Some Aspects of the Argentine Reception of the Computer

Nicolás Babini

Av. Córdoba 2540, 1120 Buenos Aires, Argentina
<babini@netex.com.ar>

Abstract. This paper describes activities developed in Argentina between 1956 and 1966 related to the computer and that were coincident with the arrival of the first machines in the country. It deals, particularly, with the work of the mathematician Manuel Sadosky (1914-2005) in the University of Buenos Aires, who was responsible for the first university computer, the first applied mathematics laboratory, the first computer career, and the first professional computer society in Argentina. The construction of experimental computers and the first imported business computers are also mentioned in this paper.

1. Introduction

The computer arrived in Argentina in 1960 and it involved business as well as university environments. The fact that an early attempt to produce computer science preceded and then accompanied its arrival (which had an interruption in 1966), made me consider that the computer created a unique situation in Latin America and even a rare one for the rest of the world.

The Mercury II, an English machine produced by Ferranti Ltd., was among the computers that arrived in the country. The University of Buenos Aires (U.B.A.) received the first Mercury II and it would have been the first *operating* computer in Argentina if it were not for the delay of construction for its location. The achievement was possible thanks to the tireless efforts of the Argentine mathematician, Manuel Sadosky.

Please use the following format when citing this chapter:

Babini, N., 2006, in IFIP International Federation for Information Processing, Volume 215, History of Computing and Education 2 (HCE2), ed. J. Impagliazzo, (Boston: Springer), pp. 193–201.

2. The Work of Manuel Sadosky

Manuel Sadosky (1914-2005) received his doctorate in the National University of La Plata under the direction of the Spanish mathematician, Esteban Terradas, who had orientated him to applied mathematics. Sadosky traveled to France in 1947 due to a grant awarded by the French government and there, Sadosky heard about computers for the first time. The following year, another grant allowed him to become acquainted with the Instituto Nazionale per l'Applicazioni del Calcolo (INAC), founded by Mario Piccone in 1932. Each sojourn was a decisive event for his visionary future. In 1950, he wrote about computers in *Ciencia y Técnica*, a publication of the engineering students of the University of Buenos Aires [1]. After the university removed him from his teaching post in 1952 because of political reasons, he wrote two mathematics books, which became popular and which were widely known. When the University of Buenos Aires recovered its autonomy in 1955, after the overthrowing of Juan D. Perón dictatorship, it appointed Sadosky as professor and then Director of the Department of Mathematics of the Faculty of Exact Sciences, where he was able to put his innovatory projects into practice.

2.1 The first university computer

An intense training campaign of the people who would operate the Ferranti computer preceded its acquisition. The training included courses about calculations with tabulators and programming seminars given by foreign mathematicians like the Spaniard, Ernesto García Camarero [2] and the Englishwoman Cecile Popplewell. Ferranti Ltd. also undertook the training of two Argentine engineers in its plant who would take charge of the machine maintenance.

The Mercury II was acquired in 1958 thanks to a subsidy given by the National Council of Scientific and Technical Research (currently, the Conicet). Its installation reached a conclusion at the beginning of 1961 in a building of University City, then under construction. The machine, which the University of Manchester had designed, held the features that were characteristic of the first English computers. These features included its large size, its thermo-ionic tubes, and its punched tape operation. The machine used a high-level language (called Autocode), and its operation was more suitable than the other existing computers for doing scientific tasks. It operated intensely until 1966. In addition to the University of Buenos Aires using it, different public organizations gravitated to it including the researchers from the University of the Republic in Montevideo, Uruguay.

Unlike what was happening in the Faculty of Exact Sciences, in the Faculty of Engineering of the same university, Professor Horacio C. Reggini (b. 1933)—another computer science pioneer—could not reconcile that his students and colleagues would accept the computer as an auxiliary to the teaching of engineering. (The universities of Michigan and Houston had discussed that issue during those

years [3].) However, such a goal finally became a reality at the Faculty of Engineering of the recently created Argentine Catholic University (U.C.A.), where an IBM 1620 operated until Reggini's resignation in 1966. Reggini also created a Study Group for Computer Applications (GEAC) in the Department of Stability of the U.B.A. In 1966, that Group published a book about Stress, [4] a language that had just appeared at MIT—an institution with which Reggini maintained a close relationship.

2.2 The "Instituto de Cálculo"

It is highly likely that the idea of a computer-based applied mathematics laboratory had been in Sadosky's mind during the very first moments. However, it could only become official in 1962, when the University approved the creation of the "Instituto de Cálculo" [5]. In the meantime, about fifty graduates participated in the organization of working groups. Most of the people were mathematicians and engineers, and later, a great many of them went on to have distinguished careers in Argentina and abroad.

One of those groups developed models related to the Argentine economy, which applied new concepts through its director Oscar Varsavsky. He conceived those models such as "numerical experimentation models", which differed from the ordinary econometric models [6-8]. Another group, directed by Pedro E. Zadunaisky, worked on numerical solution of differential equations and particularly in the trajectory of the Halley comet [9-11]. Zadunaisky in the United States then continued those calculations resulting in dedicating an asteroid in his own name. The group, directed by Mario Gradowczyk, worked on solid and fluid mechanics and structural analysis [12-15]. Another group, under the direction of Julián Aráoz Durán, conducted a study of the hydraulic use of Andean rivers by applying the method of mathematical modeling. He developed that study in the framework of an agreement between the Argentine's Federal Council of Investments (C.F.I.) and the U.N.O. Economic Commission for Latin America (CEPAL) [16]. The same group also worked on linear programming problems and the "Critical Path Method" for public organizations and private companies [17].

The group in charge of the maintenance and development of the Mercury worked on the expansion of the machine, particularly on the construction of a card-tape converter, the installation of magnetic drums, and a line printer, in addition to the construction of an analog-digital converter for a neurology research of the Buenos Aires Children Hospital. The engineer, Jonás Paiuk, developed an outstanding reputation in all those works. He had taken part in the construction of an experimental computer in the Faculty of Engineering—to which I will refer afterwards—and had received training at Ferranti Ltd. itself in Manchester. Paiuk would later become a pioneer of industrial automation in Argentina.

The Programming Group, directed by Wilfred O. Durán, developed a new language called COMIC (Compilador del Instituto de Cálculo) [18] to overcome the limitations of the Mercury's Autocode and to satisfy the economic model demands under development by Varsavsky. The group was also in charge of the programming of a plotter acquired in the United States. The Statistics Group, directed by Sigfrido Mazza, had received the greatest number of assignments from third parties (such as the design of the sample of the National Census of 1960) [19]. The Computer Linguistics Group, directed by Eugenia Fischer, worked on the Russian-Spanish automatic translation.

In the early 1960s, mathematical models and automatic translation were new. Planning and control techniques based on networks—like PERT and CPM—dated back from 1958 and they demonstrated a degree of advancement based upon the works developed at Sadosky's Institute. The Institute itself published many of those works (see references).

2.3 The first computing curriculum

In the Argentine of 1960, the only computing training courses were those offered by the importing companies conducted by their own personnel. That same year, an IBM subsidiary began to train its sales engineers as System Engineers (which included a stay at the head office in the United States). In 1962, Sadosky proposed the creation of the Curriculum of Scientific Computer in the Faculty of Exact Sciences. At first, people viewed it as a minor specialty though it lasted three and a half years. The curriculum included mathematics, programming, numerical analysis, operational research courses, ten obligatory courses, and some other courses that were optional. However, when it became evident that such scientific guidance reduced the labor opportunities of the graduates, they called people from IBM to give courses also. Mathematics and physics graduates from their own faculties (whose studies lasted for five years) mainly nurtured the curriculum. The faculty had already approved a great number of the curriculum courses. For that reason, the computing curriculum had produced its first graduates in 1963.

2.4 The first professional society

In 1960, the Argentine Society of Calculus (S.A.C.) came into existence. Sadosky had driven that undertaking and he assembled the first students, teachers, and professionals of computer science. Between 1961 and 1962, the S.A.C. published the *Boletín de la SAC*, which was the first specialized journal of computing in Argentina. The second one, *Decisiones Gerenciales y Computadoras*, which had also a short life, appeared in 1965. During those two years of the early 1960s, the S.A.C. had an intense activity and in 1962, it became the Argentine member of IFIP. After a period of little activity, it reconstituted in 1972 as the Argentine Society for

Computing (Sociedad Argentina de Computación), which then evolved into a new society after having an essential part in the organization of the First Ibero-American Congress of Informatics (I CIADI) held in Buenos Aires in 1972.

The beneficiary of those efforts was the Argentine Society for Operational Research (Sociedad Argentina de Investigación Operativa, SADIO), founded also in 1960 by a group of teachers of operational research. Until 1977, the SADIO had organized ten conferences (called JAIO) that had a growing participation of computing papers. In 1979, the Society adopted the name of Argentine Society for Informatics and Operational Research (Sociedad Argentina de Informática e Investigación Operativa). In the following year, IFIP recognized it as a replacement of S.A.C.

3. Experimental Computers

While Sadosky lay the foundations of what would be the "Instituto de Cálculo" of the Faculty of Exact Sciences, the engineer Humberto Ciancaglini (b. 1918), who had just been appointed Director of the Department of Electronics, began the development of an experimental computer in the Faculty of Engineering, which shared the building with the Faculty of Exact Sciences. Ciancaglini, who was a civil engineer, had received training in electronics in the laboratories of the Dutch company Philips. The company installed these laboratories in Buenos Aires in 1943 after they had moved them to England during the Nazi invasion of the Netherlands. Ciancaglini was able to see operating computers for the first time in 1956, during a business trip to Europe. He realized that Argentina could not stay behind those advances. Therefore, he decided to build a computer and began the preparatory activities, which extended during a year. Among them was a course consisting of a series of public lectures aimed to interest the entrepreneurs in the field. The course, patronized by the Argentine Center of Engineers, was not successful in convincing these business people that the university was able to achieve that goal. However, it did provide the reason to produce the first book on computers that had appeared in Argentina. Remington Rand Sudamericana published the book in 1958 and reprinted it in 1962 [20].

The machine, called CEFIBA (Electronic Computer of the Faculty of Engineering of Buenos Aires), was built with a great effort between the years 1958 and 1962 [21-23]. The director of the project was the engineer Felipe Tanco (b. 1923), who had just returned from the United States where he had participated in the Radio Corporation of America's role in the Bizmac development. A group of graduates took part in the design and construction of the machine. They include Eduardo T. Ulzurrun, who designed the circuits, and the already mentioned Jonás Paiuk who played an exceptional role in its development. The project had a subsidy from the National Council of Scientific and Technical Research and had the

collaboration offered by the National Commission of Atomic Energy Workshops. The Naval Laboratories were also important because of the great shortage of equipment and components at that time.

The CEFIBA had a central processing unit of transistors of intermediate frequency, a memory of magnetic drum (ten thousand characters), a paper tape as input, and a typewriter as output. The programming was in machine language. According Ciancaglini, they did not conceive the CEFIBA as an experimental machine but as an implementation that allowed students to familiarize themselves with that new technology.

Another experimental computer began construction in 1960 at the Southern National University in the harbor city of Bahía Blanca (situated over the Atlantic Ocean, 800 kilometers away from Buenos Aires). In 1956, its designer, the engineer Jorge Santos (b. 1927), had created a "seminar" that became a Laboratory of Computers (which had the participation of the Spaniard mathematician Ernesto García Camarero). In 1959, he received a grant from the University of Manchester, where he worked under the direction of Thomas Kilburn in the design of the Atlas computer. With that experience, he began to construct a machine called the CEUNS (Electronic Computer of the Southern National University) [24]. In accordance with the defined project, the machine would contain a central processing unit of transistors and a main memory, subdivided in a "fixed memory" and a "work memory" of 64 words of 64 bits, consisting in a piece of the ferrite memory from the Manchester's Mark 1 (that had been donated by Kilburn). Secondary memory consisted of a 9,000-word magnetic drum (a loan from Ferranti Ltd.) and punched tapes for input and output. The programming was similar to that of the Ferranti Mercury of the "Instituto de Cálculo" and the programmer was Victoria Bajar, the first graduate of the Specialist of Scientific Computer. The construction reached an impasse in 1962 when the financing stopped because of the fall of the Buenos Aires Province Government, which had given a subsidy to the project.

After that attempt, Santos worked on ternary systems (as an alternative of the binary systems that had then begun to prevail) and with collaborators, wrote several papers about them that appeared in publications in the United States between the years 1964 and 1970 [25-26]. We should recall that in 1959 in the Soviet Union, Nikolai Brusenzov was able to build the ternary computer Stun [27].

Finally, it is worth mentioning the unsuccessful attempt by the Fate Electronics Division of Fate S.A. (an important Argentine tire manufacturer) to produce minicomputers at that time. The development of the minicomputer, called Serie 1000, began in 1970 and it extended to 1979; it became evident that the design had become obsolete and the investments involved had caused a significant financial loss. The adventure put an end to the Division, which during that time had also successfully produced the first electronic calculators of Argentina—from pocket calculators to accounting machines.

4. Other Imported Computers

Apart from the Ferranti's Mercury II, two public utilities received the other computers that arrived in 1960; they were a railway service (that received two Univac USS 90 machines) and an urban transport service (that received an IBM 305). A second IBM 305 also arrived and IBM installed it in its local headquarters. IBM also displayed the machine to the public at a fair held in Buenos Aires in 1960; there, people would pose questions to it and wait for a response. A similar model of this machine had fulfilled the same functions in the Brussels World's Fair of 1958.

At the end of the 1960s, the number of imported computers reached almost 340, with IBM maintaining a 60% predominance of the market. The main competitors of IBM were the French Bull machines and the NCR and Burroughs computers. We should remember that these machines were very expensive and that they required a significant initial investment. In addition, the expense of the physical set up of its site and the training of the people who would be in charge of the machines was costly. In fact, it was often necessary to make a total rearrangement of the procedures and forms and even of the internal organization of the user company to adapt them to the precision and rigidity of the computer.

The increase of computers went on continuously. In 1980, before the "microcomputer explosion", Argentina had more than 5.700 computers. I think that there were two principal motivations for this. The first "actual" motivation was the replacement of the abundance of accounting machines (known as tabulators or unit record machines) at that time. The other motivation was symbolic; that is, having a computer implied the achievement of a certain business prestige. The combination of these two factors often led to an inefficient use of the computer, which in essence had become a giant typewriter and had caused significant financial losses to its users.

5. Conclusion

Though Argentina continued receiving computers, the activities related to the computing sciences suffered a considerable delay after 1966. That year, the army overthrew President Illia and universities came under government control. The administrators, teachers, and students of Exact Sciences and Engineering Faculties were repelling the "intervention". The resulting severe repression caused people like Sadosky, Ciancaglini, and Reggini to resign their positions. Curriculum teachers and institution's researchers did also.

The leaders of the scientific and technologic effort of the years from 1955 to 1966 stopped their participation at the university, which had been traditionally the core of the Argentine scientific research. Many of these leaders and their followers went abroad, largely due to the political instability and an atmosphere of intolerance

that prevailed in Argentina during the second half of the twentieth century. In this new twenty-first century, the hope is that an atmosphere will come into existence that would allow Argentina to take the path once again that had begun by its computing pioneers.

References

[1] M. Sadosky, "Progresos recientes y evolución del cálculo mecánico y automático". *Ciencia y Técnica,* No. 580, 1950, pp. 170-186.

[2] E. García Camarero, *Autocode. Un sistema simplificado para la programación de la computadora Mercury*, Instituto de Cálculo, Buenos Aires, 1961.

[3] H. C. Reggini, "Aplicación de las computadoras a la enseñanza de la ingeniería". *Ciencia y Técnica,* No. 662, 1963.

[4] Grupo de Estudio de Aplicación de Computadoras, *Stress. Un lenguaje de computadora para ingeniería estructural*, Universidad de Buenos Aires, Facultad de Ingeniería, Departamento de Estabilidad, Buenos Aires, 1966.

[5] M. Sadosky, "El Instituto de Cálculo de la Facultad de Ciencias Exactas y Naturales" *Revista de la Universidad de Buenos Aires,* V época, vol. VII, No. 4, 1962, pp. 646-650.

[6] O. Varsavsky, "La experimentación numérica". *Ciencia e Investigación*, vol. 19, no. 30, 1963.

[7] O. Varsavsky, *Los modelos matemáticos numéricos como herramientas de decisión en problemas dificilmente cuantificables. El MEIC-0*, Instituto de Cálculo, Buenos Aires, 1965 [mimeo].

[8] O. Varsavsky, N. Lugo, H. Paulero, R. Frenkel, M. Malajovich, L. Lew y V. Yohai, *Matrices positivas. Propiedades utilizadas en teorías económicas*, Instituto de Cálculo, No. 13, Buenos Aires, 1966 [en prensa; no se publicó]

[9] P. Zadunaisky, V. Pereyra, *Sobre la convergencia y precisión de un proceso de correcciones diferenciales sucesivas.* Instituto de Cálculo, No. 5, Buenos Aires, 1965 [traducida al inglés en *Proceedings of the International Federation for Information Processing, 1965*].

[10] P. Zadunaisky, V. Pereyra, C. Berdichevsky, G. Oliver, E. Ruspini, G. Galimberti, *Un método para la estimación de errores propagados en la solución numérica de un sistema de ecuaciones ordinarias.* Instituto de Cálculo, No. 1, Buenos Aires, 1964.

[11] P. Zadunaisky, V. Pereyra, C. Berdichevsky, G. Oliver, E. Ruspini, G. Galimberti, *El movimiento del cometa Halley durante el retorno de 1910*, Instituto de Cálculo, Publicación no. 4, Buenos Aires, 1964.

[12] M. H. Gradowczyk, *Una teoría matemática para el estudio de problemas de erosión*, Instituto de Cálculo, No.10, Buenos Aires, 1965.

[13] M. H. Gradowczyk, H. C. Folguera, *Modelo matemático para el estudio de la erosión de lechos móviles.* Instituto de Cálculo, No. 6, Buenos Aires, 1965 [traducida al inglés: *Analysis of scour in open channels by means of mathematical models*].

[14] M. H. Gradowczyk, J. Schujman, H. C. Folguera, E. Risler, A. Rivas, O. Maggiolo, *Tensiones térmicas en cáscaras elásticas*, Instituto de Cálculo, No. 2, Buenos Aires, 1964.

[15] M. H. Gradowczyk, J. Schujman, H. C. Folguera, E. Risler, A. Rivas, O. Maggiolo, *Discusión sobre un modelo matemático para el estudio de los problemas de erosión de lechos móviles*, Instituto de Cálculo, No. 3, Buenos Aires, 1964.

[16] J. A. Aráoz Durán, O. Varsavsky, J. J. C. Riva, R. Carranza, *Estudio del aprovechamiento hidráulico de los ríos andinos por el método matemático*, Instituto de Cálculo, No.11, Buenos Aires, 1965.
[17] J. A. Aráoz Durán, M. Larramendy, N. Sameghini, J. C. Fränkel, *Camino crítico aplicado a la construcción de edificios*, Instituto de Cálculo, No. 12, Buenos Aires, 1966 [en prensa; no se publicó].
[18] W. O. Durand, *Introducción al lenguaje Comic*, Instituto de Cálculo, No. 14, Buenos Aires, 1966 [mimeo]
[19] Instituto Nacional de Tecnología Agropecuaria. *El uso de la computadora Mercury en el análisis de los datos experimentales*, INTA, Buenos Aires, 1963.
[20] *Ciclo de conferencias sobre computadoras dictadas en el Centro Argentino de Ingenieros*. Remington Rand Sudamericana, Buenos Aires, 1958 [2ª ed., 1962].
[21] F. Tanco, La computadora construida en la Facultad de Ingeniería de Buenos Aires. *Boletín de la Sociedad Argentina de Investigación Operativa*, No. 3, Buenos Aires, 1960.
[22] H. A. Ciancaglini, "Computadoras digitales", *Revista Telegráfica Electrónica*, No. 628, Buenos Aires, 1957.
[23] M. Diamand, "Circuitos lógicos", *Revista Telegráfica Electrónica*, No. 639, Buenos Aires, 1957.
[24] J. Santos, "Diseño lógico de una computadora de costo limitado", *Revista Telegráfica Electrónica*, No. 580, Buenos Aires, 1961.
[25] J. Santos, H. Arango, "Base 3 vs. Base 2 Synchronous Arithmetic Units", *IEEE Transactions on Electronic Computers*, 1964.
[26] J. Santos, H. Arango, On the Analysis and Synthesis of Three-valued Digital Systems. *Proceedings of the 1964 Spring Joint Computer Conference*, 1964.
[27] S. V. Klimenko, "Computer Science in Russia: a Personal View", *IEEE Annals of the History of Computing*, vol.21, no.3, 1999, p. 17.

Bibliography

[1] N. Babini, *Tres décadas de SADIO*, Sociedad Argentina de Informática e Investigación Operativa, Buenos Aires, 1990.
[2] N. Babini, *La informática en la Argentina. 1956-1966*, Ediciones Letra Buena, Buenos Aires, 1991.
[3] N. Babini, "Modernización e informática. Argentina 1955-1966", *Quipu*, Vol. 9, No. 1, México, D.F., 1992., pp. 89-109.
[4] N. Babini, "Bibliografía informática argentina 1949-1975". *Anales de la Sociedad Científica Argentina*, Vol. 224, No. 1, Buenos Aires, 1994, pp. 75-114.
[5] N. Babini, "Los primeros trabajos sobre la computadora en la Argentina", *Saber y Tiempo*, Vol. 1, No. 2, Buenos Aires, 1996, pp. 171-188.
[6] N. Babini, "La llegada de la computadora a la Argentina", *Llull*, No. 20, Zaragoza, Esp., 1997, pp. 465-490.
[7] N. Babini, *La Argentina y la computadora. Crónica de una frustración*, Ediciones Dunken, Buenos Aires, 2003.
[8] N. Babini, *Historia de la computación en la Argentina. Informe final*, seminario dictado en SADIO entre el 15 de abril y el 18 de septiembre de 2003 [inédito].