

Outline of a biography of Professor João Guerreiro

We start with a foreword, to put into perspective the background from which this outline of a biography of Professor Guerreiro takes shape. Although this text is based on objective and historical data, it is also a deeply personal and subjective testimony. It is intended to go beyond an account of Professor Guerreiro's mathematical and teaching career: we want to give an accurate account of the extraordinary impact this mathematician and professor had on successive generations of people who had the privilege of talking and working with him. At a time where, more than ever, the value and influence of scientists and teachers is gauged by the number of their research papers and citations, Professor Guerreiro is one of the clearest and most unquestionable counter-examples of the global validity of this rule, evidence that any search for objectivity in these matters must always be put properly into perspective and contextualized, otherwise there is an obvious danger of endorsing the most absurd mechanical schemes, perverting the aim which a search for such criteria presupposes.

This outline is not a true history of mathematics text; for this a different approach would be needed, expanded and with a more neutral approach to the subject, including extended research on primary sources. What we want now is something more immediate, but no less just or less urgent: we intend to highlight this central personality of the academic life in the Faculty of Sciences of Lisbon University in the last 40 years who, among other important matters, helped successive generations of students to discover mathematics; in many cases it was his contribution that made students change their perception of mathematics, seeing it in a new way, passionate and, why not, creative.

I

Professor Guerreiro had that quality, so rare and precious, which was to point out what was essential in a simple and elegant way.

¹Institute for Higher Culture

²Centre for Mathematical Studies of Lisbon

³Here he had a special contract as a substitute for Professor Renato Coelho, who was away in Italy.

⁴Centre of Nuclear Studies

In the second half of the 20th century Professor João Cosme Santos Guerreiro (Funchal, 27/9/1923 - Lisbon, 5/11/1987) stands out as one of the most important figures in the Faculty of Sciences of Lisbon University. He graduated in Mathematical Sciences from this Faculty in 1954, and had a grant from *Instituto para a Alta Cultura*¹ to start research in *Centro de Estudos Matemáticos de Lisboa*², under the supervision of José Sebastião e Silva.



João Guerreiro

(Photo kindly loaned by Professor Campos Ferreira)

He was an assistant teacher in *Instituto Superior de Agronomia* from March 1957 to October 1958³, where he worked with his supervisor, who was also teaching at the same institution. Then he became a full-time scholarship holder of *Centro de Estudos Nucleares*⁴. He entered the *Faculdade de Ciências de Lisboa* in 1959 as

second lecturer. Here he worked successively with two major figures in Portuguese mathematics, José Vicente Gonçalves and José Sebastião e Silva. He gained his Ph.D in 1962, with a thesis entitled *Teoria directa das distribuições sobre uma variedade*⁵ where he generalizes to an arbitrary differential manifold results that Sebastião e Silva established for R^N . He became *Professor extraordinário* in 1968, and Full Professor in 1973, the decision being made unanimously on both occasions.

In the Faculty of Sciences of Lisbon University it was Professor Guerreiro and his group of teaching assistants who extended the inheritance of Sebastião e Silva and of the so-called 40s generation of Portuguese mathematicians; it was they who continued the tradition of the *Centro de Estudos Matemáticos de Lisboa*, which was later to be continued by *Centro de Matemática e Aplicações Fundamentais*⁶. So the fact that Guerreiro was the first head of the Board of this Centre (then under the supervision of *Instituto para a Alta Cultura*) is deeply significant. After the revolution of April 25, 1974, the Portuguese Society of Mathematics was rebuilt, and Guerreiro became its first General Secretary. At the same time *Portugaliae Mathematica* was restructured in order to improve its standards and its world ranking (for this the work of Professors João Paulo Carvalho Dias and Alfredo Pereira Gomes was crucial, supported by SPM), and the *Boletim* of the Society was also restarted⁷.

He was the supervisor of Ph.D. theses by Maria Higinha Rendeiro Marques (*Secções-distribuições vectoriais e teorema dos núcleos em espaços fibrados*⁸, 1972) and of Carlos Sarrico (*Produtos distribucionais multiplicativos*⁹, 1988), the latter being examined a couple of months after Professor Guerreiro's death. He made a crucial contribution to the first Master's course on Applied Mathematics which Instituto Superior Técnico organized at the beginning of the 80s, and where he taught *Functional Analysis*. This course was essential for the creation, in the late 80s, in the same Institute, of its first graduate course in an area of mathematics, Applied Mathematics and Computation. In his later years he collaborated with other universities, including Évora University and Madeira University. During this time he also lectured on the *History of Mathematics*. He was one of the main organizers and the Chairman of the Organizing Committee of the International Meeting *Anastácio da Cunha, o Matemático e o Poeta*, which took place in 1987, in Lisbon, at Forum Picoas. This meeting was the touchstone for a reformu-

lation and a restart in both the research and the popularization of the history of mathematics in Portugal. He was the translator into Portuguese of Dirk Struik's book *A Concise History of Mathematics*¹⁰, but he died before completing it¹¹. A second edition of this book was published in 1992, with an appendix on the history of Portuguese mathematics written by Professors José Joaquim Dionísio and Augusto Franco de Oliveira, something that Guerreiro had in mind to do when he started his translation. At the time of his death he was the Chairman of the Board of the General Assembly of the Portuguese Society of Mathematics.

II

João Cosme Santos Guerreiro was part of a whole generation of teachers who profoundly marked the life of the Mathematics Department of the Lisbon Faculty of Sciences in the sixties and seventies. This was due not only to the mathematics culture they were able to transmit, but also to their pedagogic and human qualities. He had this rare gift (which can only exist in those who live mathematics from within, in those who breathe it) of being able to transmit the essence of each subject, underlining the elegance of mathematical reasoning. His classes were not only a didactic but also an aesthetic model of teaching; he knew how to show students the simplicity and the beauty of what is profound. It is true that many small mathematical points were left open, that the proofs of results were often only outlined. When it came to choosing between what was essential and what was not, Guerreiro did not hesitate: the student could complete by himself what was left unfinished in the class, this work was part of the learning process; what in fact only the deeply thought experience of mathematics could give, this Guerreiro would present to the student, in such a way that he could understand its essence, so that he could infer the complex connections which resulted from it.

In this way he contributed decisively to the human and scientific education of successive generations of FCUL students. It is no wonder then that many see in the subjects he taught (from first year Analysis courses, to the final year Higher Analysis subjects), the turning point in their learning of mathematics, in their way of thinking and feeling about it. Those who discovered *Topology* with him, when this subject was the introductory part of his course on functions of complex variables, a yearly subject taught in the early 70s in the third year of the Mathematics course, learned how it was

⁵Direct theory of distributions on a manifold

⁶Centre of Mathematics and Fundamental Applications

⁷There was also an unsuccessful attempt to restart publication of *Gazeta de Matemática*.

⁸Vector sections-distributions and kernel theorem in fibre spaces

⁹Multiplicative distributional products

¹⁰Published in Portugal in 1989 by Gradiva, volume 33 of the series *Ciência Aberta*, with the title *Uma História Concisa das Matemáticas*.

¹¹The translation was completed by Professor Paulo Almeida.

possible to teach an introductory theory of this central area of mathematics, rigorously obtaining results of extreme complexity, and at the same time without losing touch of a geometrical and intuitive vision of the subject, which to me seems essential, not only in the learning of mathematics but also in all the work that follows, including that of scientific research.

But it was not only as a lecturer that Guerreiro was outstanding. He was also an innovator in his way of being a teacher; there was something extraordinarily warm and sincere in his deeply human dimension, in the way in which he related to his students and colleagues. This is the same feeling as in the testimony of his student during the sixties, and later his assistant and colleague Augusto Franco de Oliveira: “Santos Guerreiro, more than anyone else (and initiating a new style), was approachable; he honoured and ennobled us with his human warmth and friendship. For more than 20 years it is he that we see as an example of the human condition of the Teacher, of the ability to communicate, as a paradigm of the modernity and elegance of mathematics and of its teaching (*Functional Analysis, Topology, Complex Variables, Differentiable Manifolds, Differential Geometry*). It was essentially through him, and by him, before, during, and after the political change of the 25th April 1974, with selfless sacrifice of his working conditions as a scientist, that the conditions and hopes of the scientific and academic life of the young *guerreiros* were established, today almost all full professors, and of the numerous others who had the good fortune to be his students or assistants.”

Guerreiro was part of a brilliant group of teachers of the Faculty of Sciences of Lisbon who in the sixties and seventies defined a golden epoch in the teaching of mathematics at university level. Lecturers as José Vicente Gonçalves, José Sebastião e Silva, Fernando Veiga de Oliveira, José Joaquim Dionísio, António Simões Neto, Fernando Dias Agudo, Maria Luisa Galvão, Margarita Ramalho, António St. Aubyn, and others - this list is by no means exhaustive-, marked an unforgettable epoch for those who lived through it, and whose history is still to be written. Those were different times, with far fewer students (in the mathematics courses¹²), with the courses structured, in content as well as in form, according to a very different philosophy from today's, and that, before April 25, 1974, worked in a social and political framework that had little in common with present times. Therefore, any comparison must be made carefully, bearing these differences in mind. But it is poignant to know that students then, in contrast to the common feeling nowadays, generally saw in the majority of their lecturers cultured people, with knowledge that often went far beyond the boundaries of mathemat-

ics, and this was something that would overflow from their classes; mathematics was only one of the cultural sides of these teachers, the one about which they talked passionately during their classes¹³.

Taking a general overview of higher education institutions in Portugal, it is teachers like Professor Guerreiro who make the Faculty of Sciences of Lisbon something to be remembered by its students as irreplaceable and invaluable, as a real singularity, as a school, in the noblest sense of the word, that makes his students proud of having been in that particular place at that particular time.

III

Published works by Professor Santos Guerreiro

1. Research publications

1. Les changements de variable en théorie des distributions, *Portugal. Math.*, 16, pp. 57-81, 1957.
2. La multiplication des distributions comme application linéaire continue, *Portugal. Math.*, 18, pp. 55-67, 1959.
3. Teoria directa das distribuições numa variedade, Ph. D. thesis, *Portugal. Math.*, 22, pp.1-92, 1963.
4. Secções-distribuições em espaços fibrados, *Revista da Faculdade de Ciências de Lisboa*, 2nd series, A-Mathematical Sciences, 11, pp. 223-246, 1965/66.
5. Cohomologia das correntes numa variedade com bordo, *Proceedings of the First Luso-Spanish Mathematical Meeting*, pp. 99-100, Lisboa, 1972.
6. Sobre as distribuições quase-periódicas, *Proceedings of the First Luso-Spanish Mathematical Meeting*, pp. 110-112, Lisboa, 1972.
7. Sobre as distribuições quase-periódicas vectoriais. Uma aplicação à equação das ondas, *Revista de la Universidad de Santander*, Número 2, Parte I, pp. 237-241, 1979.

2. Monographs, courses, and other works

1. *Elementos de Análise Funcional*, additional notes to the course on Higher Analysis, published by Associação de Estudantes da FCUL, 1959/60.
2. *Uma construção axiomática do Integral de Lebesgue* (Lecture notes by Professor Guerreiro's students), AEFCUL, 1964/65.

¹²Up to 1986/87 the Faculty of Sciences of Lisbon also ran classes for the first years of the Engineering Courses.

¹³The pressure for publication of original research, which in those days did not exist, may explain something of this change, but it in no way seems sufficient; other parameters must be analysed.

3. *Curso de Geometria Superior. II. Variedades diferenciáveis*, Instituto para a Alta Cultura, Publications of Centro de Estudos Matemáticos de Lisboa, FCUL, 1964/65.

4. *Matemáticas Gerais* (Engineering and Geology Courses) - FCUL, 1966/67.

5. *Curso de Matemáticas Gerais*¹⁴

Volume I. Conjuntos. Noções de Álgebra. 1st edition 1967. 2nd edition 1972. Livraria Escolar Editora, Lisboa.

Volume II. Números reais. Séries. Funções contínuas. 1st edition 1967. 2nd edition 1973. Livraria Escolar Editora, Lisboa.

Volume III. Derivadas e integrais das funções de variável real. 1st edition 1968. Livraria Escolar Editora, Lisboa.

Volume IV. Noções de Álgebra Linear. 1970. Livraria Escolar Editora, Lisboa.

6. *Anastácio da Cunha e as Matemáticas em Portugal*, Catalogue # 23, Biblioteca Nacional, Exhibition *José Anastácio Da Cunha (1744-1787), o Matemático e o Poeta*, pp. 39-42, Lisboa, 1987 (This paper was posthumously included in the Proceedings of the International Conference

Anastácio Da Cunha (1744-1787), o Matemático e o Poeta, pp. 27-30, Biblioteca Nacional-Casa da Moeda, 1990)

7. *Espaços Vectoriais Topológicos*, Coleção Textos e Notas 45, CMAF, 1990 (posthumous publication, organized by J. Campos Ferreira and J. Silva Oliveira)

Acknowledgements: I would like to thank everyone who, in some way, helped with the writing of this paper, but in particular, I would like to mention Professors J. Campos Ferreira, Maria Hígina Rendeiro Marques, Suzana Nápoles, Augusto Franco de Oliveira, J. Silva Oliveira and Carlos Sarrico, for the conversations they had with me about Professor Guerreiro. I would also like to thank Pilar Pereira, of the Science Museum Library, and Maria de Lurdes Duarte, of the Secretariat of the FCUL Mathematics Department, for their help with Professor Guerreiros bibliography, and Paul Covill, for his linguistic revision.

Luis Saraiva

CMAF / Faculdade de Ciências da Universidade de Lisboa

¹⁴Livraria Escolar Editora republished the first three volumes in a single tome, in 1989, with the title *Curso de Análise Matemática*.