

ALL TIME GREATS – GOA

EMÍDIO AFONSO

BY ANTONIO VALENTINO FERNANDES¹

*“...by faith and custom's fiat
To go and seek his brother
Through boundless seas and dark mist.”*
–Fernando Pessoa, *Mensagem*
(Trans. by E. Honig and S. M. Brown)

Slight in build, always smiling, a cigarette in the corner of his mouth; a fine and easy grace, modest, simple, casually dressed, and with a look in his eyes that hinted that he was searching for something – a solution to some problem. That was my first impression of the figure that honoured the *Escola Médica de Goa* (Goa Medical School), with his creative and pioneering work in chemistry and biochemistry. He was a man who for more than a quarter of a century continued to keep the name “Goa” in scientific research publications around the world.

Colonial Goa

*“Some, with their eyes fixed in the Past, see what they don't;
Others, with the same eyes, looking into the Future, see what cannot be seen.”*
–Ricardo Reis², *Odes*
(Free Trans.)

The egregious *Escola Médico-Cirúrgica de Nova Goa* (Medical-Surgical School of New Goa) was established by the Portuguese Governor Conde de Antas, by Portaria³ of November 5, 1842. Dom Christovam de Souza Coutinho in 1687, had then recorded a plea: “If two or three physicians come here from Portugal they could teach medicine to many natives, who are very clever and would easily learn it and turn not the worst physicians”, that was to be repeated at intervals until the foundation of this school that survived several attempts to suppress it, and became the first and the oldest medical teaching institution in the East. In the first year, the school admitted only 8 students, and among them we find the names Agostinho Vicente Lourenço and Bernardo Wolfgang da Silva.

We must not forget the prestigious services rendered by the graduates in the European possessions in Africa and Asia and the extraordinary and their superb contribution for the salubrity and improvement of health of the natives of the regions.

From the 1,327 physicians and 469 pharmacists who graduated from the school until its extinction in 1963, we find names of doctors in hospitals and charitable organizations, military surgeons, clinicians, government medical officers, professors, scientists and writers who attained some fame; among those names is Emídio Afonso.

There is no doubt that Goa (declared the 25th state of the Indian Union in 1987, after 451 years of Portuguese colonial rule), at the turn of the twentieth century, was not equipped academically, technologically or organizationally for the future. Nested in the Western Gaths on the Konkan Coast of the Indian sub-continent, is a very small state



¹ A self-published monograph about Emídio Afonso co-authored with W. Antão, first appeared in the Portuguese magazine *Voz do Oriente* in 1999. This English version, published on the 25th year of his death and centenary of his birth, was updated with additional facts and dates gleaned along the years, from conversations and correspondence with Dr. Emídio's late brothers, Drs. Alvaro and Adriano.

² Ricardo Reis is the pseudonym of the Portuguese poet, Fernando Pessoa (1888-1935).

³ Government Order.

with an area of only 3700 km². Despite revenue from the tourism industry and from leading exports of manganese and iron ore, Goa's economy was always in a difficult financial situation.

Having few financial alternatives and being located about 8,000 km from the leading centers of science where scientific advances were happening almost daily, it was a formidable endeavour to keep abreast of these advancements and to acquire the sophisticated instruments and chemicals used for those tasks. Nonetheless, Emídio Afonso distinguished himself by producing a body of scientific work beginning with his first paper in *Lancet*, and continuing with papers in journals such as *Nature*, *Clínica Chimica Acta*, *Immunochemistry* and *The Journal of Clinical Pathology*.

Family Life

Emídio da Conceição Afonso was born in Panjim, Goa, on the second of March 1916, at the residence of his grandfather, General Doctor Miguel Caetano Dias (1852-1936, honoured with a bust in front of the Panjim Postoffice) in a home where science and art combined to ferment young minds and surrounded by a family of scientists and medical men. It was an enlightened, cultivated childhood.

His father, Joaquim Antonio de Jesus Bossuet Afonso (1881-1957), born in Betalbatim, Goa became Doctor of Medicine, Ophthalmology and Obstetrics at the University of Würzburg, Germany and Docent in the University Hospital where he did research on the effect of X-rays on the eyes and returned to Goa in 1914 at the start of the First World War. The X-ray machine used in the research is in the collection of the *Deutsches Museum*, in Munich, Germany.

His mother, Albertina Lavinia Escolastica Dias, daughter of General Dr. Miguel Caetano Dias, brought the intellectual and moral family traditions to her new home. The marriage produced six children: Emídio da Conceição, Elfrida Vitoria, Melba Aurea, Skoda António, Miguel Álvaro and Adriano de Santo Hilario. Dr. Emídio's three brothers and subsequently, his eldest daughter and his three sons embraced the scientific field of medicine, chemistry and physics.



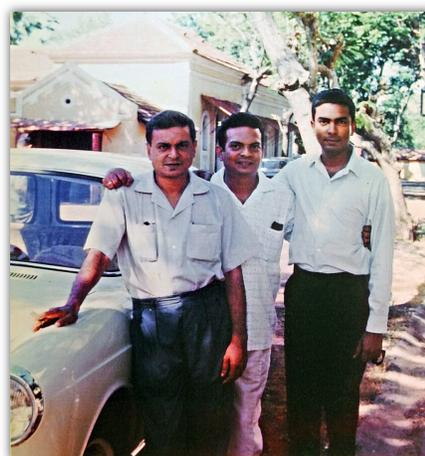
His grandfather's house, where he was born, was the old Casa da Moeda (The Mint), in Panjim.

Early Accomplishments (1936-1946)

In 1936, at the age of 20, he assembled the first electrocardiograph in Goa (and possibly even in India) using vacuum tubes, and began publication of his "*Resenhas Cardiológicas*" (Cardiac Review) where he described his experiments and for the benefit of local doctors who lacked access to the latest journals, included an advice column on treatment of heart diseases.

He graduated from *Escola Médico-Cirúrgica de Goa*⁴ in 1938 with perfect grades in all subjects and secured almost all the prizes awarded each year at the medical school.

One year after his debut paper, "Treatment of Gas Gangrene", was published in *Lancet*, Dr. Emídio published a book, "COR IN VITRO – Experimental Studies on Embryology, Histology, Physiology and Pathology of the Heart", in 1941. A dedicated reader of international journals, he followed the latest discoveries by scientists working with most modern, rare and very expensive equipment. At the insistence of his father he took interest in Ayurvedic medicine and began researching the use of copper and calcium elements for the treatment of human diseases.



Emídio Afonso and his brothers, Álvaro and Adriano.

⁴ In 1963, Goa Medical School was upgraded to Goa Medical College and became affiliated with Bombay University until 1986, when it was affiliated with Goa University, founded in the previous year. The College and the attached hospital moved to the new campus in Bambolim in 1993.

Laboratórios ECA

In 1945, he registered the first pharmaceutical laboratory in Goa, the *Laboratórios ECA* (his initials) located in a separate building on his property at Campal on Alameda Alexandre Herculano (renamed Doctor Emídio Afonso Road), near the shores of the Mandovi river, where he lived with his family. In his laboratory, after having the product registered, he manufactured the injectables GADUSOL (a colloidal solution of copper morrhuate used in the treatment of tuberculosis), Colloidal Calcium solution and Complex B Vitamin. Additionally, he prepared other vitamin products such as BEVITOL, CEVITOL and ADVITOL, respectively, oral tablets of Vitamin B, Vitamin C and Vitamin A capsules, for use by the Goan medical community. It was the first demonstration of his executive and organizational skills which would be successfully repeated later in his career.



His residence in Campal, Panjim. In 2000, the street was renamed Doctor Emídio Afonso Road in his honour.

The contribution of Emídio Afonso to colloidal chemistry was honored by the erstwhile Portuguese authorities with the honorary title of Professor of Colloidal Chemistry, by the decree of the Overseas Ministry of Portugal.

Bombay (1946-1953)

In 1946, Edison Pereira, the manager of the Continental Drug Company in Worli, Bombay (now Mumbai), needed a chemist to run his medical manufacturing business because their chief chemist, a Mr. Morgan, had to leave for England on short notice. Mr. Pereira mentioned this to Father Maschio of Don Bosco Matunga, who happened to know Emídio Afonso, and thus recommended him for the position.

Mr. Pereira invited Emídio Afonso to join the firm to lead their clinical and pharmaceutical departments. While working there, he developed a unique method for the complicated preparation of injectable liver extract and preparation of injectable hormones and extraction of Vitamin A from shark liver oil. For this unique method he applied for and obtained an Indian patent. At the same time, Dr. Emídio Afonso proposed to the Government of Bombay Province the addition of Vitamin A and other essential fatty acids to *Vanaspati*, a proprietary product of saturated vegetable oil; the title of the patent is, "Enrichment of Hydrogenated Oils with Vitamin A and Essential Fatty Acids from Shark Oil."

Return to Goa (1953-1963)

In 1953, he left the Continental Drug Company and returned to Goa due to the poor health of his father (who passed away after a lengthy illness in 1957) and re-established his medical practice. He was offered and accepted the post of Director of the *Laboratório de Análises Clínicas, Químicas, Bromatológicas, e Toxicológicas* of the Directorate of Health Services, Goa, when no candidate applied for the vacant post after the retirement of the previous director, the Portuguese doctor Manuel Ferro. He was also appointed Professor of *Escola Médico-Cirúrgica de Goa* and Director of the "*Gabinele de Análises*" of the Military Services.

Laboratório de Análises

He transformed the *Laboratório de Análises* (Analytical Laboratory) into a training institution for future analysts. For the first time in Goa, photoelectric, colorimetric, clinical and chemical analyses were undertaken under his leadership. He introduced the most modern methods as well as enzymatic micromethods for clinical, chemical and toxicological analysis, at the same time as the field was making giant leaps forward in laboratories in the Western world.



(L-R) Pharmacy Course Assistant, João Proença, a Pharmacy student, Professor Dr. Emídio Afonso and another student (and future wife) Ivone da Costa in 1955.

Determinations like glucose, transaminases (SGOT and SGPT), *amylase*, phosphatases (alkaline, acid and prostatic), *urea*, creatinine, electrolytes, *carbon dioxide*, bacteriological tests with antibiotic sensitivity, *electrophoresis in cellulose acetate* were introduced, providing spectacular successes in the diagnosis of many diseases and thus saving many lives (the italicized words are references to individual papers listed in the Appendix). The development knowledge he brought to the lab proved invaluable in introducing new methodologies to the analysts at the same time.

This development was accomplished during a time of very limited resources. Out of necessity, he personally assembled all the required laboratory instruments for the use in the *manometric*, *colorimetric* and *electrophoretic* procedures and prepared his own cellulose acetate membrane because the imported ones were very expensive, and thus saved the Goan government a lot of money.

Sometime between 1958 and 1959, the laboratory name was shortened to, *Laboratório de Análises*. This was the first of three re-organizations during his tenure as director.

WHO Fellowship

On April 3, 1958, one year after his father's death, Dr. Emídio Afonso married the pharmacist Maria Ivone dos Remedios Gomes da Costa who was a member of the teaching staff of *Escola de Farmácia* and later of the Goa College of Pharmacy.

A few months after the marriage, accompanied by his wife, he travelled to the U.S. on a WHO fellowship to the National Institute of Health (NIH), the biomedical research facility in Bethesda, where his leaps of intuition confounded fellow scientists. He impressed many of them with his deep knowledge of inorganic and organic chemistry, physics, electricity, electronics, flashes of ingenuity and innovations of routine clinical analysis and with his own ideas in the field of manometric techniques that he continued to pursue upon his return to Goa in the last quarter of 1959.

They had six children (a genetic coincidence?): Nélia Maria (born in the U.S.), António Bossuet⁵, Luís Celestino (all medical doctors), João Sérgio (Ph.D. in physics), Francisco Paulo (M.A. in journalism) and Ana Maria (insurance).

Electrophoresis

He is one of the *pioneers* in the use of cellulose acetate membranes for electrophoresis using an electric current to separate fractions of proteins and hemoglobins in the blood, used to detect diseases like sickle-cell anemia, etc. The results were published in 1961 in the paper, "On the Electrophoresis of Proteins on Cellulose Acetate Membranes", in *Clinica Chimica Acta* (see figure on the following page).

At the time, electrophoresis was carried out in filter paper— a very long procedure that took more than 36 hours with a separation of only four blurred and badly defined bands, that resulted in a unreliable quantitation. By using cellulose acetate membranes, prepared after a lengthy and difficult process from cellulose acetate threads used in the textile industries and readily available in the local market, he managed, instead, to obtain results in 20 minutes, with 6 to 7 sharp and well-defined serum protein bands that made the fraction identification and quantitation very reliable. Due to different patterns that various diseases exhibit, this proved to be an astoundingly quick method of diagnosis.

⁵ Named after his famous grandfather, Antonio Bossuet, M.S., F.R.C.S., is an esteemed surgeon and sought-after consultant, who lives in his father's house with his wife and two children, and who continues the distinct family tradition in Goa.

thermometer. The manometer has a scale graduated in millimetres with the zero downwards and a total length of 30 cm. The stopcocks are well greased and the apparatus is tested for leaks. Before and after operation the apparatus is washed with distilled water as follows. Keep stopcock M open and stopcock I and O closed, and fill the inlet cup with 3 ml of water. Open stopcock I and allow the water to drain

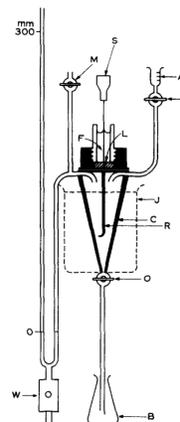


Fig. 1. A, inlet cup; I, inlet stopcock; O, outlet stopcock; B, outlet receiver; C, reaction chamber; R, glass-sleeved stirring rod; S, coupling to stirring motor; L, leather bearing; F, silicone seal; M, Warburg manometer stopcock; W, manometer regulation screw; J, water jacket.

into the chamber. Open stopcock O to drain out the water. Repeat the washing 2-3 times. The apparatus used in this study had a capacity $V = 14.2$ ml.

EXPERIMENTAL

The influence of stirring speed on the release of CO_2 was studied as follows. (1) Stopcock M was kept open and the manometer was adjusted to the zero level, with the other 2 stopcocks closed. (2) Stopcock I was opened and 0.2 ml of a 0.03 M bicarbonate solution was admitted into the chamber by means of a rubber-tipped Ostwald-Van Slyke pipet, followed by 1 ml of distilled water. (3) Stopcock I was closed and 1 ml of lactic acid (10% solution) was placed in the inlet cup (A). (4) Stopcock I was opened and closed as soon as the lactic acid had drained into the

Clin. Chim. Acta, 9 (1964) 173-178

A page from his 1964 paper in *Clinica Chimica Acta* showing a schematic of the hand-made experimental apparatus.



At home in his garden, with his wife.

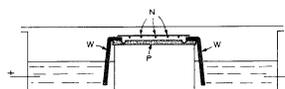


Fig. 2. Schematic cross-section of chamber (half the actual size). N = nylon threads. P = supporting platform. W = contact wicks.

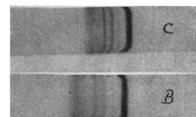


Fig. 3.

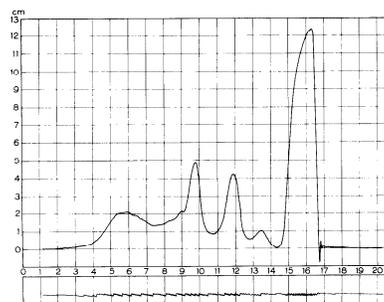


Fig. 4.

Clin. Chim. Acta, 6 (1961) 883-885

A page from his 1961 paper on electrophoresis using cellulose acetate membranes, showing a schematic of the apparatus and results illustrating the well-defined serum protein bands obtained in 20 minutes, rather than 36 hours, when performed with filter paper.

In subsequent papers, he introduced *electrophoresis and immunoelectrophoresis in agar-gel* and started to study *abnormal serum and hemoglobin patterns, liver diseases, tumors, cancers*, etc., which are attested by more than 32 papers on various subjects, published in reputed international journals of science and cited in several papers and modern English and German text books (refer to the relevant papers in the Appendix).

Later Accomplishments (1963-1978)

In 1963, two years after Goa was annexed by India, the *Laboratório de Análises* was renamed, Analytical Laboratory when English became the official language. In 1966, the laboratory underwent the third reorganization under his leadership and was renamed, Public Health Laboratory, with concomitant restructure of the departments.

He was appointed the first Principal of the Goa College of Pharmacy, affiliated with Bombay University, for one year (1963-1964), whereupon his brother, Miguel Álvaro, took over the position for eleven years. He became the Director of Health Services of the Government of Goa (1970-1972), and sat on various government commissions and was an oft-invited speaker.

After retirement in 1975, in poor health, he no longer had the freshness of mind, the energy or the patience to maintain his previous pace— between 1961 and 1972 he averaged approximately two publications annually.

In 1978, he published his final paper in the Indian Journal of Medical Research, showing a new technique to separate protein fractions of human serum.

Life as an Artist

His life was not confined to the laboratory. Art lover, excellent violinist, his evenings with family were filled with discussions and music. As a student in the *Escola Médica* he organized, with his sister Elfrida at the piano, a musical group that played at the traditional dance, *Baile da Escola Médica*, the annual gala celebration of the institution.

His hobbies included wood sculpture, oil and watercolor painting and helping his mother Da. Berta, in the construction of figurines made of seashells, admired in various exhibitions in the *Clube Nacional* and *Instituto Menezes Bragança* in Panjim.

In his leisure time he would reminisce about his debt to his parents for their encouragement in both his scientific and artistic pursuits as an artist and violinist. He would describe scenes of academic life, his research, his friends and specially his neighbours, the Clemente family (Marcelina, Miguel, Calmette, Oswaldo, Sância, Adelaide and Lamarck) and the musical group formed with them and the violinist and composer Micael Martins (1914-1999) that performed during the liturgical functions of the St. Inês Church in Panjim.

Like the *vaidyas* (the Hindu humanistic doctors of ancient India) his ideal of an investigator was contributing to the advancement of man and of medical science; always sensitive and attentive to human suffering.



Practicing the violin at home.

Death

After a lengthy battle with debilitating health issues, Emídio Afonso, aged 74, died peacefully on Sunday April 29th, 1990.

His life and work is proof that even with inadequate facilities and proper infrastructure it is possible to *create and discover*. His salient characteristic was a deeply felt humanism and generosity of spirit. He helped people of any affiliation, politics, class or nationality. Scientist and consultant, he was an ingenious mechanic, astute, witty, patient and unfailingly honest. To all who knew him he was an unpretentious giant. He was a simple man with simple needs. As were his manners and his humour. He was intelligent, persistent, hardworking and charming. An uncommon individual mind suggesting creativity, intuition and intelligence.

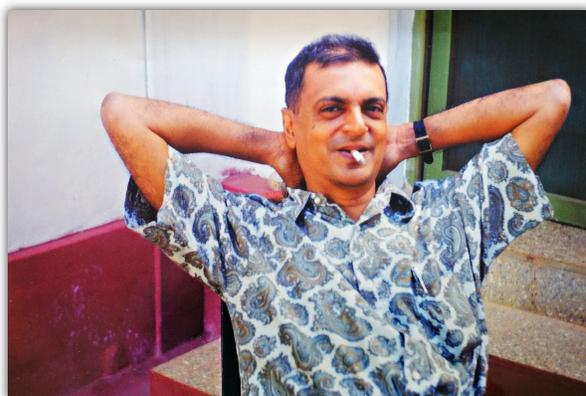
Notwithstanding his love for science, he was a fervent and devout Catholic. A man of prodigious gifts and unflagging principles, he used his talents for work and living to the last. He never bought anything he could construct, and he was skillful in manufacturing many things.

I wish to end with a quote of Shakspeare's *Hamlet*, Act II, scene 2:

*He was a man, take him for all in all,
I shall not look upon his like again.*

One may have faith in the rising generation which has given many forms to its challenge and its quest:

*We are the pilgrims, master;
we shall go always a little further.*
—James Elroy Flecker, *Hassan*.



In one of his relaxing moods, smoking his signature rice-paper cigarette of Black Lion tobacco from Holland.



APPENDIX – LIST OF PUBLICATIONS OF EMÍDIO AFONSO

1. Treatment of Gas Gangrene, *Lancet*, 1:644, April 6, 1940.
2. “COR IN VITRO” (Experimental studies on Embriology, Histology, Phisiology and Pathology of the Heart), *Tipografia Colonial*, 1941, Nova Goa.
3. Uma Nova Técnica de Microelectroforese, *Separata dos Anais do Instituto de Medicina Tropical*, Vol XII, Nº 4, Dezembro de 1955.
4. Determinação Quantitativa da Labilidade Coloidal do Soro nas Suspensões do Colesterol. Reacção de Hanger-Permanyer Quantitativa. *Separata de “O Médico”*, Nº 251, 1956.
5. Acerca dos Corantes para Esfregaços de Sangue, *Separata do Instituto de Medicina Tropical*, Vol XIII, Nº 1-2, Março-Junho de 1956.
6. Sobre a Estrutura e Biossíntese das Proteínas, *Separata dos Anais do Instituto de Medicina Tropical*, Vol XIII, Nº 3, Setembro de 1956.
7. On the Electrophoresis of Proteins on Cellulose Acetate Membranes, *Clin. Chim. Acta*, 6 (1961), 883.
8. Rapid determination of A₂ Hemoglobin by Reverse-flow Electrophoresis on Cellulose Acetate Membrane, *Clin. Chim. Acta*, 7 (1962), 545-549.
9. On the Electrophoretic Fractionation of Normal Human Erythrocytes Lysates, *Clin. Chim. Acta*, 8 (1963), 446-449.
10. Hæmoglobin Binding Serum Globulins, *Nature*, Vol. 198, Nº 4855 (1963), 1100-1101.
11. Electrophoretic Patterns of Tumor Tissue Proteins, *J. Clin. Path.*, 16 (1963), 375.
12. Quantitative Immunoelectrophoresis of Serum Proteins, *Clin. Chim. Acta*, 10 (1964), 114-122.
13. Simplified Technique of Immunoelectrophoresis, Short Communication, *Clin. Chim. Acta*, 10 (1964), 192.
14. New Manometric Apparatus and Technique for Semi-micro Serum CO₂ and Blood Urea Determination, *Clin. Chim. Acta*, 9 (1964), 173-178.

15. "A Closed Space" CO₂ Equilibration. A Basis for Micro and Ultra Micromethods for the Acid-Base Status of Blood, *Clin. Chim. Acta*, 11 (1965), 461-468.
16. Quantitative Immunoelectrophoretic Analysis of Normal and Pathological Serum Proteins, *Separata do Inst. Menezes Bragança*, Nº 86 (1965).
17. On Human Serum Amylase, *Clin. Chim. Acta*, 14 (1966), 195-198.
18. Quantitative Immunoelectrophoresis of Serum Proteins – Improved Method, *Clin. Chim. Acta*, 13 (1966), 107-112.
19. Quantitative Immunoelectrophoresis – A Simplified Method, *Clin. Chim. Acta*, 14 (1966), 567-569.
20. Depolymerisation Of Normal Human Serum Macroglobins, *Clin. Chim. Acta*, 15 (1967), 368-370.
21. Serum Proteins Changes in Indian Infantile Cirrhosis – Short Communication, *The Clinician*, May 1967.
22. Immunoelectrophoretic Identity Patterns – Short Communication, *Clin. Chim. Acta*, 17 (1967), 131.
23. On Immunoelectrophoretic Quantitation, *Clin. Chim. Acta*, 17 (1967) 138-141.
24. Evaluation of Renal Filter Selectivity by Quant. Immunoelectrophoresis, *Clin. Chim. Acta*, 17 (1967), 239-244.
25. On Interference of Diffusion in Quant. Immunoelectrophoresis, *Clin. Chim. Acta*, 18 (1967), 95-96.
26. Immunoelectrophoresis of Serum Proteins, *Tipografia Sadananda*, Pangim, Goa, India (sem data).
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28. Brief Study of Myeloma Proteins, *Clin. Chim. Acta*, 21 (1968), 283-287.
29. Nature and Significance of Serum Proteins Changes in Active Pulmonary Tuberculosis. (Preliminary Communication), *The Clinician*, Vol. 32, Nº 2 (1968), 52-57.
30. On the Structure of Some Myeloma Proteins, *Immunochemistry*, Vol. 6 (1969), 715-722.
31. Monoclonal Immunoglobulinopathies in Goa, *Indian J. Med. Res.*, 59 (1971), 1083-1089.
32. Orthogonal Immunodiffusion and Immunoelectrophoresis of Serum Proteins, *Clin. Chim. Acta*, 41 (1972), 275-286.
33. Laurell's Two Dimensional Immunoelectrophoresis – Improved Technique, *Clin. Chim. Acta*, 54 (1972), 123-126.
34. Separation of Macromolecular Protein Fractions of Human Serum – A New Technique, *Indian J. Med. Res.*, 68 (1978), 519-526.

PHOTO CREDITS

1. "Casa de Moeda", by Chryselle Dias from her online album, 2004.
2. Map of Goa, from *The New York Times*, Travel section, Feb. 4, 2014.
3. "Emídio Afonso and brothers", courtesy his late brother Adriano, 1960.
4. "Emídio Afonso, João Proença and Ivone da Costa", courtesy João Proença, 1955.
5. "His residence in Campal", courtesy Luis Afonso, 2015.
6. "At home in his garden, with his wife", courtesy his daughter Nelía Maria, c. 1960.
7. "Practising the violin", courtesy his late brother Alvaro, 1970.
8. "In one of his relaxing moods", courtesy his late brother Adriano, c. 1960.

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