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the International Academy of Astronautics**

**Houston, Texas, U.S.A., 2002**

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# Chapter 1

## Contribution of Albert Ducrocq (1921–2001) to Astronautics\*

Christian Lardier<sup>†</sup>

Albert Maurice Ducrocq was born 9 July 1921 at Versailles in Paris region to Armand Ducrocq, a colonial infantry colonel, and Germaine Ducrocq, née Adam. He studied at Saint-Jean de Béthune college and Sainte-Geneviève school in Versailles.

He would stay a part of his childhood in Aix-en-Provence, where his father was assigned. The latter, who was injured during the First World War, would disappear prematurely, like his mother, leaving him as a war orphan.

When he was only 16 years old, he discovered the permanent exhibition on astronautics, which was organized by Alexandre Ananoff (1910–1992), in Palais de la Découverte on the occasion of the universal exhibition. There occurred the birth of his passion for space exploration. Ananoff then headed the astronautic section of the French Astronomical Society (SAF). At that time, the pioneers were Robert Goddard (United States), Konstantin Tsiolkovsky (Soviet Union), Hermann Oberth (Germany), and Robert Esnault-Pelterie (France). The first liquid propellant rockets flew a few kilometers in altitude. Albert Ducrocq passed his baccalaureate and began a scientific career.

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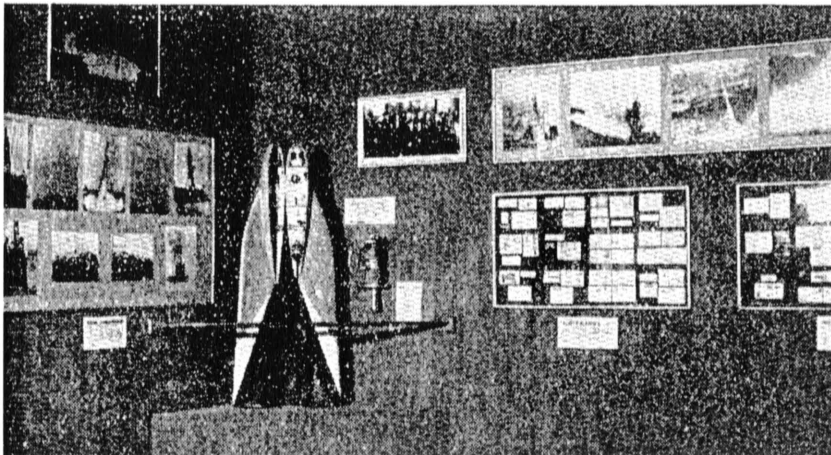
<sup>†</sup>*Air & Cosmos*, Paris, France. I would like to thank Mme Lucie Ducrocq, Guy Longueville, Claude Wachtel, and all those who helped me to realize this biography of that one who was my master during 35 years.

In 1938, he achieved superior mathematics and, in 1939, the special mathematics ranking. Then he passed the entrance examination of Ecole Polytechnique (X). He was received in the Group R1 during the armistice in May 1940.

But the Ecole Polytechnique was transferred to Lyon. He lived there for a while (14, rue Berthelot), then became a re-entry scholar in September 1942 at the Sciences Faculty of Paris University. On 22 November 1944, he was accepted by this faculty to the grade of Licencié es sciences (rational mechanics, differential calculation, and general physics). During the school year 1945–1946, he studied at Ecole des sciences politiques (now Sciences Po).



**Figure 1:** Abert Ducrocq.



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**Fig. 146.** — La première exposition astronautique au Palais de la Découverte en 1937.

**Figure 2:** The 1937 astronautical exposition at the Palais de la Découverte.

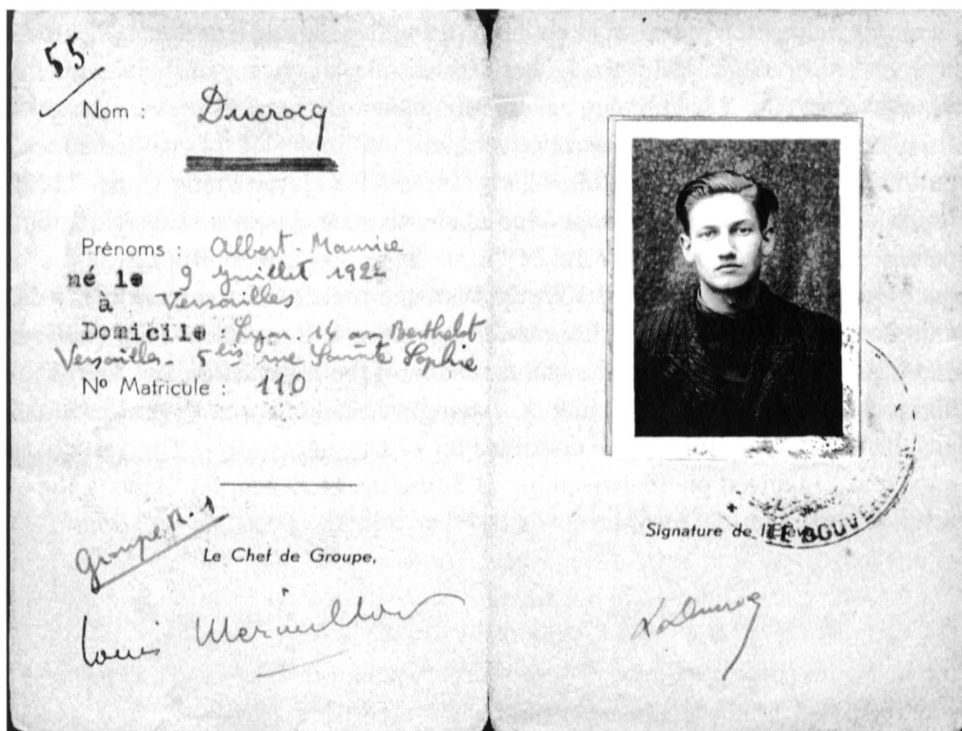


Figure 3: Ducrocq on his admission to Ecole Polytechnique in 1940.



Figure 4: Ducrocq at his admission to Sciences Po in 1945.

He prepared a thesis on atomic physics with Louis de Broglie (1892–1987), who had received, in 1929, the Nobel Prize for the discovery of the wave nature of electrons. On 18 February 1946, on presentation of Professor Louis de Broglie, he was authorized to work at the cabinet library of the mathematics department at the Poincaré Institut of Paris University (11, rue Pierre Curie, 75005). Louis de Broglie would be appointed at the Comité d'action scientifique de la défense nationale (CASDN) in July 1950.

At the end of the Second World War, the rocket and the atom made their entrance in the news with the German V-2 and the U.S. atomic bomb. On 6 July 1945, Ananoff created the astronautics section of the Association des Aéro-Clubs Universitaires et Scolaires de France (having its head office at 5, rue des Ursulines, Paris 5e), which would be dissolved on 17 December 1947. The first conference was organized on 16 November at Sorbonne (156 people). Among the enthusiasts who met on the third Friday of each month in the Milne-Edwards amphitheater of the Sorbonne were Albert Ducrocq, Audouin Dollfus, or Paul Belgodère, secretary of the French mathematical society. “We were then rarely more than 40 people and among them, the scientists were as much as you could count them on the fingers of a hand” remembered Ducrocq (*Air & Cosmos* number 1299 of 29 September 1990). In parallel, Ananoff published four issues of the magazine *L'Astronef*, which was published from July 1946 to December 1947. Moreover, he wrote “La fusée V-2” (The Rocket V-2) in June 1945, “L'énergie atomique, solution au problème de l'astronautique” (Atomic Energy, Solution to the Problem of Astronautics) in the magazine *Les Ailes* in 1945 and “Des premières fusées à la V-2” (From First Rocket to V-2) in September 1947.

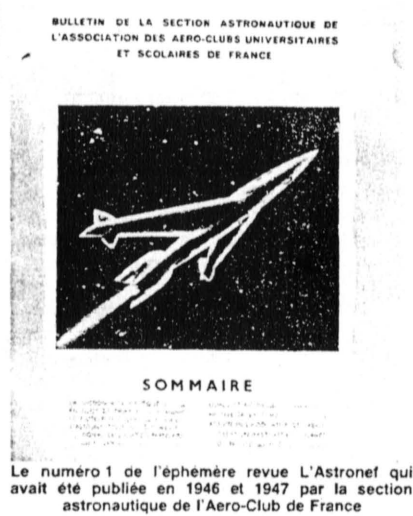


Figure 5: The first issue of *L'Astronef*, 1946.

Ducrocq, who lived then at 5bis, rue Sainte-Sophie at Versailles, became a professor of electronic physics in Ecole supérieure professionnelle. He entered the astronautics section and participated at the First National Congress of French Aviation in April 1946. In a letter addressed to Ananoff dated 2 April 1946, he talked about the possibility of publishing a small book about nuclear propulsion. In his book *Les mémoires d'un astronaute* (Memories of an Astronaut), Ananoff tells that this article was not approved by Max Cosyns, who was a detractor of the nuclear engine. On 17 May 1946, Albert Ducrocq presented on “Le moteur nucléaire” (The Nuclear Engine) in the forum of the astronautics section of Alexandre Ananoff at the Sorbonne. He described a complete system allowing use of atomic energy for an integral reaction motor, which would be very applicable to interplanetary navigation.



**Figure 6:** Invitation to presentation by Ducrocq on “The Nuclear Motor.”

In the *Libération* newspaper of 9–10 June 1946, the journalist Jean Prasteau published the article “Un Français de 24 ans conçoit un moteur atomique.” This was Albert Ducrocq who was presented as a physics specialist, assistant to one of the greatest names to date in French science. Albert explained: “Since 1942, I have been involved actively in atomic research and, since 1943, of

the atomic nucleus. I soon was convinced the whole atomic question contained invention of an engine capable of using and exploiting it. In last April, my plans were achieved.” It was a reaction engine without a nozzle. It consisted of an iron cylinder of a few meters in diameter and length. At the top of the engine pile was the uranium reserve. At the bottom, the plutonium reserve. The fission, which gave the atomic energy and propelled the vehicle, was produced at the bottom of the cylinder. The weight of the cylinder was enormous, due to the proportions that were needed to ensure cooling. “My nuclear engine can be applied above all to the interplanetary rocket. It is in fact the engine, not known until now, and required, essential, to send an astronaut to the planets of the solar system,” he said.

In between, on 17 April 1946, Leo Kowarski, scientific director at Commissariat de l’Énergie Atomique (CEA), spoke about the nuclear reaction engine at the National Congress of French Aviation. The next year, at the second congress held from 1–5 April 1947, Albert Ducrocq wrote the report “L’énergie nucléaire et la propulsion en astronautique” (Nuclear Energy and Propulsion in Astronautics). In 1948, he founded his first association: the Center for Nuclear Studies, of which he became president. With this title, he would organize a conference on the topic “What Will Be the Industry of Tomorrow” on 8 March 1951.

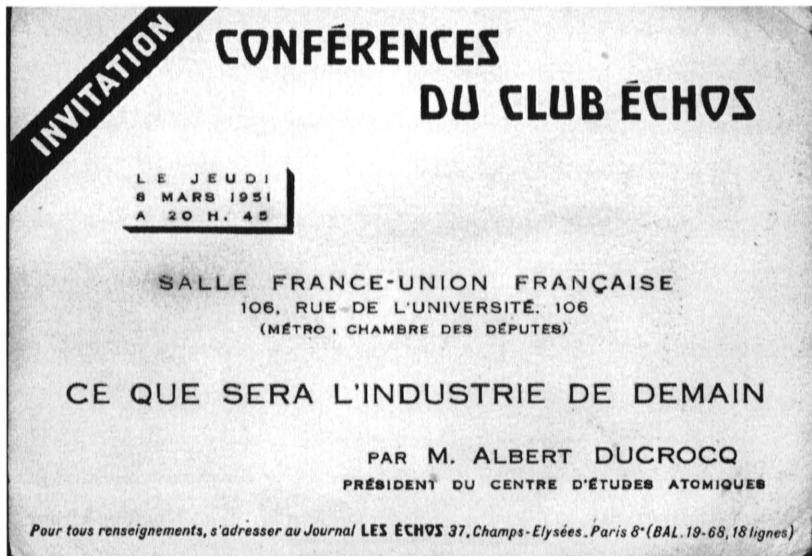


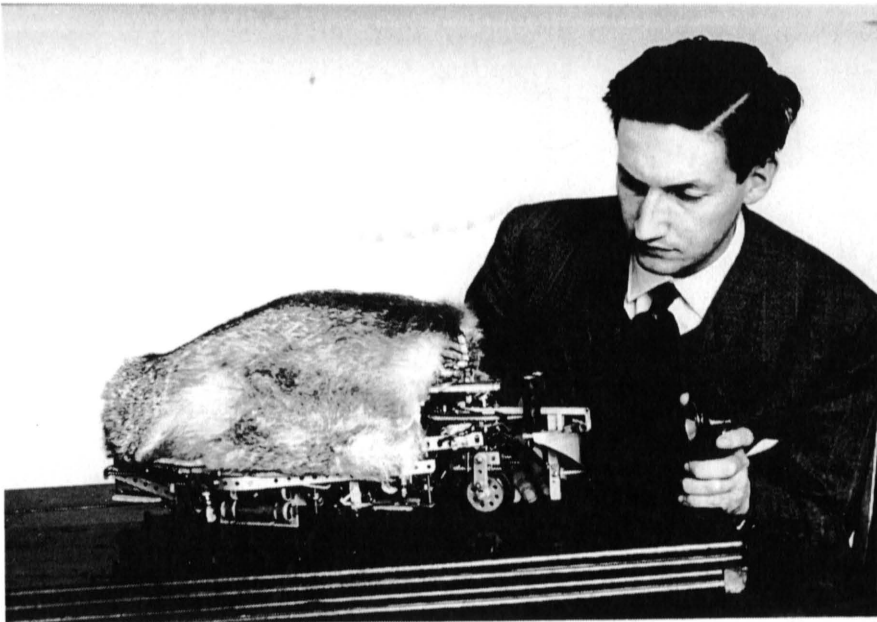
Figure 7: Invitation to conference on “The Industry of Tomorrow.”

In 1947, Ducrocq entered the French astronomical society. He would stay in it all his life. He knew the geography of the universe, in addition to those of the Moon and Mars, without forgetting the terrestrial globe on which he could



identify the smallest place on a picture taken by a satellite. This great traveler wrote *L'Humanité devant la navigation interplanétaire* (Humanity before Interplanetary Navigation) in 1947. At the same time, he met an American who was a specialist involved in the study of the war trophies in Germany. After this meeting, Albert Ducrocq published *Les armes secrètes allemandes* (The Secret Weapons of Germany) in 1947. He also published *Les armes de demain* (Weapons of Tomorrow) in 1949.

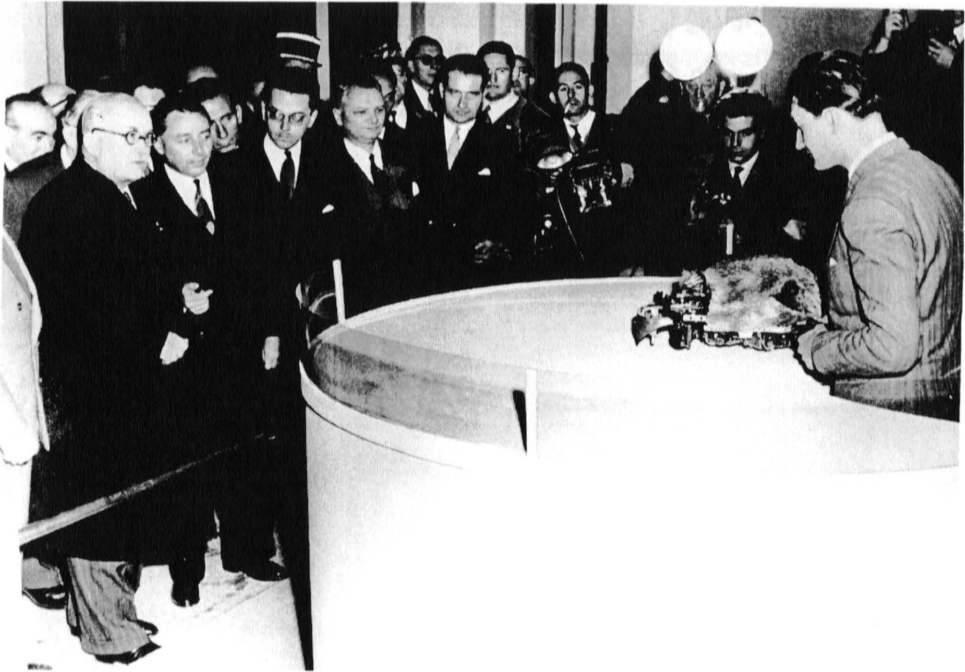
But Albert Ducrocq was most of all a passionate man of electronics who built a radio set with lamps during his childhood. Then came the discovery of the transistor by Bell Laboratories in 1948 and the beginning of integrated circuits at Intel Corporation, Texas Instruments, and Fairchild Semiconductors. The same year marked the beginning of cybernetics with publication of *Cybernetics, or Control and Communication in the Animal and the Machine* by Norbert Wiener (1894–1964). Passionate about this new discipline, Ducrocq became an engineer-consultant in 1949. He participated in the automation of factories, in particular the textiles sector (Saint-Etienne). He created the robot Calliope, a machine that produced texts, in 1952. Then he worked on what would be the most important thing of his professional career: the electronic fox. This robot, named Job, was presented to President Vincent Auriol during the SICOB exhibition in 1953. It would make him internationally famous.



**Figure 8:** Ducrocq with his electronic fox, Job, in 1953.



**Figure 9:** Ducrocq providing a demonstration of Job at SICOB.



**Figure 10:** Demonstration of Job to President Vincent Auriol.

In 1954, he created the electronic informant and, in 1956, the first typewriter with memory Electrostyl, for which he conceived a graphological keyboard and Ana-France (modeling of the French economy). Simultaneously, he

published *Les appareils et cerveaux électroniques* (The Electronic Brains and Apparatus) in 1952, *L'ère des robots* (The Era of Robots) in 1953, and *Découverte de la cybernétique* (Discovery of Cybernetics) in 1955. He then became head of the French society of electronics and cybernetics. In 1957, he was named president of the National Federation of Automation. With this title, he was invited to visit the Institute of Calculation Techniques and Precise Mechanics (ITM-VT) of Moscow, which had created the first Soviet computers. Academician M. A. Lavrentiev built the MESM\* in 1950, and then S. A. Lebedev (1902–1974) created the BESM series in 1951–74. The Soviet computers were also produced by the Cybernetics Institute of Ukraine, which was headed by the great cybernetics specialist V. M. Glouckov (1923–1982) in 1962–82. In the Soviet Union, the great specialist of automation, B. N. Petrov (1913–1980), worked on control systems for space nuclear engines. He was president of the Interkosmos council of the academy of sciences in 1966–80.

In 1960, Albert Ducrocq published *Logique générale des systèmes et des effets* (General Logic of Systems and Effects), which crowned his research on cybernetics. But being an expert in the field of robots, Albert Ducrocq was a fervent supporter of man in space. His meeting with Yuri Gagarin and the first step of man on the Moon would be the strongest moments of his life.

He also began a career as a professor. He taught mathematics first at Ecole des hautes études commerciales (HEC) from 1962 to 1965, then at Ecole des sciences politiques (Sciences Po) beginning in 1966. Due to time and transportation considerations and a heavy workload, he did not follow HEC when the school moved from rue de Tocqueville (Paris 17e) to the campus of Jouy-en-Josas. At this time, modern mathematics was introduced by André Warusfel (Normale Supérieure), Pierre Rosensthiel (Polytechnique), and Albert Ducrocq (all three professors at HEC). Albert Ducrocq and André Warusfel would write *Les mathématiques—Plaisir et nécessité* (Mathematics—Pleasure and Necessity) in 2000.

During the 1950s, astronautics was interesting only to a few “characters.” In France, there was Ananoff, who served as president of the “Aéronautique Club de France” in 1949–51. He assigned the presidency of the first congress of the International Federation of Astronautics, which was held 30 September to 2 October 1950 in Paris, to Henri Mineur, director of the Astrophysics Institute of Paris. The British Interplanetary Society (BIS) and the German Gesellschaft für Weltraumforschung (GfW) were represented, but the United States and Soviet Union were not represented. Fred Durant of the American Rocket Society ap-

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\* MESM is an acronym based on the Russian words for Small Electronic Calculating Machine. Similarly, BESM stands for Large Electronic Calculating Machine.

peared in 1953, but Leonid Sedov (1907–1999) of the Coordination Commission for the Organization of Interplanetary Communications at the Astronomical Council of the Academy of Sciences of the Soviet Union would only come for the first time in 1955. This commission, created in 1954, was composed of Leonid Sedov (president), G. I. Petrov (deputy), A. G. Karpenko (scientific secretary), A. A. Blagonravov (president of the state commission for geophysical rockets), A. G. Massevitch (astronomical council), M. A. Lavrentiev, S. A. Lebedev, V. A. Trapeznikov, B. N. Petrov, and others. In addition, an astronautical section was created at the central aero club of Touchino on 9 January 1954. The section was composed of N. A. Varvarov (president), K. N. Chistovsky (physics and astronomy), I. A. Merkoulov (rocket technics), A. A. Schternfeld (cosmic navigation), A. D. Seriapine (spaceflight biology), and You. S. Khlebtsevitch (radio guidance). The latter had been the author of a Moon-robot project at the end of the 1950s.

Ananoff met Ary Szternfeld (1905–1980) in Paris in 1934. This astronautics pioneer had lived in France from 1925 to 1935. He had finished studies at Nancy University in 1927 and La Sorbonne in 1930. A specialist in calculation of trajectories, he wrote *L'introduction à la cosmonautique* (Introduction to Cosmonautics) in 1933 and had presented his work to the astronautics section of SAF, then at the academy of sciences in January-February 1934. He received the international Robert Esnault-Pelterie–Hirsch prize for astronautics in 1934. In addition, he invented the robot-android before he returned to the Soviet Union at RNII (Scientific and Research Institute of Jet Propulsion) where his book would be published in Russian in 1937. During the war, he lived at Serov near Sverdlovsk, where he taught physics in a machine building technicum. Then he returned to Moscow where he published *Poliot w Mirowoje Prostranstwo* (Flight into Space) in 1949, *Mezhplanetnye Polyoty* (Interplanetary Travel) in 1955, *Iskusstvennye Sputniki* (Artificial Satellites) in 1956, and *Ot Iskusstvennykh Sputnikov k Mezplanetnym Polyotam* (From Artificial Satellites to Interplanetary Travel) in 1957. He became a doctor of science in 1961 and received the Galabert prize in 1962. Albert Ducrocq had a lot of admiration for Szternfeld, whose work on interplanetary trajectories he knew perfectly. Moreover, like Ducrocq, Szternfeld was a robot inventor.

On the occasion of the congress of 1950, Ananoff made a new edition of the magazine *L'Astronef* and published *L'astronautique*. He received the first international Hermann Oberth prize from the GfW. During the congress, Robert Esnault-Pelterie was absent. As a matter of fact, “exiled in Switzerland, ill, fed up, misunderstood, ruined, disinterested in space activities, he died on 6 December 1957, a few weeks after the launch of *Sputnik*,” explained Manuel Bouyssou

of the Institut français d'histoire de l'espace (IFHE). The French Astronautical Society (SFA) was created on 22 December 1955. The first meeting was held on 14 February 1956, and the society published a bulletin beginning in April 1957. The general secretary was Ananoff. The members were General Paul Bergeron (president of CASDN in 1948–55), Colonel Robert Genty (1910–2001), G. Delval (SNCASO), Pierre Contensou (Onera), Jean-Jacques Barré (chief engineer of armament), and Etienne Vassy (professor at the Faculty of Sciences of Paris). “But Ananoff is denigrated or beheld as lesser by Esnault-Pelterie and Barré, mostly for his passionate and disinterested actions. He also departed definitively from his space activities and started working on his painting expertise in 1956” said Bouyssou.

Ducrocq then embraced a journalist career. He wrote articles in the magazine *Science Pour Tous* beginning in 1948, then in editions of *Science et avenir* beginning in 1950. When the *Sputnik* was launched in October 1957, very few people were able to explain to the media what was happening. Ducrocq was naturally called to comment on the event at Europe's number-one radio station, where he would become a scientific advisor in 1960. He published immediately *La route du cosmos* (The Road to Cosmos) in 1957, and then *Victoire sur l'espace* (Victory over Space) in 1959 (translated to English by Putnam in 1961). Then he joined the newspaper *Le Figaro* and the weekly magazine *Air & Cosmos* in March 1963.



**Figure 11:** Ducrocq became the #1 European commentator in 1960.

Albert Ducrocq met Yuri Gagarin for the first time on 7 October 1963 during his visit to Paris. He was coming to receive the international prize named for Henri Galabert (French industrial born in 1914). This prize had been awarded by the French Astronautical Society since 1956 and had already been given to Sztternfeld in 1962.



**Figure 12:** First meeting of Ducrocq with Gagarin in October 1963.



**Figure 13:** The first meeting between Ducrocq and Gagarin.

This meeting deeply impressed Ducrocq, who founded the “Cosmos Club de France” (C2F), of which he would be president (October 1963–October 2001). The Interplanetary Club, created in 1961 by Guy Giami at Lycée Michelet of Vanves to pursue documentation, teaching, broadcasting, and popularization of astronautics, was affiliated with C2F. Quickly, it grew and welcomed also into its ranks the “Club polynésien d’études spatiales” and the Club “Cosmos J-2” of Draveil. The headquarters of C2F was first at 21, rue d’Uzès, Paris 2e (at *Air & Cosmos*), then moved quickly to 6, rue Laborde, Paris 8e. On the other hand, the l’association des amateurs d’aéronautique (Association of Astronautics Amateurs—AAA), which organized clubs that launched rockets of Clermont-Ferrand, Saint-Nazaire, and Montpellier, were affiliated with the ANSTJ (Association Nationale Science & Technique Jeunesse).

The first event of C2F was participation at 16e childhood salon from 30 October to 11 November at Porte de Versailles. On 9 December, in the salons of Maison de l’Amérique Latine, the C2F was presented to the aeronautics press. Among those present were George Février, president of AJPA (Association des journalistes professionnels de l’aéronautique), and Jean-Marie Riche (editor in chief of *Air & Cosmos*). In January 1964, the monthly bulletin *Cosmos-Jeunes* began to be published. The first issue was printed in 500 copies. An English version was produced by Pierre Allain, who headed the American section in New York. The study and documentation sections were headed by Marc Chabreuil (Titan), Jean-Claude Legrand (Gemini), Maurice Layette (Saturn), Alain Didier (Soviet rockets), Alain Dupas (Vostok), Jean-Marie Bue (Europe), Guy Longueville (scientific spacecraft), Alain Bouglouan (lunar spacecraft), Guy Giami (planetary spacecraft), François Chain (telecommunication satellites), and Guy Baudelocque (meteorological satellites).

The first pedagogic activity of the club consisted in “Cosmonautics Lessons,” which were given to students of elementary mathematics during the school year 1963–64. Bertrand de Lagarde, Marc Chabreuil, José Grandcoin, Christian Colongo, and Pierre Kolher were mentioned as “Very Good.” Alain Colle, Jean-Marc Gaultir, Jean-François Paillet, Jean-Pierre Coniot, Marcel Wassen, Jacques Thomas, Michel Mathieu, Jean-Paul Layrens, and Joseph Muller were mentioned as “Good.” On 7 April 1964, the C2F visited the test center of Snecma at Villaroche. The advanced propulsion section was created to develop the MESEX engine (Moteur Electrique Spatial à EXplosion). A difference in potential between two graphite electrodes allowed a mercury conductor to vaporize and create an impulse. The first test was conducted on 11 June 1964. Then on 23 October 1964, the engine was tested in the presence of people from CNES and the aeronautics industry.



**Figure 14:** Ducrocq speaking during a conference at Maison des Centraux.

On 22 January 1965, the bureau of C2F was elected with Albert Ducrocq (president), Jean-Marie Riche (vice-president), Pierre Bougé (general secretary), Jacques Morisset (treasurer), Madeleine Gaydou and Eugène Bollard (administrators), Guy Giami (information section), Aline Bats-Chabreuil (documentation section), Laurette Doriand (advanced propulsion section), Pierre Kolher (optic observation and radio station section), and Roland Morissot (mock-up section). On 20 February 1965, a projection of space movies was organized at Palais de la découverte. On 4 March, a group of C2F met Professor William Pickering of JPL who came to receive the Galabert prize, like Valentina Tereshkova who came to receive it at hôtel Lutétia on 13 May 1965. On 18 June, Guy Giami met Jim McDivitt and Edward White at Le Bourget Airshow. Three days later, Albert Ducrocq met a second time with Yuri Gagarin, who was accompanying the *Voskhod-1* crew (Komarov, Feoktistov, and Egorov) at the 2nd international festival of aerospace movies in Vichy. On 28 December, a second projection of space movies was organized at Palais de la découverte. In March 1966, the C2F received cosmonaut Alexei Leonov in Paris.

In 1968, the *Cahiers de l'espace*, produced by the Cosmos-Information team of C2F, began to be published by editions PIC. The six issues were named "Destination Lune" (Destination Moon), "Les fusées de l'astronautique" (The Rockets of Astronautics), "Découverte spatiale de la Terre" (The Space Discov-



ery of the Earth), “La Lune: aster vivant” (Moon: Living Body), “Les cabines spatiales” (Space Capsules), and “Les cosmonauts” (The Cosmonauts). In June 1969, the C2F published a special bulletin of Cosmos-Information at Le Bourget Airshow. During the *Apollo 11* mission in July 1969, he would transmit a direct report from Europe that would remain graven in everyone’s memories.

On 25 April 1970, President Valery Giscard d’Estaing opened the exhibition “Why Space?” organized by C2F with the support from CNES at Foire de Paris.



**Figure 15:** Ducrocq presents an exhibit.

In 1970, Editions Bordas with the support of Sciences et Avenir began commercializing the famous collection *Cosmos Encyclopédie*. It is still today a reference work. The first four books had the following themes: “Programmes spatiaux” (Space Programs), “L’espace au service de la Terre” (Space to Serve the Earth), “Télécommunications par le ciel” (Telecommunications through the Sky), “La découverte de l’espace” (The Discovery of Space). On 20 February 1971, the C2F and SAF organized a conference about the planets (Jean Kovalewski, Audouin Dollfus, and Albert Ducrocq). On 7 June 1971, at Le Bourget Airshow, cosmonauts Popovitch and Sevastianov had lunch with the

C2F near Champs-Élysées. In 1972, two other *Cosmos Encyclopédie* books were published: “La Lune: monde fantastique” (The Moon: Fantastic World) and “L’exploration des planètes” (The Exploration of Planets). From 29 April to 14 May 1972, the C2F organized the “Pavillon de l’espace” at Foire de Paris. In 1973, three other *Cosmos Encyclopédie* books were published: “L’homme à travers” (Man through Space), “La politique et l’astronautique” (Politics and Astronautics), and “Stations orbitales—ports de l’espace” (Orbital Stations—Harbor of Space). In June 1973, during the Le Bourget Airshow, cosmonauts Leonov, Filipchenko, Eliseiev, and Koubassov had dinner with the C2F in the “Plein ciel” restaurant at the Eiffel Tower. Finally, in 1974, the last three books of *Cosmos Encyclopédie* were published: “Des fusées à la navette” (From Rocket to Shuttle), “L’astronautique: phénomène économique” (Astronautics: Economic Phenomena), and “Vers l’infini” (To the Infinite). Among the encyclopedia authors were Guy Giami, Aline Bats-Chabreuil, Alain Dupas, Claude Wachtel, Théo Pirard, Martine Castello, Catherine Lescure, Michel Cherrier, Chantal Perrotez, Audouin Dollfus, Charles Frankel, Pierre Kohler, Alain Souchier, Christine VERNY, Michelle Saussey, and many others.

In December 1974, the C2F produced special issue number 14 of *Sciences et Avenir* named “La découverte des planètes” (The Discovery of Planets) (Albert Ducrocq, Sylvie Vatoux, Claude Wachtel, Pierre Kohler, Christian Lardier, Philippe de la Cotardière, Charles Frankel, Michel Cherrier, and Christine VERNY). On 17 January 1976, the main bureau was elected in a general assembly: Guy Giami and Alain Hejna (exhibitions-events), Alain Souchier (American programs), Guy Longueville and Christian Lardier (Soviet programs), Catherine Amiot and Frédéric Maron (telecommunications), Dominique Dolisy (Earth from space), Catherine Sauvin and Charles Frankel (planet Mars), Marie Lemaire (far worlds), Isabelle Grenier and Philippe de la Cotardière (astronomy), Michel Cherrier and Chantal Perrotez (biology), and Dominique Le Cornec (study of time).

On 24 April 1976, a conference at Maison des centraux was dedicated to big planets and Soviet launchers. On 2 October 1976, another conference was dedicated to pictures from the Viking mission, life on Mars, and the Viking spacecraft.

From 23 March to 2 April 1977, the C2F organized “Cosmos-77,” the first space festival, at the Velizy commercial center. The exhibition was organized with the support of CNEW, ESA, Matra, Aérospatiale, SEP, and Onera. On 7 June 1977, the C2F organized the “Tomorrow Space” day at Le Bourget Airshow. Among the 18 speakers, there were Hubert Curien, André Lebeau, Jean-Luc Lagardère, astronaut Alan Bean, and cosmonaut Nikolai Roukavichnikov.

In January 1978, the C2F produced special issue number 21 of *Sciences et Avenir* named "La France vue de l'espace" (France Seen from Space) (Albert Ducrocq, Albert Villeret, André Fontanel, Martine Castello, Jacqueline Huttin, Luc Prenier, and Alain Hejna).

On 7, 8, and 9 June 1978, the C2F organized the "Space and Civilization" congress with the support of CNES, ESA, NASA (United States) and IKI (Soviet Union). Nineteen astronauts and cosmonauts were among the participants (Shepard, Schirra, Cooper, Lovell, Scott, Gordon, Eisele, Cunningham, Anders, Irwin, Aldrin, Pogue, Roosa, Mitchell, Carr, Duke, Worden, Djanibekov, and Makarov). An exhibit was presented at the town library by the C2F and SAF. On 8 June 1978, the C2F organized a large conference at Palais des congrès of Lyon. In 1978, a new magazine, *Espace and Civilisation*, was published. The drafting committee consisted of Albert Ducrocq, Philippe de la Cotardière, and Jean-Paul Trachier. Thirteen issues were published between September 1978 and August 1980. Among the article authors were Christian Lardier, Charles Frankel, Michel Bignier, Alain Souchier, Roger Bonnet, and Christian Rau.

On 21 April 1979, a conference of C2F at Maison des centraux was dedicated to Salyut-6, to the planets of other systems and to the Chaîne bleue operation of Albert Ducrocq. As a matter of fact, the C2F became on that period the SETI-France (Société d'Etudes pour une télédétection de l'intelligence) with Albert Ducrocq as president. He published *La chaîne bleue-A l'écoute des civilisations extra-terrestre* in 1979. On 3 June 1980, the C2F produced the SETI-Game from which it presented results at the 31st International Astronautical Congress (IAC) in Tokyo in September 1980 (80IAA61 by Albert Ducrocq and Hélène Lacour). The second SETI-Game was held on 7 October 1980; the third was broadcast on television during the "Objectif Demain" program of 21 January 1981; and the fourth SETI-Game was held on 25 June 1981. The results of these experiences were presented at the IAC of Rome in September 1981 (81IAA300 by Albert Ducrocq). The last SETI-Game was held on 12 March 1982.

In April 1981, the C2F produced special issue number 14 of *Sciences et Avenir* named "20 ans dans l'espace" (20 Years in Space) (Albert Ducrocq, Christian Lardier, Claude Wachtel, Bréatrice Fréchy, Charles Frankel, François Benoît, and Michel Cherrier). In September 1982, it was the operation "Grand livre de la Terre" of Nathan and Kodak with the selection of the iconography among 46,374 documents provided.

The "Ciel et Spacelab" operation was launched during a C2F meeting of at Maison des centraux on 29 January 1983. A competitive experiment to be performed in flight was organized for young people. The selection of ideas was made during the first half of the year. The finalist would be "the flyby of merid-

ian” by Philippe Coué. It would be performed by Ulf Merbold during the flight of Spacelab-1 in December 1983. On this occasion, the group of winners of the competition was sent to the launch at Cape Canaveral, and the results would be presented at the IAC in Lausanne in October 1984 (84IAA242). Among the participants in the competition were Philippe Coué, Gilles et Claudine Leblanc, Pascal Lee, François Robinet, Sylvain Raimbault, Jean-Daniel Kosowski, Emmanuel Galopeau, Frédéric and Isabelle Buchet, Muriel Farizon, Hélène Givaudin, Dorothee Tillois, Jean-Pierre Nouaille, Jean-Baptiste Faure, Alexandre Szames, and Patrick Sibille. On 16 January 1984, the C2F organized a dinner with Ulf Merbold in the salons of the Automobile Club de France.



**Figure 16:** (left to right) Guy Longueville, Pascal Lee and Albert Ducrocq.

From October 1983 to January 1984, the C2F worked at drafting the *Livre de l'espace* (Book of Space), the Mazarine edition of an encyclopedia, which was to succeed the *Cosmos Encyclopédie* of Bordas. Unfortunately, it was never published.

On 30 January 1985, an extraordinary assembly confirmed a reorganization of C2F. The association was given to the “Ciel et Spacelab” team, and the new general secretary was Pascal Lee. The headquarters was transferred to 18, rue Saint-Benoît, Paris 6e. The magazine, *Orbite*, born from the internal bulletin *Ciel et Spacelab*, became C2F’s new magazine. About 40 issues would be published until 1991. A group of future astronauts was formed with Hélène Givaudin, with Patrick Baudry as godfather, and Emmanuel Galopeau, with Claude Nicollier as godfather. The group began the redaction of the Astrion bulletin. On 2 June 1985,

the C2F organized the “Espace et futur” day at Le Bourget Airshow. On this occasion, a prize was given to the winner of the competition of the orbital station “Archeopolis.” On 9 November 1985, a C2F conference at Maison des centraux was dedicated to Halley’s Comet.



**Figure 17:** (left to right): Cecile Givaudin, Sylvain Rimbault, Catherine Lescure, Claude Wachtel, Louis and Guy Longueville, Philippe Coue, Albert Ducrocq, Jean-Pierre Nouaille, Christian Lardier, Isabelle Bichet, Pascal Lee, Frederic Bichet and Helene Givaudin (4 Oct 1986).

After Robert Genty (1984) and Pierre Contensou (1985), Albert Ducrocq became president of the French meteorological society (SMF) in 1986. In January 1986, a special issue of *Orbite* unveiled the secrets of the Soviet Proton rocket. On 22 March, a C2F conference at Maison des centraux was dedicated to the discovery of the solar system. From 8 April to 8 June, the C2F organized an exhibition at Boulogne-Billancourt town hall at the occasion of the 25th anniversary of the Gagarin flight. On 3 May, a C2F conference at Maison des centraux was dedicated to “Man on Mars.” In June 1986, a special issue of *Orbite* unveiled the future *Kvant-1* module of the *Mir* orbital station. From 4 to 7 November, the C2F covered the international congress of planetology at Palais des congrès de Paris. In December, the C2F produced special issue number 61 of *Sciences et Avenir* named “Les planètes et les hommes” (Planets and Men) (Hubert Curien, André Brahic, Albert Ducrocq, Pascal Lee, Christian Lardier, Gilles Leblanc, Jean-Loup Bertaux, Philippe Coué, Roger Bonnet, Muriel Farizon, Isabelle Grenier, Audouin Dollfus, and Thérèse Encrenaz).

On 31 January 1987, a C2F conference at Maison des centraux was dedicated to orbital factories. The C2F study groups worked from March to June in the Pierre et Marie Curie university. Those about cosmonautics emerged in the publication of a special issue of *Orbite* on the Energia rocket, whereas those about planets emerged in the publication of the dossier “Des planètes et des hommes” (Planets and Men) in October 1987. At Le Bourget Airshow of 1987, the C2F participated at “Space and Young World” day and organized the competition on the spatial quotient for the selection of young astronauts.

From 29 September to 9 October 1987, the C2F participated in an event of the “Comité d’établissement d’Air France” at Orly and, from 3 to 30 October, in another event with the cultural center of Mulhouse. A special issue about the 30 years of the space era was published in October. It would be the theme of a conference at Maison des centraux organized on 3 October. On this occasion, the first C2F prize was given to Christian Lardier for his activity inside the association. Pascal Lee (working today at the NASA Ames Research Center), general secretary of C2F, was replaced by Philippe Coué (working today in Dassault) who would occupy this function until the end of 1988 (this function would then be occupied by Patrick Leinot, then Pierre-François Mouriaux).

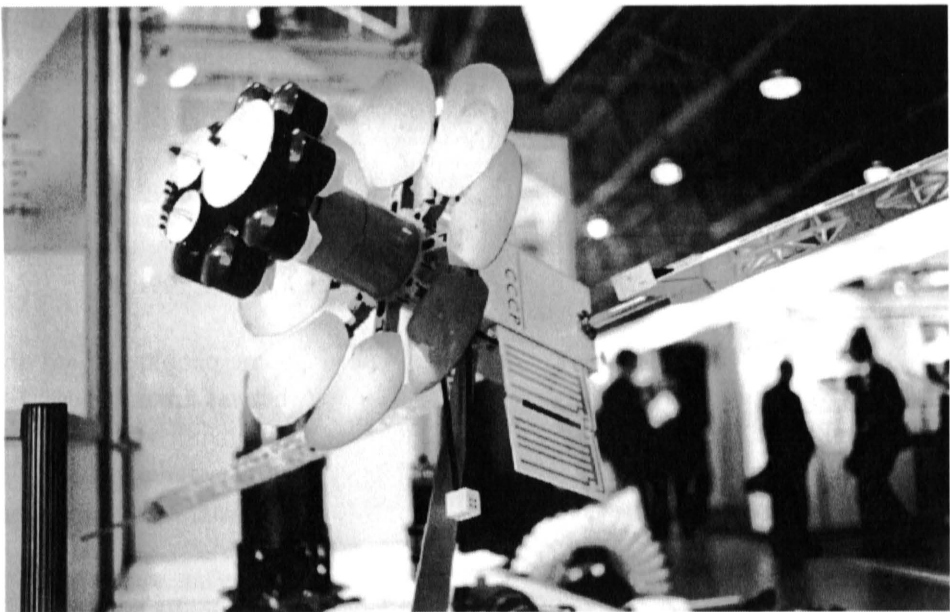
On 30 January 1988, a C2F conference at Maison des centraux was dedicated to “Space and Astronomy.” The press kit about the Phobos mission was published in May 1988. On 25 May, a C2F/SAF conference about Mars exploration was held at the oceanographic institute of Paris. On 9 July, an extraordinary assembly decided to create a Phobos Center, which would publish a regular information letter (ten issues would be published between February 1989 and December 1990). On 15 October, a C2F conference at Maison des centraux was dedicated to “Phobos et l’astronautique douce.”

On 28 January 1989, a C2F conference at Maison des centraux was dedicated to parabolic flights, to Baïkonour, and Bourane. The first special issue of *Orbite* about Bourane was published on this occasion. Then a special issue “Comment l’URSS a perdu la course à la Lune” (How the USSR Lost the Race to the Moon) was produced by Claude Wachtel and Patrick Leinot in September 1989. The C2F covered the symposium about the Phobos mission results, which was held between 23 and 27 October. The next day, a C2F conference was held at the Aéro-Club de France. At this occasion, an *Orbite* press kit about the Voyager program was published, and the 1988 C2F prize was given to Claude Wachtel.

In 1990, the C2F participated in an event at Mulhouse, in a conference at Maison des Arts and Métiers, at Paris Air Trophée of the association Jonathan in Le Bourget, at the 40th anniversary of the first IAC at Palais de la découverte, at

the first conference of club des abonnés d'*Air & Cosmos* at Maison des Arts and Métiers, and launched the “Drapeau de la Terre” operation from Hélène Givaudin’s idea. The competition, organized by Europe number 1, *Air & Cosmos*, and Express, would end on 30 May 1991. The prize would be given at the Le Bourget Airshow during the “Earth Modeling” day. This day also would see the first publication of *Gaya*, special bulletin of the youth section headed by Myriam Humetz, and publication of a special issue of *Orbite* covering ten years of the Space Shuttle. In 1991, the C2F continued the conferences of club des abonnés d'*Air & Cosmos* at Maison des Arts and Métiers. On 12 October, a “Cosmos night” was organized with SAF. The last years of C2F would be less productive and the end of activities would coincide with the Le Bourget Airshow in June 1995.

After that, Albert Ducrocq would become vice president of the Institut Français d’Histoire de l’Espace (IFHE) in March 1999, then honorary president of Association Planet Mars (APM) in May 2000. He, who saw the birth of the informatic, also became president of Bull Institute in 2000. Until his death, he would bring his weekly article to *Air & Cosmos*. The last subject that he brought, on 23 October 2001, was dedicated to the future of geostationary telecommunications satellites, which he envisioned as becoming increasingly heavy and reaching the dimensions of the Globis Russian project (an 18-ton satellite launched by an Energia rocket). But this article would never be published.



**Figure 18:** View of the Globis satellite at the last forum of Albert Ducrocq.

Albert Ducrocq was an encyclopedist. He had tried to unite all the sciences into only one trilogy. It was first *Le roman de la matière* (The Material Novel) in 1963, then *Le roman de la vie* (The Life Novel) in 1966, and finally *Le roman des hommes* (The Men Novel) in 1973. Far ahead of the present time, he recommended what is now the cross-fertilization of sciences.

He was member of the International Academy of Astronautics (IAA), a member of the Académie Nationale de l'air & de l'espace (ANAE), and Chevalier de la Légion d'Honneur in 1991. He had received the academic Palmes and the IAA engineering science book award for *Notre Ciel* in 1991.



Le ministre Hubert Curien (à gauche) remet les insignes de la Légion d'Honneur à Albert Ducrocq. (PHOTO MICHEL ISAAC)

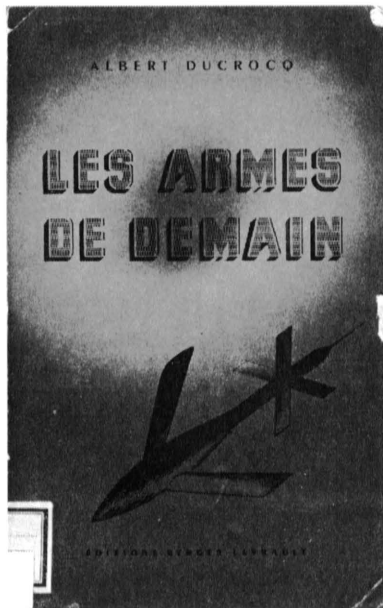
**Figure 19:** Presentation of the Legion of Honor, March 1991.

“Albert Ducrocq was a pioneer of astronautics. Some people will say that he had never built a rocket or a satellite. It’s true, but he was among those, like Tsiolkovsky and, nearer us, Ananoff, who believed in astronautics when nobody was interested in it, who launched innovative ideas useful to space conquest, who ensured this adventure, instead of being limited to specialists, has impassioned millions of people” wrote Claude Wachtel.

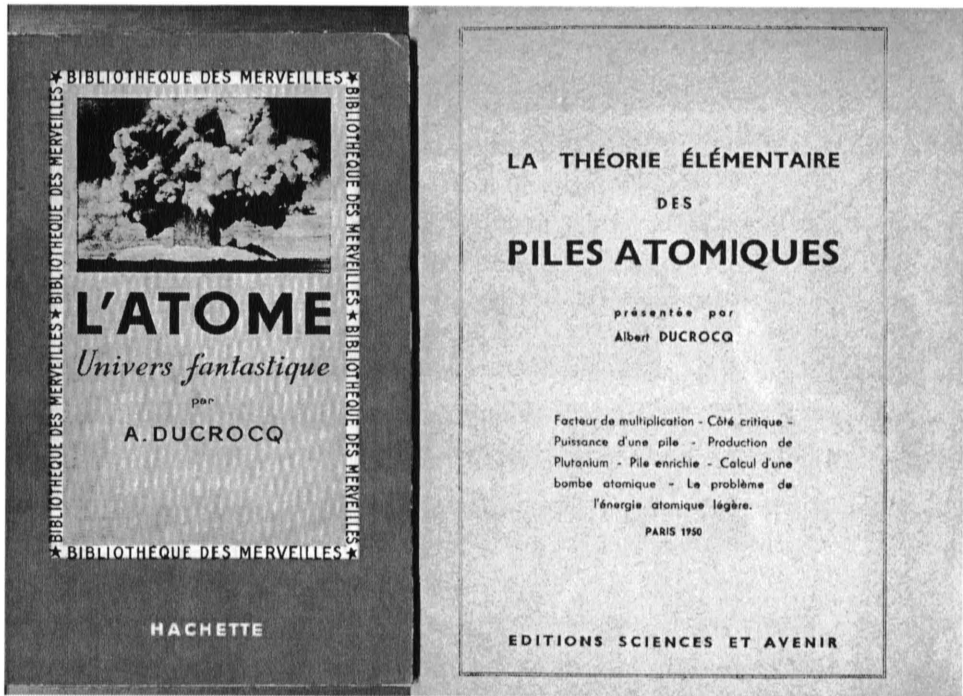




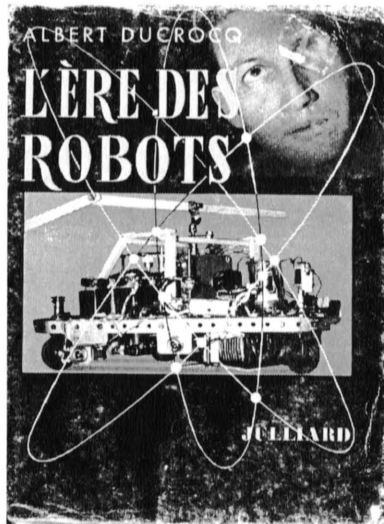
**Figure 20:** The tomb of Albert Ducrocq in Chaville.



**Figure 21:** *Les armes de demain* (The Weapons of Tomorrow) (Berger-Levrault, 1949).



**Figure 22:** *L'atome, univers fantastique* (Hachette, 1951) and *Théorie élémentaire des piles atomiques* (Elementary Theory of Atomic Reactors) (Editions Sciences et avenir, 1950).



**Figure 23:** *L'ère des robots* (Julliard, 1953).

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