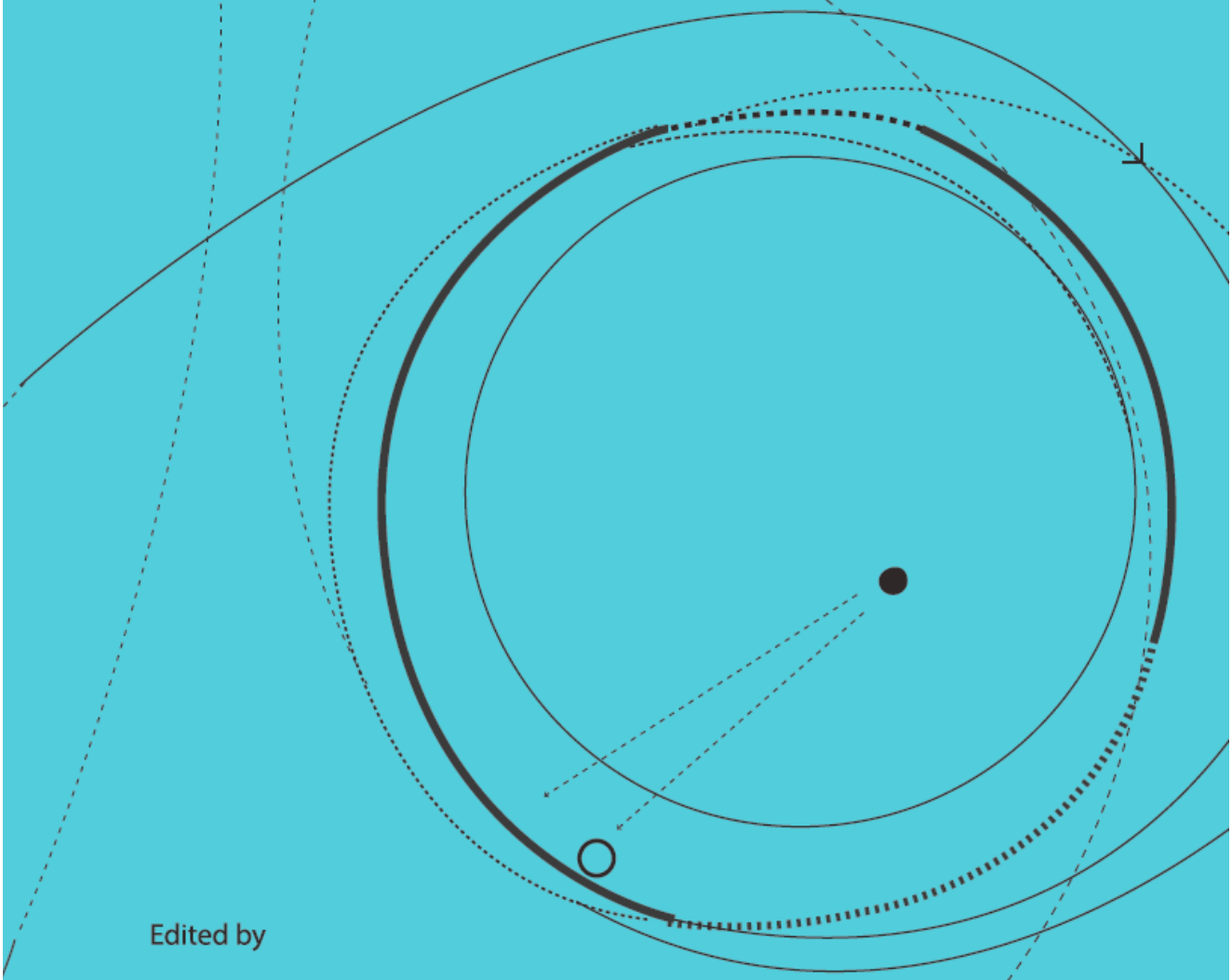
FUTURE TRAJECTORIES OF COMPUTATION IN DESIGN

CAADFutures 2017

Istanbul 12-14 July



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Future Trajectories of Computation in Design

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Preface

The Computer-Aided Architectural Design Foundation was established in1985, and ever since, has encouraged state-of-the-art research and practice of computing in architectural design through conferences and publications. Istanbul, the vibrant metropolis that lies For the designer in the multidisciplinary world of the 21st century, computation provides a powerful medium for the extension of understanding other disciplines. In accordance with this global change in the field of design,

CAADFutures 2017 called for papers around the theme of “future trajectories of computation in design.” In fostering a multidisciplinary discourse for the future of computation in design, the conference aimed at not only gathering the latest research, design practice and pedagogies but also revealing the possible phenomena, factors and forces that will influence these trajectories in design with an exploratory perspective.

In the first stage of paper evaluations, 184 abstracts were received from 27different countries. In a two-tier double-blind review process, 66 papers were selected for the conference. This volume includes full texts of 44 of these papers and the abstracts of 22 that were selected for an edited book published by Springer. The content of this proceedings volume can be accessed in Cumincad (cumincad.scix.net). Each paper was reviewed by at least three experts from an international committee of 80 experienced researchers.

The papers in this volume have been organized under twelve headings: (1) Shape Studies, (2) Urban Studies, (3) Building Performance Studies, (4) Design Geometry and Form Studies, (5) Building Information Modelling, (6) Decision Support Systems and Human Computer Interactions, (7) Fabrication and Materiality, (8) Parametric Tools and Models for Design, (9) Pedagogical Approaches to CAAD, (10) Augmented and Virtual Reality Environment Studies, (11) Generative Design Systems, and (12) Rethinking Design in Digital Context. The first group provides research on mathematics of shapes in design. The second offers examples of various applications of computation in studying the urban environment. Whereas the third showcases research on building performance, the fourth comprises of papers that offer in-depth understanding of form. The fifth group displays various approaches to BIM, and the sixth group includes a broad range of studies in optimizing the creation and sustainment of the built environment. The seventh group reports on new ways of making that incorporate materials and computational thinking.

The eighth group opens new horizons for parametric design studies. The ninth group of papers offers discussions on the recent roles of computational approaches in design curriculum, and the tenth group provides explorative insights for virtual experience in design. Finally, while the eleventh group of papers reveals the qualities of generative design systems within different scenarios, the twelfth group provokes new discussions on the character of design in digital contexts. Contributors of this volume are researchers from the fields of architecture, design, urban design, computer science, engineering, and other disciplines that address issues of computational design.

As editors of this volume, and organizers of the conference, we thank Professors Bauke de Vries and Tom Kvan of the CAADFutures Foundation for their continuing support in the process of organizing the conference and the preparation of this book. Gabriela Celani, the chair of the 2015 conference, has been extremely resourceful and helpful to us from the very beginning. We also thank all members of the scientific committee for their diligent reviews that paved the way to match the high academic standards CAADFuture

conferences are known for. We are also grateful to each member of the conference organizing committee. Finally, the conference would not have been possible without the support of Istanbul Technical University Rectorate, the Faculty of Architecture, and our generous sponsors. It has been a great honor and pleasure to organize and host the CAAD Futures Conference in Istanbul. We hope that this great selection of papers is an indication of the contribution of the conference to the field and that you enjoy the book.

Gülen Çağdaş
Mine Özkar
Leman Figen Gül
Ethem Gürer

July 2017, Istanbul

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Design and architecture for the dawn of the personal computer

The pioneer vision of Adriano Olivetti

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Abstract. In 1952 the Italian Olivetti Company opened a study laboratory on electronic calculators in New Canaan, USA; in 1955 it created an electronic research laboratory in Pisa and two years later, co-founded a company to produce electronic conductors. In 1959 it presented ELEA 9003 and in 1965 the P101, respectively the first full transistorized computer and the first desktop computer. This paper aims to investigate how the Olivetti Company accomplished in such a brief period of time a pioneer vision in the field of computing. By one hand it seeks to highlight the forerunner idea of Adriano Olivetti (1901-1960) for an integrated awareness of what computing could become and on the other hand, how that wakefulness fostered an innovative agenda among architects, designers, filmmakers and scientists for the invention of the computer as an artifact expression of an epoch. This successful endeavor anticipated what would become the concept of personal computing. Moreover the paper underlines how the early commercial development of Olivetti and IBM computing flourished in the context of the Universal Exhibitions of Brussels and New York.

Keywords: Olivetti, Computing, Architecture, Mario Tchou, Ettore Sottsass, IBM

1 Introduction

History of computing and its impact in architectural thinking and production is still a recent area of inquiry. However scholarship upon these themes has grown over the last years with research focusing at particular aspects of the intellectual history of architecture computing: namely investigation exploring the relevance of the Second World War with the emergent field of computing and the inception of architectural research centers started to be documented[1]. These works give particular emphasis to the development of computing mainly in the USA and in the UK, but there is still the lack of a broader historical account of that phenomenon in Italy. This paper attempts to bridge this gap by presenting an interpretation of what was the vision and endeavor of Adriano Olivetti's Company by the early 50s to foster a pioneer research agenda for the design, construction and commercialization of the (personal) computer. This vision included also a remarkable investment in architecture, product design, advertising and media for an industry that should be unified under an extraordinary high standard for visual communication.

The society *Ing. Camillo Olivetti & C*. was best known for its early success with the manufacturing of typewriters and was founded in October 1908 in Ivrea, a small city 50 miles north of Turin, at the foot of the mountains around the Valle d´Aosta, Italy, by Camillo Olivetti (1868-1943) an industrial engineer who studied at the Politecnico di Torino. His son, Adriano Olivetti (1901-1960) was a chemical engineer and industrialist whose personality compelled him to become a leading entrepreneur and patron of the arts. When Adriano took over the company succeding to his father, all Olivetti products were based on mechanical technologies and it was Adriano who gradually started to transformed the company into a modern factory. Looking ahead he predicted that sooner or later, mechanical products would reach its limits and that the future of the company would be to move into electronics.

At the end of World War II, Italy was a devastated country with a ruthless memory of twenty years of a fascist dictatorship, a defeat against the allies and within a turmoil of an internal political crisis. Alcide de Gasperi (1881-1954) the last president of the ministerial council of the Kingdom of Italy and the first prime minister of the Italian Republic was who initiated the reconstruction of the country making use of the "Marshall Plan" thanks to an unconditional political and financial support from the United States of America. During this period, Olivetti launches its first electromechanic calculating machine, the *Divisumma 24,* which constituted a major commercial success that paved the way for Olivetti´s further technological experimentation with automatic and electronic devices. The development of electronics at the Olivetti Company emerged in this context and could be divided in four phases encompassing sixteen years of pure and applied research. The first phase is firmly associated with the foundation of the *Olivetti Bull Spa* in 1949, a commercial agreement with the French company *Machines Bull*, the principal opponent of IBM in

[1] See: Rocha, João. Architecture theory 1960-1980. Emergence of a Computational perspective. MIT, Ph.D Dissertation, 2004; Alise Upitis, Nature Normative: The Design Methods Movement, 1944-1967. MIT, Ph.D Dissertation, 2008; Daniel C. Llach, Buildors of the Vision. Software and the imagination of design. Routledge, 2005.

Europe, for the distribution of mechanographic punchedcards equipment in Italy. *Olivetti Bull* has provided a fundamental contribution to the understanding of the market requirements in terms of information processing, and for a sucessuful evolution towards the adoption of electronic data processing systems consistent with the Olivetti vision.

The second phase encompasses the early years of 1950s when Dino Olivetti (1912-1976) the youngest brother of Adriano, becomes the Director of the *Olivetti Corporation of America* (OCA) in New York city and responsible for the initiation of an Electronic Research Laboratory[2] in New Canaan, Connecticut in 1952, with the technical supervision of the mathematician Michele Canepa. During that period a group of distinguished Italian mathematicians did a study trip in the USA to visit the main scientific laboratories where computers were being developed and tested. The idea was from Mauro Picone (1885-1977) a notable Italian scientist who created in 1927 one of the first institutes dedicated to develop applied research in mathematics, the *Istituto Nazionale per le Applicazioni del Calcolo*, (INAC). Therefore under the guidance of Picone, Angelo Guerraggio, Gaetano Fichera, Giulio Rodinó, Bruno de Finneti, and Michel Canepa (an engineer already working for Olivetti) a joint effort for studying the possibility of designing and constructing an Italian computer was devised. This corresponded to state of the art technology that needed to be acknowledged in first hand by the Italian mathematicians who also participated at important scientific Conferences and Seminars, as we will describe ahead. The result of this enthusiastic and pioneer journey constituted an early and solid contribution for the definitive decision that Adriano Olivetti would do in order to expand his business in electronics.

The third phase, may be characterized by the agreement signed in October 1954 between the University of Pisa, Italy and *Olivetti* for an initial partnership with the aim to design and build, the "Calcolatore Elettronico Pisano-CEP". To accomplish this goal Olivetti establishes the Electronic Laboratory at Barbaricina, near Pisa, in a nineteenth century Villa. To lead the scientific participation of *Olivetti* at the development of the CEP, Mario Tchou, son of a Chinese diplomat in the Vatican and professor in Electrical Engineering at Columbia University, New York, where he taught from 1952 to 1955, is invited. Olivetti was introduced to Tchou in New York in the spring of 1954 and at the age of 31, Mario Tchou become the head of the "Divisione Elettronica Olivetti" responsible to conceive, design and construct the first electronic products for the Ivrea company. This represents the birth of the ELEA (Elaboratore Elettronico Automatico) project, which constituted a major technological and commercial breakthrough being presented at *Fiera Campionaria di Milano* in 1959.

The fourth phase comprehends the full development of the computers series ELEA 9003 and P101 and the relocation of the Electronic Division to Borgolombardo in the periphery of Milan. This was an extremely exciting period with *Olivetti* designing and producing two groundbreaking computers, with the participation of architects Mario Bellini, Ettore Sottsass and Tomas Maldonado whose involvement in the full design process was fundamental for the inception of an innovative design praxis.

[2] Centro di Ricerche Elettroniche.

2 Mathematics Computing and Olivetti in America

The need of sophisticated computing machines for the practical use of advanced mathematics was initially claimed by Picone who became overwhelmed with the first news about the appearance of automatic computers in the USA. Since then he started to envision the possibility to raise funds and partnerships to design and build an Italian computer. To achieve this it was important to do study missions in the USA and to the UK, in order to gain first hand insight into the emergent field of computing and electronics. Indeed and at request of Mauro Picone, Gaetano Fichera, (Picone´s student), the mathematician Bruno de Finetti (a consultant at the INAC) and Michele Canepa, visited some of the most advanced research centres in computing, during the Spring of 1950. This coincides with the 1st International Congress of Mathematics, held at Harvard University and at the Massachusetts Institute of Technology[3] (FIG.1), where world mathematicians gathered for their first post-war congress. Picone with Fichera and Guerraggio left from the city of Naples to New York in August 1950 in a ten-day ocean trip on board of the *Conte Bicamano* cruise ship.[4] The group visited several Institutions in the West and East Coast of the USA, but was at the Harvard Computer Lab that better acquaintances were established. Here, Howard Aiken (1900-1973) was building an electromechanic machine that could perform mathematical operations quickly and efficiently. He succeeded in convincing IBM to fund his project becoming thus co-inventor of MARK I, the first IBM electromechanical automatic computer that started to be used in the war effort during the last period of the conflict.

Canepa, Picone, Finetti remained the summer in the USA and all joined the Harvard Congress of Mathematics which had the chairmanship of John von Neumann. The meeting run for a week with several thematic sessions, many of which given by leading scientists whose work become relevant for the field of computing. Namely, Claude Shannon and Stanislav Ulam presented a communication entitled, *Random processes in physics and communications;* John von Neumann and Sydney Goldstein presented, *Partial differential equations;* Norbert Wiener, *Statistical Mechanics*.[5]

[3] August 30-September 6, 1950. The American Academy of Arts and Sciences, Boston College, Boston University, The Massachusetts Institute of Technology and Tufts College.

[4] See for this subject: Guerraggio, A.,Mattaliano, M and Nastasi, P.: Alla fine fu FINAC. In, SAPERE, 42-55, Aprile (2005).

[5] The program also included: Szolem Mandelbrojt, Rice Institute and College de France, "Théorems d unicite de la théorie des fonctions", Saturday, September 2. Section II Analysis; Norbert Wiener, MIT, "The statistical mechanics in communication", conference in applied Mathematics Statistical Mechanics", Wednesday, September 6; Howard Aiken, Harvard University, "Computing Machines", August 31 evening lecture; Claude Shannon, Bell Telephone Laboratories, "Some topics in information theory".

Fig. 1. First International Congress of Mathematicians, ICM, Harvard University and MIT, September 1950.

From the Italian group both Bruno de Finetti and Gaetano Fichera spoke at the congress, which illustrates their knowledge within the addressed topics.[6] The meeting revealed state of the art technology on the application of digital calculating machinery, Picone felt that he was on the right place and the contacts made with Howard Aiken´s Laboratory favoured a research stay of eighteenth months for Michele Canepa. Here Canepa and Giulio Rodinò received training in circuit and component design for electronic digital computers, while working at the Mark IV project. In a letter to Picone dated March 4, 1952, Aiken mentions the work of the Italian mathematicians at his Lab, he says: "... as you know the Mark IV is at its final stage of construction and tests (…) and Giulio Rodinò who decided to not enrol courses at MIT is dedicating is entire time at the this project (…)"[7] (Fig. 2).

Finetti already in 1949 had written an initial article about the working principles of electronic machines, "*Como funzionano le calcolatrici elettroniche*" (Fig.4) takes this opportunity to travel in the USA to attended other important scientific meetings, such as the Symposium on probability at the University of California at Berkeley[8], and the Industrial Computation Seminar, held in New York and sponsored by the International Business Machines Corporation (Fig.5). The ninety researchers who participated, met to discuss the fundamental computational methods applicable in a variety of research problems and this meeting drew upon the success of IBM's Selective Sequence Electronic Calculator (SSEC), built under the direction of Wallace

[6] Finetti presented the communication: "La nozioni di beni independenti in basi ai nuovi concetti per la misura della utilità", In, Proceedings of the International Congress of Mathematicians, Cambridge MA. Published by the American Mathematical Society, 1952.pp: 588-589. Fichera presented a paper entitled: "Methods for solving linear functional equations, developed by the Italian Institute for the applications of calculus". The success of this meeting followed the Symposium of Large Scale Digital Calculating Machinery, which took place precisely one year earlier also at Harvard University and sponsored by the Navy Department Bureau of Ordnance and the Computation Laboratory.

[7] Finetti and Rodinò also attend the International Symposium on Automatic Digital Computing in Teddington, London, March 1953. See: Symposium on automatic digital computation (in collaboration with N. Kitz, and G. Rodinò). In: *La Ricerca Scientifica,* n.7 (1953), 1248-1259.

[8] Finetti presented a paper entitled: "Recent Suggestions for the Reconciliation of Theories of Probability". In, Proceedings of the Second Berkeley Symposium on Mathematical Statistics and Probability, 217-225, University of California Press, Berkeley, 1951.

Eckert, distinguished astronomer and founder of the Thomas J. Watson Astronomical Computing Bureau at Columbia University. Eckert's paper read at the IBM seminar, "*The Role of the Punched Card in Scientific Computation*" caught Finetti attention since he had been working in this filed in Italy at major insurance companies.

THE COMPUTATION LABORATORY OF HARVARD UNIVERSITY
CAMBRIDGE 38, MASSACHUSETTS

March 4, 1952

Howard Aiken
Director

Professore Dr. Mauro Picone
Instituto Nazionale per le
Applicazioni del Calcolo
Piazzale delle Scienze, 7
Roma, Italia.

Caro Professore Picone:

Sono stato molto contento di ricevere la Sua lettera del 20 Febbraio, nella quale ci assicurava che i piani per la costruzione della vostra calcolatrice vanno ormai assumendo forma concreta. Come già ebbi occasione di dirLe, La prego di contare su di una nostra collaborazione, in qualsiasi misura, al fine di portare a compimento questo importante progetto.

Per quanto riguarda Giulio Rodinò, questi già partecipa ai lavori per il Mark IV, ed avendo rinunziato ai corsi al MIT, dedica tutto il suo tempo a questa attività. Già gli abbiamo assicurato che gli è permesso interessarsi di qualsiasi settore egli desideri, per allargare nel miglior modo la sua esperienza. Gli sta diventando prezioso per noi, e quindi sono sicuro che le sarà di valido aiuto quando verrà il tempo del suo ritorno in Italia. Saremo molto felici di ricevere i Dottori Enzo Aparo e Dino Dainelli qualsia si momento a Lei piaccia mandarceli. Come Lei sa, il Mark IV è ancora nella fase finale di costruzione e prove. Quindi, al loro arrivo al laboratorio, il loro primo compito sarà in connessione con la preparazione dei programmi di prova, anzichè con la codificazione di problemi per la risoluzione. In ogni caso la codificazione dei programmi veri e propri per la risoluzione di problemi sarà richiesta tra un mese o due, e non è perciò affatto troppo presto per loro per cominciare, se Lei è d'accordo.

In ultimo, invitato dai governi di Spagna e Belgio, penso di trovarmi a viaggiare in Europa durante il mese di Maggio e la prima metà di Giugno. Avevo già pensato che, ove Lei lo ritenga conveniente, mi potrei fermare per una breve visita a Roma. La prego di farmi sapere se questo sarebbe desiderabile o utile, che in tal caso cercherò di organizzare i miei piani in questo senso.

La prego di gradire i miei migliori saluti ed auguri per Lei ed il Suo Istituto.

Howard Aiken
(f.to Howard Aiken)

Per copia conforme:
IL SEGRETARIO-ECONOMO
dell'Istituto per le Applicazioni del Calcolo
(Dott. Carlo)

Fig. 2. Letter from Howard Aiken to Mauro Picone, March, 1952.

Once Finetti concluded his trip, he wrote a major review about the state of the art computing. Initially published by the University of Trieste, Finetti´s article entitled: "*machines that think and that make you think,"* [9] (Fig.3) was full of first hand analysis gathered during his journey, presenting technical descriptions about the several computing machines he observed and studied. His article, the first in itialan language, presented an apendix with detailled illustrations and photos of the main computers ("machine calcolatrici") he saw: SIMON, 1950, conceived by Edmund Berkeley; the SSEC, 1947, (Selective Sequence Electronic Calculator) designed and built by IBM; the UNIVAC, 1951 (Universal Automatic Computer) designed by Ecert-Mauchly Computer Corperation; the SEAC (Standards Eastern Automatic Computer) built at the National Bureau of Standers, Washingon, D.C, 1950.

[9] "Macchine «che pensano» (e che fanno pensare)", In, Pubblicazioni delle Facoltà di Scienze e di Ingegneria della Università di Trieste. Serie A. Trieste,1952, 40pp.

Wallace Eckert in the meantime, become director of the Thomas J. Watson Astronomical Computing Bureau at Columbia University, writing an important article, "*Electrons and Computation*"[10], in which he describes the advantages of the SSEC calculator, in terms of computation speed and easy use by "any reader of this article." Finetti´s text "*Macchine che pensano e che fanno pensare*", which can also be seen as an inspiration from Edmund Berkeley´s book, "*Giant Brains and machines that think"*, represents fundamentally the earliest source of reliable and detailed material ever made available to the Italian scientific community.

All this insightful information along with the research internship at the Harvard Computation Lab of Picone and Olivetti´s mathematicians strengthened the belief of a possible partnership for the inception of a collaborative electronic venture in Italy.

Fig. 3. Front page of Bruno di Finetti article, "Macchine che pensano", with an illustration and description of the UNIVAC Computer, 1952.

[10] W.J. Eckert. "Electrons and Computation". In, The Scientific Monthly, November 1948.


COME FUNZIONANO
LE CALCOLATRICI ELETTRONICHE
di BRUNO DE FINETTI

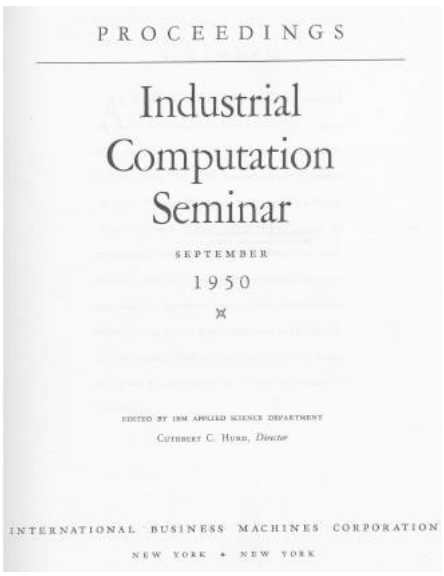

PROCEEDINGS
Industrial Computation Seminar
SEPTEMBER
1950
EDITED BY IBM APPLIED SCIENCE DEPARTMENT
CUTHBERT C. HURD, *Director*
INTERNATIONAL BUSINESS MACHINES CORPORATION
NEW YORK • NEW YORK

Fig. 4. Bruno di Finetti article: "Come funzionano le calcolatrici elettroniche", February 1949.
Fig. 5. Proceedings of the Industrial Computation Seminar, IBM, New York, September 1950.

3 Olivetti Corporation of America

Was this affinity with the American academia and industry mainstream just a happy coincidence or was rather the consequence of a former familiar empathy with the USA scientific milieu? Certainly that we can acknowledge that the Olivetti family had a previous contact with the American University and with its entrepreneur and research environment. Camillo Olivetti visited the USA in the fall of 1894 and for six months become assistant of electrical engineering at Stanford University in California. Later his son Adriano at the age of twenty-five does his first trip in America departing from Liverpool and arriving to New York in August 1925. But probably more important was that Dino Olivetti came to Cambridge, USA, by the end of the 30s, after having participated at the Italian fascist military campaign in Ethiopia that culminated with the conquest of the city of Addis Abeba by in May 1937. In Cambridge, Dino enrolls as a student at the Mechanical Engineer Department of the Massachusetts Institute of Technology where he submitted a dissertation entitled, "*Performance test on a Sterling Diesel Engine*" as a requirement to obtain the Bachelor of Science Degree in General Engineering (1940).[11] Here he also gets an appointment at the Automotive Laboratory, being this stay fundamental for Dino´s new connections with young scientists working in mechanics and electronics both at MIT but also in New York and at Columbia University, something that proved decisive when Olivetti started to recruit for their new Electronic Laboratory in New

[11] Dissertation co-authored with John Vanderpoel under the supervision of Prof. C. Fayette Taylor, MIT.

Canaan. On the other hand, Roberto Olivetti (1928-1985) a strong supporter of the development of *Olivetti's* electronic department, after graduating from economics at the Bocconi University in Milan, does in 1954 a Business Administration course at Harvard University.


olivetti

OLIVETTI CORPORATION OF AMERICA

December 15, 1955

Mr. Roberto Olivetti
Ivrea, Italy

Dear Roberto:

Re: Transistor License

Here enclosed is a copy of a letter I have just received from Western Electric Company.

It seems to me very necessary that you make a decision on this transistor license. If we want to get into this business, I think we will still have to go through these steps.

I also noticed a very important part, that is, the preparation of silicon and germanium diffusion processes which is very important for the preparation of the transistors and photo diodes and rectifiers.

I am very interested with respect to the particular problem of rectifiers because of the possibility of making a cheap electric keyboard both for typewriters and teleprinters, and I was just discussing this point with Canepa. Unfortunately, at the time set for these conferences, Canepa will not be here, so if we get into this business, he will not be able to attend; however, I may even ask him to come back to the States for the three days to attend the conferences, because, at the moment, I don't have anyone else here who would be able to follow them.

Please do something about this and let me hear from you.

All my best.

Fig. 6. Front cover of MOMA Catalogue exhibition, *Olivetti: design in industry*, 1952.
Fig. 7. Letter from Dino Olivetti to Roberto Olivetti, December 1955.

The foundation of the *Olivetti Corporation of America* (OCA) in New York takes place in 1950 with Dino Olivetti becoming its president. The American market was a challenge for *Olivetti* and now with the establishment of a branch in New York, started to be possible to expand *Olivetti´s* commercial boundaries. Moreover with the creation of the *OCA*, the company invested in new and better production facilities, but design excellence was what really set it apart from competitors. Under Dino Olivetti´s leadership in New York an exhibition of the work of the Olivetti Company at the Museum of Modern Art, MOMA is organized in 1952. *Olivetti: Design in Industry* (Fig.6) was at display from October 22 to November 30, showing architecture and industrial design products by the architects Luigi Figini and Gino Pollini, Ugo Sissa, and Marcello Nizzoli, constituting a main surprise to the American public and a major success proving that an industrial company could also be a leading corporation in the design field both within its products as well as within its buildings. *Olivetti* demonstrated to be a model of intelligent and imaginative management, and a cornerstone of Italy's post-war economic revival. Central to its success was its enlightened patronage of contemporary design and art, and the elegance with which they were integrated into its commercial interests. Dino Olivetti was also responsible to open a showroom in New York fifth Avenue, entrusting the design of their store to the Milanese architectural firm of Banfi, Belgioioso, Peressutti and Rogers (BBPR).

It is acknowledged that when Thomas J. Watson Jr. was preparing to succeed his father as chief executive of I.B.M stopped at the Olivetti shop, being so impressed, that he travelled to Italy to meet with Adriano Olivetti to discuss with him a new design policy for IBM. Olivetti machines had sleek designs and a variety of colors and the architectural space of its showroom was modern, full of light, almost as a theatre stage. In contrast, the commercial areas in IBM's offices where still very conventional and not so glamorous. The brand communication strategy competition between IBM and Olivetti has thus its roots in this store of New York with IBM hiring as the company design consultant, Eliot Noyes a well-respected architect and former curator of industrial design at New York´s Moma Museum. Noye´s goal was to create a corporate design program that would encompass everything for IBM´s products. Noyes brought in a wide variety of artists, designers and architects including Charles and Ray Eames, Eero Saarinen and Paul Rand, all working for a new company design philosophy.

While the success of the Olivetti brand in America and particular in New York was rising, their previous partnership with Pisa University and with Mauro Picone regarding the design and construction of an electronic calculator come to and end. Despite the theoretical expertise that *Olivetti* group had recently acquired in the USA, the lack of financial support from the Italian government prevented the project to be realized even if *Olivetti* collaborators were ready to do so. Michele Canepa who was working with the team of Howard Aiken, mentions to Picone in a letter from December 1951, that he was disposed to cooperate whatever decision would be made, he says: "i 18 mesi trascorsi negli Stati Uniti d´America con i solo scopo di studiare il problema mi permettono ora di vedere in modo chiaro quale la strada deve essere seguita verso la realizzazione della ricordata Macchina (...) nel frattempo avrò pure interpellato la Direzione di Ivrea circa il detto progetto e potrò quindi riferire sulla possibilità della mia collaborazione".[12] At this moment Dino convinces his brother Adriano to open an Electronic Research Laboratory in the USA so that the gained expertise would not be lost, but rather focused at the possibility of *Olivetti* moving into the electronics field. Like this Canepa will soon start to work at the newly founded laboratory created by Dino Olivetti in New Canaan, now the residency area of Dino Olivetti´s family.

The city of New Canaan, located 25 miles west of Manhattan and southeast from Boston is considered part of Connecticut's gold coast, where since the mid 1800s, many of New York wealthy citizens lived. After the World War II this quiet and beautiful area, full of colonial and farmhouses houses, become the realm for contemporary architecture and prosperous business. To this setting, contributed very much the establishment of Walter Gropius as professor at the GSD at Harvard University, and modernist architects like Marcel Breuer, Philip Johnson and Eliot Noyes, (known as the Harvard Five) initiated to design houses for their clients and

[12] Translation by the author: the 18 months spent in the United States of America with the sole purpose of studying the problem allow me now to see clearly where the road must be followed towards the realization of the mentioned machine (...) in the meantime I have also asked the Department of Ivrea about the project and I will then report on the possibility of my collaboration. Source: Archivio Storico Olivetti.

themselves in this location, transforming it, in a glamorous and prestigious residential destination.

The role of the electronic research laboratory was pivotal to *Olivetti's* new strategy and Dino´s and Canepa´s leadership is not yet full recognised within the success that Olivetti achieved in its new business. The primary goal of the Laboratory was to do R&D and to stay close to the technological advances in electronics and information technology that were been developed in the USA. The change of correspondence between the *Olivetti Corporation of America* with the Ivrea headquarters, mainly amongst Dino and Adriano, shows a enduring interest of Dino in participating at the last developments of the field, but also inquiring about the viability of incorporating these new technologies in *Olivetti´s* new electronic products. Their communication focused issues such as, the technology that *Philco* used for its electronic brain machine, and consideration about its design. In one letter Dino writes:" the machine is very neatly designed, very advanced in design especially for production"; or in another he speaks about the importance of using and producing electronic transistors, he says: "Here enclosed is a copy of a letter I have just received from Western Electric Company. It seems to me very necessary that you make a decision on this transistor license. If we want to get into this business, I think we will still have to go through these ropes."[13] (Fig.7). Moreover the *OCA* also sponsored Italian graduate students at American Universities with the subsequent possibility of being hired to collaborate with the New Canaan Laboratory, where at its peak, almost seventy researchers and staff worked.

4. Olivetti Computers and the International Exhibitions

In 1937 Pablo Picasso painted for the Spanish pavilion at the Universal Exhibition of Paris his masterpiece, *Guernica*, which displayed the agony and suffering of the Spanish people during the country civil war. Sadly this conflict constituted the offspring of World War II, the *Age of Extremes* as Eric Hobsbawm critically described. WWII forced the development of new technologies and at the early 1950s, major institutions and companies tried to bring to profit their investments and technological breakthroughs. As the Cold War grew out of the devastation of World War II, International World's fairs became staging grounds for displays of the U.S.-Soviet rivalry but also for the exhibit of new technological apparatus. In 1958, *Sputnik* satellite was launched, consumer society was emerging and the population wished to believe that the dawn of a period of peace and progress had arrived. The Brussels International Fair, inaugurated in April of that year, become the setting for this new European will.

The presentation of the two *Olivetti* computer projects coincides with the period of the inauguration of the Brussels International Fair in 1958 and the New York World Fair in 1964. In Brussels IBM participated with an exhibit with the company´s 305 RAMAC, one of the last vacuum tube computers and a modern pavilion designed by Eliot Noyes. For the event, Noyes also commissioned for screening at the IBM

[13] Letters from Dino Olivetti to Roberto Olivetti, December 1955 and December 1956. Source: Archivio Storico Olivetti.

pavilion, *The Information Machine: Creative Man and the Data Processor*, the first film of the Eames Office, bringing to a wide audience the brave new world of computing. If this projection created a great impact by its novelty, Le Corbusier´s pavilion for *Phillips* constituted also a major technological and architectural breakthrough. In that period Le Corbusier was in Chandigarh, the new city he began building in 1951, when we wrote a letter to the French born composer, Edgar Varese inviting him to collaborate at the project. Other important member of the team was Iánnis Xenaquis who was working as an advisory engineer on the structure of the Supreme Court and the hyperbolic tower of the Assembly that houses the Chandigarh Parliament. Xenaquis was collaborating with Corbusier since mid 40s and his mathematical and architectural skills constituted a strong asset for the design of the pavilion that should pay tribute to light, sound and color, since *Philips* was a leading world company in that sector. Within this context, the eighth minute *Le Poéme Electronique*, (Fig.12) was a multimedia project with electronic music, which wasn't written to sound pleasing, but rather to expand the conception of what music could be. It was laboratory created and projected with images in the inner space of the pavilion, transporting the general public, to a new atmosphere of novelty and modernity. Probably influenced by the success of these multimedia projects, the Olivetti Film Office, created for the presentation of its ELEA Computer a striking film documentary, entitled, *Elea class 9000,* with original music by Italian composer Luciano Berio, with movie direction by Nelo Risi and Nuzio Mazzolli, transforming the film into a contemporary advertising masterpiece (Fig.13). Here as well, the music score was at the forefront of electronic technology and Berio one of the most important contemporary Italian musicians used the recently inaugurated "Studio di Fonologia Musicale di Radio Milano" to compose the music for *ELEA class 9000.*

The ELEA 9003 (Fig.8; Fig.9), acronym referring to the ancient city of Elea, known for being the home of the philosophers Parmenides and Zeno, was the first full transtorized computer which mainframe and console design was entrusted to the architect Ettore Sottsass, who aware of the anxiety-inducing image of computing, gave to this apparatus a colorful visual interface (Fig.11). How would one design and give visible form to objects and buildings in a fully industrialized world dominated by the new media? Not surprisingly the work that Tomas Maldonado developed at the Ulm School of Design, Hochschule für Gestaltung, was crucial and very calling for the new electronic project at Olivetti, by creating a new sign system for the computer console interface (Fig.11). This magnificent machine presented a different concept, it had a human scale, its cables were floating in the air, and not under the ground, had a modular system and the console keyboard was designed accordingly to the last semiotic theories. The influence of the Ulm school, had an enormous impact on design thinking of the late 50s, where the role of the designer emerged as a coordinator of various experts.

Construction of the ELEA 9003 began by the early 1958 and one year later, Ettore Sottsass received the Compasso d´Oro design award. By the occasion of the official presentation of the ELEA 9003 computer at the *Fiera Campionara di Milan* in November 1959, Adriano Olivetti says: "L´elettronica non solo ha reso possibile l´impiego della energia atomica e linizio dell era spaziale, ma, attraverso la moltiplicazone di sempre piu complessi ed esatti apparati di automazione, sta

avviando l´uomo verso una nuova condizione di liberta e di conquiste".[14] Unfortunately even within the presence of his Excellency the President of the Italian Republic, Olivetti never received any governmental financial support, contrasting with the huge financial aid that American research laboratories had from their agencies.

Fig. 8. ELEAComputer 9003, 1959.

Fig. 9. ELEA Computer 9003, 1959.

[14] See: Il mondo che nasce, Edizioni di Comunità, Roma-Ivrea 2013.pp.122-123.

Fig. 10. ELEA Computer 9003, for the Monte dei Paschi bank, Siena, presentation brochure, 1959.

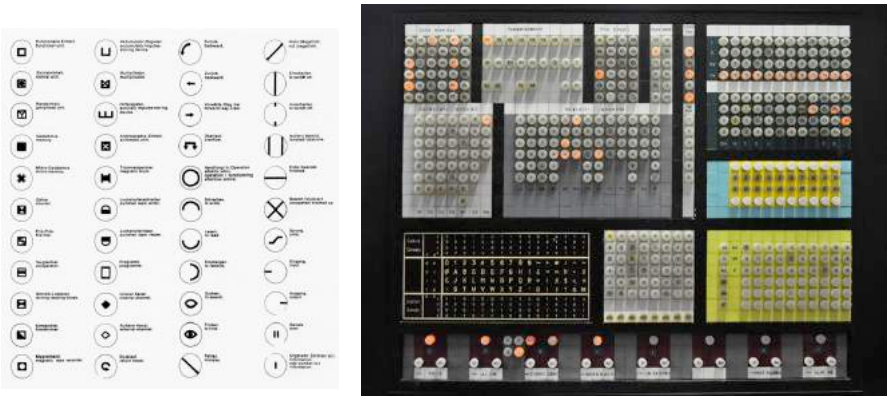
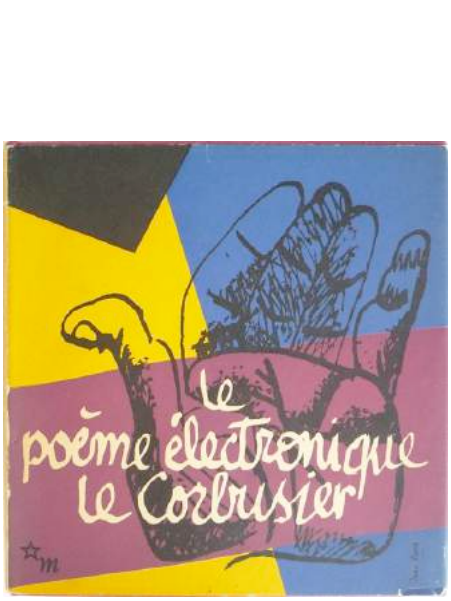


Fig.11. Sign system design, for the ELEA 9003 computer console. Tómas Maldonado with Ettore Sottsass, 1960.

However, upon the optimistic social milieu of the mid 50s there was still a suspended atmosphere of peril and the two major powers agreed to host national exhibitions from the other nation, displaying their “science, technology, and culture”. The Soviet show opened in the Coliseum at Columbus Circle in New York City in June 1959 while the American installment opened in Sokolniki Park in Moscow in July of the same year. For this exhibition Eliot Noyes did the master plan and invited Buckminster Fuller, who designed a geodesic dome for the USA pavilion and where the film of Charles and Ray Eames, *Glimpses of the USA* was projected in several suspended screens.

During the early sixties, the ELEA series represented for Olivetti, almost 30% of the Italian market share, a result that could appear satisfactory since the lack of financial support for such a robust and innovative project. However a far more reaching machine would soon be released due to research, in the meantime, carried out by a few members of the Olivetti Electronic Division, namely, Pier Giorgio Perotto, an engineer who was with Mario Tchou´s team since 1957, Giovanni de Sandre and Gastone Garziera. Together in agreement with Roberto Olivetti they worked on the development of a small, programmable ”desktop computer,” the P101, presented at the World’s Fair in New York in October 1965 (Fig.15), competing successfully with IBM electronic products at display at the company ovoid pavilion (Fig.14) designed by Eero Saarinen and where the Eames film *Think* was at display. Designed long before the spread of the integrated circuit, the Programma 101, as it was called, was completely built with discrete components such as transistors, diodes, resistors and capacitors and an innovative memory drum. Computing appeared as a friendly device and no longer as a ghost (war) machine. The design was by Mario Bellini, a young architect of the Sottsass' team, who soon become one of the main industrial designers of the following years. In an era when people largely regarded computers with suspicion, it had an impact few could have anticipated. The P101 was considered the first personal computer, and was a major commercial success (Fig.17, Fig.18), with companies such NASA acquiring it for the calculations for the 1969 Apollo 11 moon landing, or the Oceanographic Institute at Marseille, which used the P101 for calculations for its ocean research program (Fig.16).



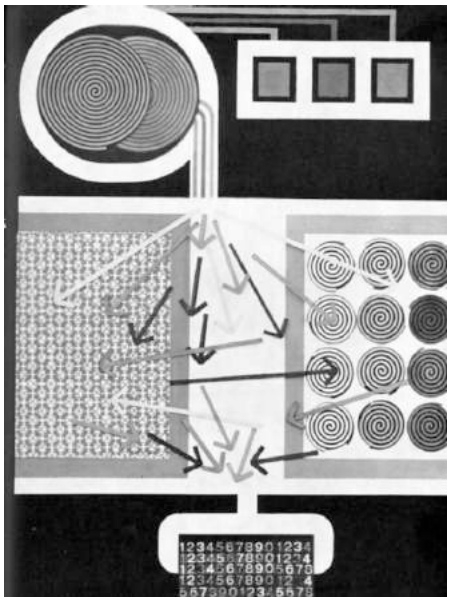


Fig.12. *Le Poème Electronique* by Le Corbusier, 1958 **Fig.13.** Giovanni Pintori, ELEA 9000, 1957

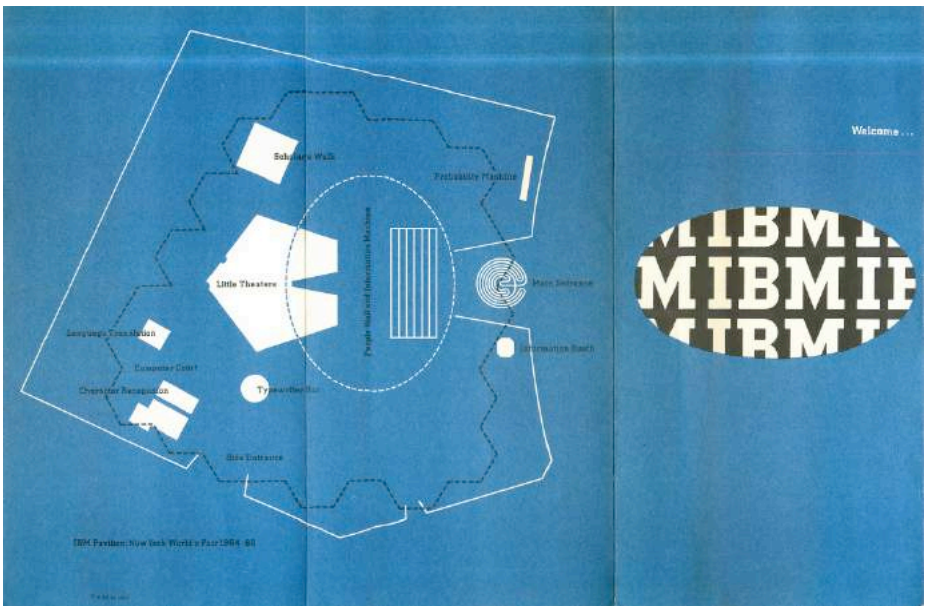


Fig. 14. Paul Rand´s brochure for the IBM Pavilion, New York World´s Fair, 1964/65.

Fig. 15. Presentation of Computer P101 at the New York, 1965.
Fig. 16. Computer P101in use at oceanographic research, Marseille, 1966.

Fig. 17. P101 Computer production line at the Olivetti-Underwood factory, designed by Louis Khan, Pennsylvania, USA, 1970.

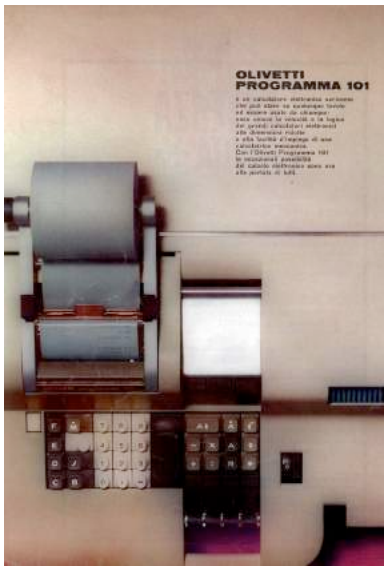


Fig. 18. Olivetti Programma 101 advertising Poster, 1966.

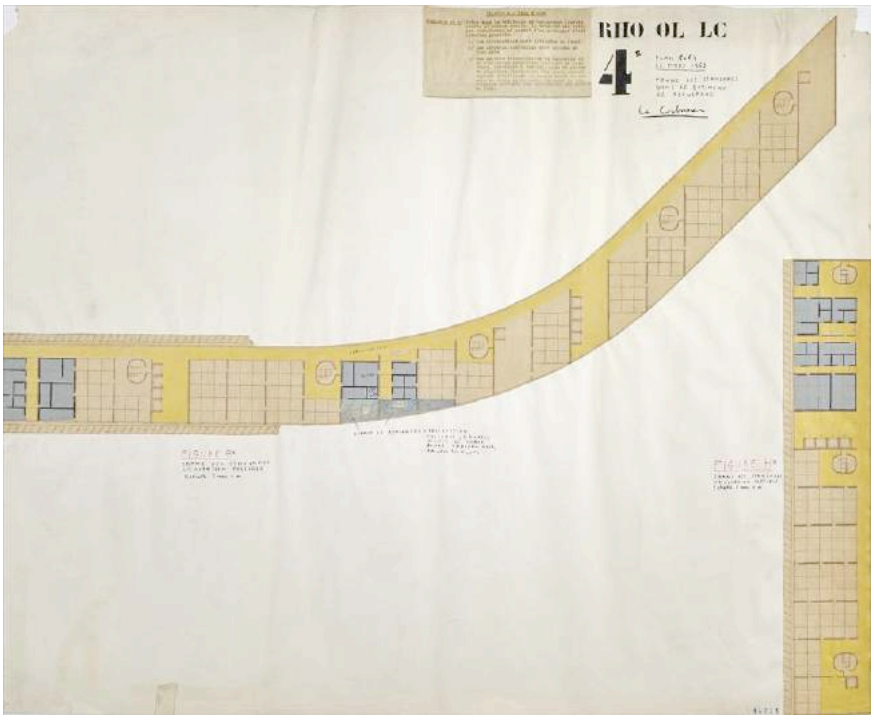


Fig. 19. Le Corbusier drawing for the *Centro di Calcolo Elettronico Olivetti*, 1963.

The initial success of the digital enterprise of *Olivetti´s* company, made Adriano think of new industrial facilities to produce his state of the art computers and Le Corbusier was the chosen architect to develop a master plan and project, for this new "industrial city". The first contacts between Olivetti and Le Corbusier had taken place by the mid 30s when Olivetti decided to promote an international competition for a new social housing complex for the company. With the suddenly death of Adriano Olivetti in February1960, this endeavor would be carried out by his son Roberto, who was also the responsible for all R&D activities of the electronic department. The site for the new electronic factory was located near the city of Rho in the Milan area district, and between 1962 and 1964, Le Corbusier develops three different versions for the project, which regrettably will never come to light (Fig.18). Silvia Bodei in her book, *Le Corbusier e Olivetti*, describes in detail this project, and mentioning that Corbusier in 1965 publishes a full version of the project for the *Centro di Calcolo Elettronico Olivetti* (Oeuvre complète 1955-1965).

5 Conclusion

The numerous technological achievements of *Olivetti* in the field of computing were conducted with a vivid passion and firm belief that electronics would be the leading industry of the future and for its success, a high standard of design was mandatory for all levels of the production chain. Between 1959 and 1966 *Olivetti* developed a different range of products and projects working with architects such as: Marcello Nizzoli, Ettore Sotssas, Mario Belinni, Giovanni Pitori, Le Corbusier, Louis Khan, and earlier with the Ernesto Rogers firm, creating an exiting new culture of design excellence and influencing greatly the design and marketing strategies of its main competitor, IBM. Moreover the P101 computer remained in production at the Olivetti-Underwood factory in Pennsylvania until the late 1971, just five years before the market appearance of Apple I. The design and technology idea associated to Steve Wozniak and Steve Jobs Computer Company, benefited greatly of the several patents and design thinking that Olivetti, Mario Tchou and his electronic group so persistently pursued during their lifetime. No other corporation acted in such an integrated view, and which products, consolidated an inspirational and technological form, for years to come.

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Figure 1. Harvard University Archives

Figure 2. Archivio Storico Olivetti: Fondo Documentazione Società Olivetti / 28. Presidenza / 2. (RISERVATA) Documentazione. Faldone 31, fascicolo 179.

Figure. 3. Bruno de Finetti online Digital Archive.

Figure. 4. In: *Sapere*, n.339-340, (1949).

Figure. 5. International Business Machines Corporation, (1951).

Figure. 6. http://www.moma.org/calendar/exhibitions/2741

Figure. 7. Archivio Storico Olivetti: Fondo Arch.Aggr. Adriano Olivetti/ 22.3 Corrispondenza1925-1960/ 22.3.1. Carteggi per corrispondente. Faldone 5,fascicolo 131.

Figure. 8. Archivio Storico Olivetti: Tratto da: "Olivetti Elea 9003. Nazionale Cogne S.p.A."/ Fondo Biblioteca Sala-F/ Fabbrica e Famiglia. Faldone 5, fascicolo 8.

Figure. 9. Photo published in Journal of the Hochschule für Gestaltung, October, (1962) .

Figure. 10. Archivio Storico Olivetti: Tratto da: "Olivetti Elea 9003. Monte Paschi di Siena" Fondo Biblioteca/ Sala-F/ Fabbrica e Famiglia. Faldone 5, fascicolo 7.

Figure. 11. In, Maldonado, T.: Avanguardia e Razionalitá, Einaudi, pp:52-53,Torino (1974).

Figure. 12. Le Corbusier, Jean Petit. Editions de Minuit, (1958).

Figure. 13. Archivio Storico Olivetti. Fondo Fototeca.

Figure. 14. http://www.eamesoffice.com/eames-office/

Figure. 15. Archivio Storico Olivetti: bib 2210/Indici Emeroteca/1965 / I prodotti Olivetti alla BEMA di New York.

Figure.16. Archivio Storico Olivetti: "L'Olivetti Programma 101 usato per le ricerche oceanografiche a Marsiglia". Fondo Fototeca / Foto Storiche (ex DCUS) / Applicazioni di Macchine. Faldone 1, fascicolo 20.

Figure. 17. Archivio Storico Olivetti. Fondo Fototeca. Foto Ezra Stoller.

Figure. 18. Archivio Storico Olivetti. Fondo Fototeca.

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