cândido Azevedo Mendes and Carlos Zimmermann, teachers of the Jesuit college of São Fiel (Castelo Branco), in 1902, and comprising more than 1300 research papers, published during its existence, on zoology, botany, biochemistry and molecular genetics, this scientific journal was one of the most significant learned journals in Portugal in the 20th century.²⁰

In the 19th century, anticlericalism had reached a critical peak in Portugal, and quarrels between politicians and clergy were recurrent.²¹ In this tense anticlerical atmosphere, in the Portuguese Parliament sessions some of the most significant politicians were continuously demanding the closure of the Jesuit colleges, arguing that the Society of Jesus was the most responsible for the scientific backwardness in Portugal. This accusation was not completely new. It had been the major argument used by the Marquis of Pombal (1699-1782) in 1759, when he expelled the Jesuits from all the Portuguese territories. This line of reasoning, which associated Portuguese Jesuits with illiteracy

19 He was editor of *Brotéria-Ciências Naturais* from 1962 to 1979 and then founded and directed the journal *Brotéria-Genética* from 1980 to 2002. He was also the editor of the cultural journal *Brotéria-Cultura e Informação* from 1972 to 1975 and from 1993 to 2000.

20 FRANCISCO MALTA ROMEIRAS, Henrique LEITÃO, "Jesuítas e Ciência em Portugal. IV - A revista *Brotéria - Sciencias Naturae* e a sua recepção nacional e internacional", *Brotéria* 174 (2012), pp. 323-333; FRANCISCO MALTA ROMEIRAS, "The Journal *Brotéria* (1902-2002): Jesuit Science in the 20th century", *HoST* 6 (2012), pp. 100-109. Joaquim da Silva Tavares, * 17.VIII.1866 Vila de Rei (Portugal), S.J. 13.XI.1880 Barro (Portugal), † 2.IX.1931 Paris (France) (*DHCJ* IV, p. 3706); Cândido Azevedo Mendes, * 17.I.1874 Torres Novas (Portugal), S.J. 7.IX.1888 Barro (Portugal), † 16.XII.1943 Ceará (Brazil) (*DHCJ* III, p. 2618); Carlos Zimmermann, * 28.V.1871 Elighen (Germany), S.J. 7.IX.1890 Lyon (France), † 21.X.1950 Salvador (Brazil) (FRANCISCO MALTA ROMEIRAS, Henrique LEITÃO, "Jesuítas e Ciência em Portugal. II - Carlos Zimmermann SJ e o ensino da Microscopia Vegetal", *Brotéria* 174 (2012), pp. 113-125; Doriedson Ferreira GOMES, Oberdan CALDAS, Eduardo Mendes da SILVA, Peter Andrew GELL, David M. WILLIAMS, "Father Zimmermann (1871-1950): the first Brazilian diatomist", *Diatom Research* 27 (2012), pp. 177-188.

21 Carlos Moreira AZEVEDO (ed.), *História religiosa de Portugal*, Círculo de Leitores, Lisboa, 2002; Artur VILARES, *As congregações religiosas em Portugal, 1901-1926*, Lisboa, Fundação Calouste Gulbenkian-Fundação para a Ciência e Tecnologia, 2003; José Eduardo FRANCO, *O Mito dos Jesuítas. Em Portugal, Brasil e Oriente. (Séc. XVI a XX)*, Vol. 2, Lisboa, Gradiva, 2006, pp. 90-98.

and scientific backwardness, was perpetuated for more than two centuries and was only overcome recently.

Indeed, in the 20th century the accusations of illiteracy were still what motivated the suppression of the Society of Jesus in Portugal on October 8, 1910, only three days after the republican revolution.²² Nevertheless, the imprisonment and proscription of the Portuguese Jesuits was not the most adverse consequence of the republican revolution. With the suppression of the Society of Jesus, the colleges of Campolide (Lisbon, 1858-1910) and São Fiel (Castelo Branco, 1863-1910) were bombarded and looted by a violent mob, which destroyed the scientific instruments and invaluable manuscripts and books.²³ With this attack, the scientific and pedagogical legacy of Portuguese Jesuits was irremediably lost. These colleges were amongst the most significant pre-university institutions in Portugal from 1858 to 1910. In these establishments, the Jesuits promoted an experimental approach to the teaching of botany, zoology, physics, chemistry and astronomy, which represents a landmark in the Portuguese pedagogical context.

Besides teaching natural sciences, and especially since the early 20th century, Portuguese Jesuits were particularly concerned with the development of botany and zoology, their main domain of expertise, having described and classified more than 2200 new species in the journal *Brotéria*, from 1902 to 1979.²⁴ Furthermore, with the foundation of the journal *Brotéria*, they intended to reverse the positivistic discourses and to establish that there was no incompatibility between science and faith. There was also the intention to contradict the 18th century belief that claimed that it was impossible for the Jesuits to achieve relevant and novel scientific knowledge. Only with this particular endeavour could the Society of Jesus recover its scientific reputation, which had been completely shattered since the 18th century.²⁵

22 Decree of the Portuguese Republic, 8-X-1910.

23 FRANCISCO MALTA ROMEIRAS, Henrique LEITÃO, "Jesuítas e Ciência em Portugal. V - Os Colégios de Campolide e de São Fiel e a implantação da República", *Brotéria* 174 (2012), pp. 425-440.

24 *Índices Gerais da Brotéria Científica [1902-2002]*, Brotéria Genética, Braga, 2002. All the statistics concerning *Brotéria* are available on the website: http://webpages.fc.ul.pt/~fmromeiras/Broteria_/Estatisticas.html (5 December 2013).

25 José Eduardo FRANCO, "História da revista *Brotéria* (1902-2002)", in: Hermínio RICO, José Eduardo FRANCO (eds.), *Fé, Ciência, Cultura: Brotéria - 100 anos*, Lisboa, Gradiva, 2003, pp. 87-139.

Between 1902 and 1932, under the direction of Silva Tavares, the Jesuit naturalists were especially concerned with the identification and classification of novel species. However, beyond this scientific agenda, there was clearly one apostolic intention, evident since its establishment. In the first issue, and recovering the famous metaphor of the Two Books, the naturalists described that the main objective of this journal was the diffusion of their studies, an activity that should, at the same time, awaken the scientific research in Portugal and contribute to an improved understanding of God's mysteries.²⁶

Under the direction of Luís Archer, from 1962 to 1979, *Brotéria* published international papers on biochemistry featuring state-of-the-art scientific issues such as cellular metabolism, enzymatic activities and protein electrophoresis.²⁷ From the 1970s onward, *Brotéria* published the first papers on molecular genetics, the vast majority of which was written by foreign researchers, thus indicating the international influence of this scientific periodical of the Society of Jesus.²⁸ In addition, in 1980, subsequent to the exponential

26 For the metaphor of the *Two Books* check Olaf PEDERSEN, *The Two Books - Historical Notes on Some Interactions Between Natural Science and Theology*, Vatican City, Vatican Observatory Foundation, 2007.

27 William SULLIVAN, Adam J. Von KNOBELSDORFF, "The *in vitro* and *in vivo* effects of fluoride on succinic dehydrogenase activity", *Brotéria-Ciências Naturais* 31 (1962), pp. 3-13; William SULLIVAN SJ, "The spectrophotometric determination of malic dehydrogenase and 'malic' enzyme in normal populations of *Tetrahymena pyriformis* GL.", *Brotéria-Ciências Naturais* 33 (1964), pp. 143-158; Levi GUERRA, F. Edmund HUNTER, "Sucrose inhibition of gramicidin induced swelling of isolated rat liver mitochondria", *Brotéria-Ciências Naturais* 34 (1965), pp. 227-246; Elinor O'BRIEN, William SULLIVAN SJ, "Electrophoretic patterns of proteins constituents in tissues of tumor-bearing and non-tumor bearing animals", *Brotéria-Ciências Naturais* 43 (1974), pp. 3-14; Seikh Amjed ALI, A. Qayyum SIDDIQUI, A. HASNAIN "Electrophoretic characteristics of soluble eye lens proteins of *Ophrycephalus punctatus* (Bloch) in different concentrations of sodium chloride solution", *Brotéria-Ciências Naturais* 44 (1975), pp. 9-15; Carlos AZEVEDO, "Núcleolo - estrutura, citoquímica e aspectos funcionais", *Brotéria-Ciências Naturais* 48 (1978), pp. 3-52.

28 R. B. GOSH, "Karyomorphological studies of somatic chromosomes in *Ailanthus excelsa* Roxb. - an ornamental and a road-side plant", *Brotéria-Ciências Naturais* 39 (1970), pp. 3-8; Syed Shafi ASHGAR, D.K KHAWAJA, A.K. JAFRI, "5'-Nucleotidase activity in the tissues of the cat-fish, *Heteropneustes fossilis* Bloch.", *Brotéria-Ciências Naturais* 41 (1972), pp. 3-7; S. BAGCHI, R.M. DATTA, "On the nature of chromosome in meiotic mechanism of a natural tetraploid *Sebasniana benthamiana* Domin.", *Brotéria-Ciências Naturais* 42 (1973), pp. 31-37; Asit Kumar BANERJEE, Archana SHARMA, "Chromosome studies on some indian members of Compositae. I. Tribe Inuloideae", *Brotéria-Ciências Naturais* 43 (1974), pp. 15-

growth of several fields of molecular genetics, Archer modernized the journal and created the *Brotéria-Genética*, thus integrating the need for a scientific journal of genetics in Portugal with his scientific programme. Up to 2002, *Brotéria Genética* published more than 300 papers on issues such as bacterial genetics, plant and animal breeding, human genetics and bioethics.²⁹

Science and faith: the last interview of Luís Archer

From the 1970s, Luís Archer was especially interested in contradicting the popular believe that science and faith are irreconcilable, arguing that there were no contradictions in being a catholic priest and a molecular biologist, retrieving thus the conviction of the Portuguese Jesuits, in the early 20th century.

In his last interview, he reflected on the major events of his life, focusing on the two most important aspects: his scientific career and his apostolic mission as a Jesuit priest. Considering the beginning of his career, he recalled the main obstacles that he encountered in the United States. Despite being the most promising biologist from Oporto, in 1947, graduating with the highest mark from the entire University, he was utterly unprepared for the molecular studies on which he was embarking. However, after a successful adaptation to the novel molecular paradigm of biology and with special attention from the Portuguese scientific community, he recalled the organization of the first international meeting on *Bacterial Transformation* at the Gulbenkian Science Institute (Oeiras) in 1972. Moreover, he recalled this congress and the events that followed in the subsequent years, namely the sheer astonishment. The Portuguese biologists, who were completely unprepared for the molecular turn in Biology, avidly learning from the Jesuit priest that had just returned from the United States.³⁰

While thinking about the future of biology, he claimed that nowadays we live in a post-genomic delusion era. Following the

32; B.D. CHAURASIA, Vijay K. SHARMA, "Karyological studies in *Phaseolus mngo* Linn.", *Brotéria-Ciências Naturais* 43 (1974), pp. 33-34; B.D. CHAURASIA, Vijay K. SHARMA, "Karyological studies in *Asphodelus tenuifolius* Cav.", *Brotéria-Ciências Naturais* 43 (1974), pp. 35-37.

29 *Índices Gerais da Brotéria Científica*, pp. 189-237.

30 LUÍS ARCHER, "Quintanilha: o velho mestre feito jovem aprendiz", *Brotéria-Genética* 9 (1988), p. 23; LUÍS ARCHER SJ, "Vinte anos de genética molecular em Portugal", *Brotéria-Genética* 10 (1989), pp. 19-48; LUÍS ARCHER, "Mestre Quintanilha faz-se aluno", *Brotéria-Genética* 14 (1993), pp. 29-32.

results of the Human Genome Project, as soon as it became evident that it did not suffice to know all the human genes to cure all the infirmities in the world but it was necessary to identify the proteins that are encoded and the molecular phenomena that regulate their molecular expression, the popularity of physics received new impetus. For him it was clear that only physics could now provide more suitable responses to the famous questions about mankind and the Universe, overthrowing the latest trends that had been canonizing the fashionable molecular biology since the 1950s. The future of biology, however, could never be detached from the great ethical questions that emerged in the 20th century. Thus, summing up all his contributions in bioethics, he emphasized that of greatest importance in all bioethical discussions is the issue of human dignity. Only then is it possible to reflect, act and legislate about these ethical matters, according to the molecular biologist.

In the vast majority of his interviews he was frequently asked about the apparent paradox of being a successful scientist and professor and a Jesuit priest.³¹ Based on his personal experience, he explained that he was never treated differently in all the laboratories where he had worked for being a priest nor had any colleague or student ever avoided to beseech him for spiritual support. For him, there was no contradiction in being both a pious catholic priest and a successful scientist. This apparent paradox, in his opinion, should have been overcome in the past, and was completely unreasonable nowadays. The main problem concerning the dialogue between science and faith is the scientists' refusal to accept that it is not possible scientifically to perceive and understand God. As advocates of two incommensurable paradigms, atheist and Christian scientists are unable to interact.³² Therefore, only taking into account the incommensurability and the metaphor of the Two Books, clearly stated in the opening statements of the journal *Brotéria*, is it possible then to establish a coherent dialogue between science and faith, and to fully understand the drive that led a Jesuit priest to be a molecular biologist, following the example of several remarkable scientists in our history, amongst whom we include Copernicus, Nicolas Steno and Gregor Mendel, to name only a few.

31 Lisboa, Arquivo da Província Portuguesa da Companhia de Jesus, *Luís Archer's personal documents and interviews*.

32 Thomas S. KUHN, *The structure of scientific revolutions*, Chicago, University of Chicago Press, 1962.

Abstract

Luís Archer was one of the most prominent Portuguese scientists in the 20th century. With more than 250 published works, Archer was frequently recognized in Portugal for his contributions in molecular genetics, history and philosophy of sciences and bioethics. In this paper, I shall describe and analyse the scientific life of Luís Archer, the founder of molecular biology in Portugal and a Jesuit priest who always rejected the popular belief that science and faith are incompatible.

Resumen

Luís Archer fue uno de los científicos portugueses más destacados del siglo XX. Con más de 250 trabajos publicados, Luís Archer fue reconocido con frecuencia en Portugal por sus contribuciones en genética molecular, en historia y filosofía de las ciencias y en bioética. En este artículo describiré y analizaré la vida científica de Luís Archer, el fundador de la biología molecular en Portugal y un sacerdote jesuita que siempre rechazó la creencia popular de que ciencia y fe son incompatibles.