

THE CONVERSION OF THE ATOM

NUCLEAR SCIENCE AND IDEOLOGY IN FRANCOIST SPAIN

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At the beginning of the atomic age, Francoist Spain launched an expensive project to develop, research and use nuclear energy. Scientists, the military and high-ranking officials in the administration mobilised to materialise a technoscientific dream with an international scope. The modernity of nuclear science contrasts with the reactionary ideology of the regime, but the paradox is only apparent because until now there has not necessarily been any historical relationship between science and democracy. The drive towards nuclear technoscience reveals the mutual construction of science and politics during the Cold War era and the different ways to appropriate and exploit the atom during the dictatorship.

Keywords: science, Franco regime, technology, nuclear energy.

The study of the relationships between science, ideology and politics during Franco's dictatorship revealed the existence of multiple forms of support between scientists, academics, journalists and members of the Administration. Recent research on evolutionism, chemistry or physics in Francoist Spain does not contrast scientific practice and ideological debate, rather, it analyses their mutual articulation (Anduaga, 2009; Florensa, 2013; Herran & Roqué, 2012; Malet, 2008; Nieto-Galan, 2013). In this article we will examine one of the most representative cases of co-production of knowledge and power during the dictatorship: science and nuclear technology.

On 6 July 1965, the Spanish Minister of Industry, Gregorio López Bravo, detonated a dynamite charge in Almonacid de Zorita, Guadalajara, as a demonstration for the president of the Nuclear Energy Board, the ambassador of the United States in Spain, the president of the company Unión Eléctrica Madrileña and the bishop of Sigüenza-Guadalajara. It marked the start of the construction of the José Cabrera power plant, the first nuclear

plant in the country. According to the NO-DO¹ from 19 July, «the Minister was pleased with the active incorporation of Spain into the peaceful use of atomic energy» (NO-DO, 1965).

The presence of scientific, political, industrial and ecclesiastical figures reveals the importance of the event and of the power dynamics prevalent in the dictatorship. However, the most telling picture of the day was taken not in the gallery of authorities, but in the Zorita Town Hall. This photograph, distributed by the news agency CIFRA, shows a group of residents in front of a model of the new power plant, overshadowed by a banner with the Francoist shield depicting the eagle and the yoke and arrows. An old woman dressed in black, an old man with a straw hat, and a man with the sleeves of his shirt rolled up and his hands resting on the back of a child contemplate the model as if it

«THE VICTORY OVER
THE REPUBLIC GAVE
THE FRANCOIST
GOVERNMENT CONTROL
OVER SPANISH INSTITUTIONS
AND THE SCIENTIFIC
COMMUNITY»

¹ Acronym for *Noticiarios y Documentales* (Newsreels and Documentary films), a series of audio-visual programmes produced by the Franco regime as propaganda; their showing in cinemas before the feature film was compulsory.

was a Nativity scene, while a man with a cap smokes indifferently.

Through the public exhibition of its technological prowess, covered in its own symbols, the regime entered the atomic age without renouncing its own ideology, and in the same way the first nuclear power plant was integrated into a traditional and historic landscape:

Nearby there are [...] some serious and austere Castilian-looking moorlands and hillocks. The ruins of an old castle, with a church and its legends and memories of warriors. On the neighbouring La Oliva hill there was a Visigoth city; remarkable archaeological remains have been found there.

(Baró Quesada, 1968)

The nuclear power plant, in turn, transformed the landscape and updated the image of the regime and its allies. With the twentieth anniversary of Hiroshima coming in just a month, in public opinion the civilian use of atomic energy had neutralised the latent threat of a total nuclear conflict.

The Zorita plant is an example of the mutual construction of science, technology and politics during Francoist Spain, also evident in the Noguera Ribagorzana river dams, the rice varieties cultivated in the laboratory specifically for the Guadalquivir river delta, the uranium mining operations in the Andujar mountain range, or the new reinforced concrete building processes (Camprubí, 2014). Scientists and engineers actively collaborated in all these projects and the regime provided them with laboratories and resources which were selectively distributed, with hints of autocracy, based on Franco's government's priorities. In 1963, the first global study in Spain on the cost of education and research was carried out, as part of the preparations for the I Development Plan. Of the 1,513.8 million pesetas devoted to research and development, only 10.8% was for fundamental research, while the rest was divided between applied research (47.5%) and development (41.7%). Of the 1,158.9 million pesetas invested in public research bodies, three sectors stood out: nuclear energy (25.9%), biological sciences and agriculture (21.5%), and geology and mining (14%); together, these sectors accounted for almost two thirds of the overall expense (Romero & Santesmases, 2008; Roqué, 2012).

Exploitation of the atom was, therefore, a priority in Franco's Spain, as in other countries that wanted to use nuclear energy to recover their glory (like Fourth-Republic France) or become a nation (like postcolonial India). Here, we are interested in the distinctive features of a project that required not only enormous investments, qualified technicians, radioactive fuel, and international relationships, but also the alignment, conversion, and capitalisation of the atom by the dictatorship.



The picture shows a group of residents in front of a model of the Zorita power plant, exhibited in the Town Hall in 1965.

■ THE PURIFICATION OF PHYSICS

Before the first atoms of Spanish uranium, which had been enriched in the United States, were split at the Zorita reactor, the regime had to reconcile them with its own national-Catholic vision of science. This process had two aspects, one better known than the other: the purification of people and institutions, and the ideological appropriation of new theories on the subject.

The victory over the Republic gave the Francoist government control over Spanish institutions and the scientific community. The Board for the Extension of Studies and Research (JAE, for its Spanish acronym), the national body created in 1907 to promote scientific activity and exchange with other countries, was eliminated to create the Spanish National Research Council (CSIC, for its Spanish acronym), in order to «link scientific production with the spiritual and material interests of the Homeland» (decree for the creation of the CSIC, 24 November 1939). The exile, or purging, of the university staff led to the loss of almost half of the active chairs in 1936. The regime took advantage of this void to systematically build and model the scientific community after the war and during the post-war period. As the author of the most detailed study about the destruction of the Spanish university system by Franco points out, «the professors who stayed in Spain and took up positions were those



[ES] MEC.D., AGA. Fondo Medios de Comunicación Social del Estado, signature 33-01377-00003

who created the real and long-lasting wasteland [...] because ideology overtook science and had forty years to perpetuate itself» (Claret Miranda, 2006, p. 360).

Two key people in the nuclear project and in Spanish science policy thrived professionally in this context. The naval engineer José María Otero Navascués (1907-1983), a military specialist in optics, who rose to prominence as a figure in Spanish physics from the end of the war to the 1960s. Otero became the president of the National Physics Council and the Nuclear Energy Board (JEN, for its Spanish acronym), represented Spain as part of international physics bodies, and was the president of the International Committee for Weights and Measures from 1968 to 1976. One of his disciples, the Full Professor of Atomic and Nuclear Physics Carlos Sánchez del Río (1924-2013), who worked with him at the JEN, was the general director of Science Policy at the Ministry of Education and Science, and was the president of the CSIC during the Spanish transition to democracy. As we shall see, both practiced physics from the perspective of scientific humanism, based on the epistemological limitations of the discipline, a perspective that began to take shape before the war.

■ THE CONVERSION OF THE ATOM

For the right-wing ideologists that undermined the Republic during the 1930s and set the stage for the military rebellion, science and technology were modernity idols and agents of culture subversion. Physics, in particular, promoted materialism and atheism through its image of a mechanical world with no soul or spirit, where matter was able to evolve and organise itself without the Creator.

Concern over the monstrosity of science was accentuated at the beginning of the atomic age. References to the Apocalypse are common in many countries after the nuclear attacks against Japan, but in Spain they acquired a very obvious literal sense in the texts of one of the first atomic communicators, the Jesuit astronomer Ignacio Puig. In *La energía nuclear. Las bombas A, H y C* (“Nuclear energy. A, H and

C bombs”), Puig foresaw «the possibility of the world ending because of nuclear energy» and comforted himself with the idea that the annihilation of humanity due to the abuse of natural forces would perfectly fit «the designs of Divine providence», as a catastrophic

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The travelling exhibition «Atoms for Peace», inaugurated in May 1968, presented the peaceful applications of nuclear energy to the general public, with material from the «Atoms for Peace» campaign of the United States Atomic Energy Commission (AEC).



[ES], MECD, AGA. Fondo Medios de Comunicación Social del Estado, signature 33-03652-00014

The general director of the Nuclear Energy Board, Otero Navascués, faced the challenge of simultaneously maintaining Spain's connection to the CERN as well as to a nuclear project in its execution phase. In the picture, a cartoon titled «Otero Navascués: To be, or not to be a member of CERN – that is the question».

end of the world resulting from a natural cataclysm (Puig, 1954, p. 413).

This view of science represented a problem for a regime that could not abandon the use of such a powerful weapon in an ideological and economic battle. The answer was the spiritualisation of science by integrating it into a single Christian tree of knowledge. This appropriation manoeuvre, explicitly expressed in the decree for the creation of the CSIC, found support, according to modern reactionaries, in contemporary physics theories, because relativity and quantum mechanics proved the failure of the rigidly deterministic universe of classical physics. The physicist José García Santesmases (1907-1989) wrote in his public examination report in 1944:

In the current century, physics [...] has experienced an unexpected and wonderful transformation. There has been a spiritual revolution, but one under the banner

of tradition, equally separated from idealism and materialism, and establishing an intimate and mysterious rapport between matter and spirit.

(Otero Carvajal, 2014, p. 144)

The physicist Julio Palacios insisted in 1947: «Everyone speaks about a crisis in physics because it has stopped being rational and has become what we could call a mystical doctrine, based on principles that are inaccessible to reason» (Palacios, 1947, p. 15). These are only two of the many references to Heisenberg's uncertainty principle and to the non-causality of the scientific humanist discourse during the dictatorship, exemplified by Otero and Sánchez del Río. It was not simply a matter of taking a metaphysical stance, because this form of humanism materialised in the management of the nuclear project and in Spanish research (Herran & Roqué, 2012; 2013).

■ ATOMS FOR PEACE

Once physics was reconciled, the atomic dream was spurred on by the existence of national uranium deposits. The Board of Atomic Research was created in 1948; it was a private institution that became public in 1951 as the JEN. The JEN promoted research and training in physics and nuclear technology, and coordinated efforts to search for and mine uranium, but its relationship with scientists and foreign institutions was intense from the start. The signing of the USA-Spain agreements in 1953, which included the installation of military bases in Spain, contributed to Spain's incorporation in the international isotope distribution programme *Atoms for Peace*, launched by the Eisenhower administration to promote a benign image for the atom and to achieve world hegemony for the North-American nuclear industry (Krige, 2006). Otero Navascués and Sánchez del Río, as members of the JEN, would be part of the Spanish delegation to the International Conference on the Peaceful Uses of Atomic Energy in Geneva (August, 1955), along with representatives from the Ministry and executives and engineers from the electricity industry (Romero de Pablos, 2012; Romero de Pablos & Sánchez Ron, 2001).

While the companies and financial partnerships that would support the national atomic industry were created in Spain, the JEN negotiated Spain's admission to the CERN (acronym for its original French name, European Council for Nuclear Research, now the European Organization for Nuclear Research), a key research institution for European construction after World War II. Spain joined in 1961, after negotiating a favourable fee reduction. But the disparity between



Picture of the José Cabrera nuclear plant in Almonacid de Zorita, Guadalajara. It was the first plant of this type in Spain and worked until 2006, when it ceased its activity.

the research culture of Spanish scientists and their European colleagues, together with the lack of contracts for Spanish companies and the progressive increase in the membership-continuity fee, led Spanish authorities to question the advantages of remaining part of the institution. In 1963, Spain contributed 55.7 million pesetas to the CERN, almost a third of the whole national budget for fundamental research. It was a huge amount compared to the 14 million pesetas devoted to mathematics and astronomy research, or the 17.4 million pesetas devoted to medical research, but it pales in comparison to the 300 million pesetas devoted to nuclear energy itself.

■ TO BE, OR NOT TO BE A CERN MEMBER

As the general director of the JEN since its creation and its president since 1958, Otero faced the challenge of simultaneously maintaining Spain's connection both to the CERN (essential for the budding Spanish community of high-energy physicists) and to a nuclear project in its execution phase. The question of maintaining membership ended up in the hands of

«ZORITA IS AN EXAMPLE OF THE MUTUAL CONSTRUCTION OF SCIENCE, TECHNOLOGY AND POLITICS DURING FRANCOIST SPAIN»

a divided inter-ministerial committee. The Ministry of Foreign Affairs was in favour, but the Ministry of Finance considered the links to European fundamental research less important than the energy needs of an expanding economy. In August 1968, the Spanish government communicated their intention to leave the institution to the CERN. The decision was widely discussed in the press, especially after the cabinet confirmed it on 8 November 1968, and it sparked a response in Madrid and Barcelona universities, where students and professors participated in acts of protest in the science faculties. The reaction, however, was not unanimous. While the Full Professor of Thermodynamics at the Central University subscribed to the opinion that CERN «was bad business for Spain», the Faculty of Science at the University of Barcelona published a statement denouncing the harm leaving would mean for Spanish universities and research (Riquer, 2010; Roqué, 2012).

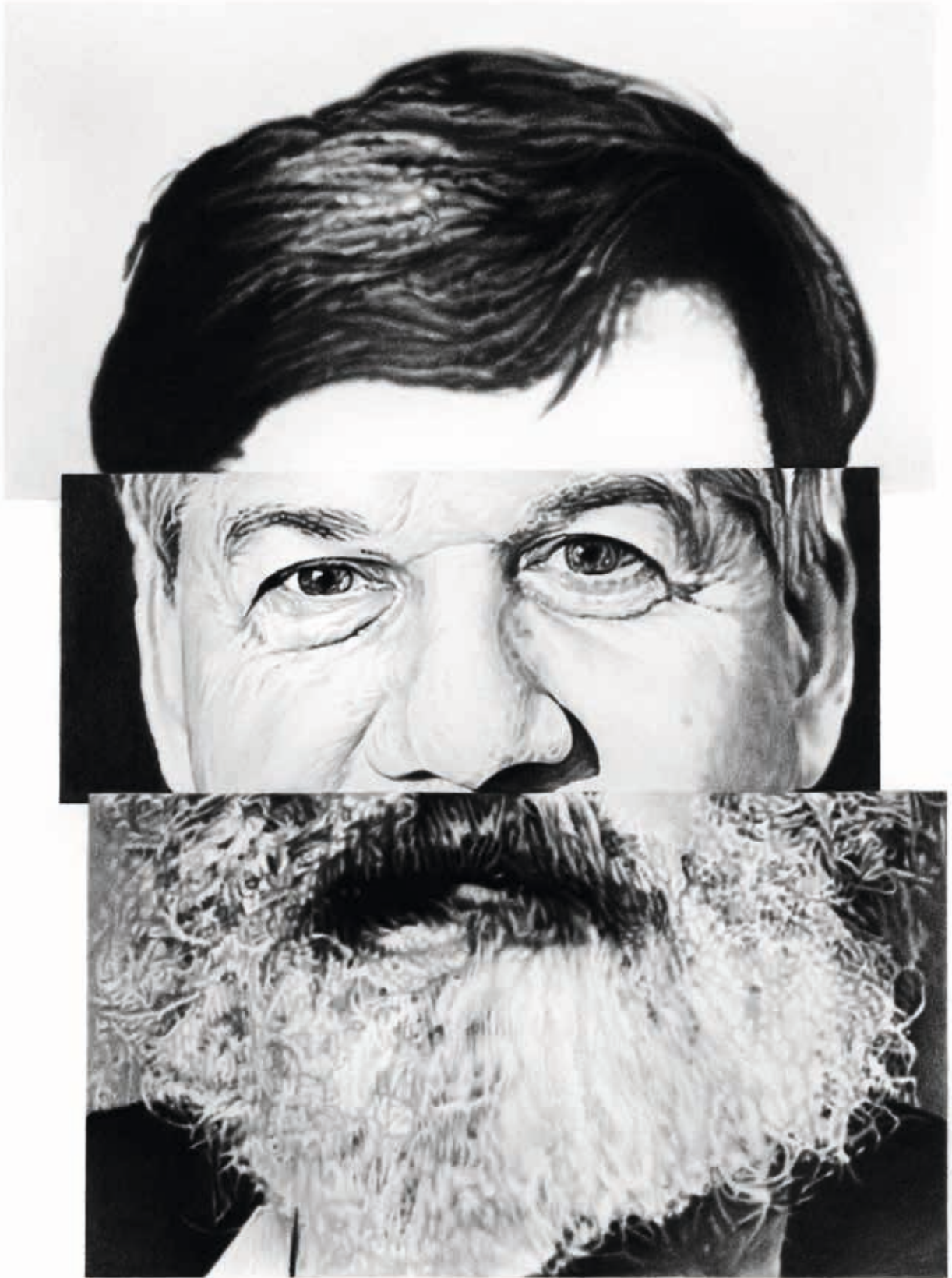
Meanwhile, Zorita prepared for the Supreme Commander's (Franco's) visit, scheduled for 12 December. The inauguration of the José Cabrera power plant featured the unexpected presence of Bernard Gregory, director of the CERN. In Madrid, Gregory had been maintaining conversations with Spanish

high-energy physicists and with the Minister of Education, José Luis Villar Palasí, in order to guarantee Spain's continuity within the organisation. Their work had immediate effects and the withdrawal request was provisionally halted. But the decision was already taken, and the Ministries of Education, Science and Industry issued

official statements on the matter. The government had decided to reduce their participation in the CERN and committed themselves to the industrial development of nuclear energy. Therefore, the funds that, until then, had been intended for «a pure research institution» could be devoted to obtaining «practical results, with more social adjustability, in the shorter term» (*Abc*, 1969).

■ CONCLUSIONS

In 1938 the North-American sociologist Robert K. Merton defended the ethical coherence between science and democracy: «The conflict between the totalitarian state and the scientist derives in part, then, from an incompatibility between the ethics of science and the new political code which is imposed upon us all» (Merton, 1973, p. 258). His reflection was motivated



Ernesto Casero. *Non-Galtonian composite portrait*, 2016. Charcoal on paper, 70×100 cm.

by the changes in innovation, education and research systems in countries that competed for scientific and economic hegemony with conflicting organisation models (Pestre, 2008; Shinn, 2002). Although the Mertonian ideal of universal, democratic, communal and altruistic science became unsustainable during the Cold War era, it still conditioned the perspective on science in non-democratic regimes.

In the case of Francoism, the general opinion was that there was no real science, or that science was done despite the regime. Sánchez del Río, for instance, considered that the ideological intervention of science was superficial and that the scientific policy of the regime was beneficial and not very intrusive, to the point that it showed some continuity with the science of the Republic. In an article written in 1990 on the fiftieth anniversary of the creation of the CSIC, he lamented the scientific exile caused by the war but warned about «the description of such a regrettable situation by some very unobjective current-day historians. Because not everyone who left was valuable and not everyone who stayed was incompetent. There was a mixture of everything, logically, because talent and the capacity to work do not have a monopoly on any specific political ideology». An impartial analyst should not be blinded by «imperial phraseology and [...] symbolic images», because Spanish science was only politicised towards the end of the Francoist era, especially at universities, «where the mixture of opponents to the regime and the spirit of 1968 made any serious work impossible» (Sánchez del Río, 1995, pp. 261 and 264).

However, science and politics are, as we have seen, a precious resource to each other, even in totalitarian systems, where the emphasis on ideological distortion has overshadowed other debates. What space was there for scientific practice, apart from within the designs of Franco's regime? How did exiled scientists or those who worked abroad interact with the scientists who trained in Spain after the war? What elements of scientific and industrial infrastructure created during the dictatorship were continued in democracy? An approach to these and other questions needs to transcend the idealised vision of the nature of science and its political relations. ☺

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