

MEMORIA CIENTÍFICO-TÉCNICA PROYECTOS COORDINADOS

Convocatoria 2023 - «Proyectos de Generación de Conocimiento» y actuaciones para la formación de personal investigador predoctoral asociadas a dichos proyectos.

AVISO IMPORTANTE - La memoria no podrá exceder de 35 páginas. Para rellenar correctamente esta memoria, lea detenidamente las instrucciones disponibles en la web de la convocatoria. Es obligatorio rellenarla en inglés si se solicita 100.000 € o más (en costes directos).

IMPORTANT – The research proposal cannot exceed 35 pages. Instructions to fill this document are available in the website. If the project cost is equal or greater than 100.000 €, this document must be filled in English.

1. DATOS DEL PROYECTO

TÍTULO DEL PROYECTO COORDINADO (ACRÓNIMO):

Zonas de intercambio en la producción y regulación de la tecnociencia en la Península Ibérica: Académicos, activistas y industria, 1930s-1990s (EXCHANGESCI)

TITLE OF THE COORDINATED PROJECT (ACRONYM):

Exchange Zones in the Production and Regulation of Technoscience in the Iberian Peninsula: Academics, Activists and the Industry, 1930s-1990s (EXCHANGESCI)

DATOS DE LOS SUBPROYECTOS - SUBPROJECTS DATA

SUBPROYECTO 1:

IP 1 COORDINADOR/A 1 Jaume Valentines-Álvarez

TITLE: Exchange Zones of Epistemic Resistance and Alternative Innovation: Activism, Grassroots Movements and Expertise, 1970s-1990s

SUBPROYECTO 2:

IP 1: Ximo Guillem Llobat

IP 2: Ignacio Suay Matallana

TITLE: Exchange Zones in the regulation of technoscience: Universities, Industries and the Public Sphere, 1930s-1990s

TÍTULO DEL PROYECTO (ACRÓNIMO):

Exchange Zones in the Production and Regulation of Technoscience in the Iberian Peninsula: Academics, Activists and the Industry, 1930s-1990s (EXCHANGESCI)

2. JUSTIFICATION AND CONTRIBUTION OF COORDINATION

This coordinated project results from a long-term collaboration between the History of Science Institute (formerly Centre d'Història de la Ciència, CEHIC) at the Universitat Autònoma de Barcelona (UAB) and the Institut interuniversitari "López Piñero" (IILP), a joint center of the Universitat de València (UV), Universitat Jaume I (UJI), Universitat Miguel Hernández d'Elx (UHM) and Universitat d'Alacant (UA). After nearly 25 years of collaborative research on the history of science in Spain, the coordinated project involving these groups is now led by younger researchers as Principal Investigators, has integrated renowned international scholars and has moved on to new disciplinary, interdisciplinary and transnational challenges.

While the past joint projects have focused on the publics of science, on the circulation of science, on the social construction of expertise and on what American historians Robert Proctor and Londa Schiebinger defined as "agnotology" (the study of ignorance) (Proctor and Schiebinger, 2008), this new coordinated project goes a step further by broadening two

historiographical concepts: a) “contact zones”, that is, “social spaces where disparate cultures meet, clash, and grapple with each other, often in highly asymmetrical relations” (Roberts, 2010; Musselman, 2010); b) “trading zones” understood as symbolic and spatial sites in which the local coordination of beliefs and action between different scientific and epistemic subcultures would take place (Galison, 1997). These two concepts are articulated within the novel historiographical framework of “exchange zones” in order to include a wider array of actors, spaces and practices in the process of production and regulation of technoscience and to contribute to making the past (and the discipline) more inclusive in terms of gender, class or racialized minorities. The project focuses on those zones in which the academic world, the industrial world and citizens’ groups have historically come together to make (and occasionally de-make and re-make) scientific knowledge, technological artifacts and sociotechnical imaginaries.

In order to develop this perspective which challenges the international discussions on knowledge politics, the project requires the close involvement of the abovementioned groups based in Barcelona and Valencia as they have been cornerstones in the study of the complex processes of circulation of science, expertise and lay knowledge for more than two decades. Besides their high productivity standards and internationalized research, these two groups are behind the only joint M.A.r-Ph.D. graduate programs in history of science in Spain. This program has a strong emphasis on science communication, heritage and scientific expertise in society. Within the framework of both graduate programs, this new project EXCHANGESCI foresees regular exchanges of graduate students of both groups working on this topic, as well as research seminars, publication outputs and outreach activities involving the members of both research teams. Moreover, it will reinforce international networks in which both teams have been involved over the last decade.

3. JUSTIFICATION AND NOVELTY OF THE PROPOSAL

The historiography of science in recent decades has dealt with the circulation of knowledge as a central theme. This circulation has generated large debates in which diffusionist models (expressed in terms of transmission and reception of knowledge) were replaced by models based on the circulation of knowledge (as communication and appropriation of ideas and practices) (Gavroglu et al., 2008; Raj, 2013). These standpoints were strongly influenced by the work by James Secord *Knowledge in Transit* (2004). Secord suggested that historians of science, in conducting studies, should always consider science as a form of communicative action. And following this argument, he seemed to encourage the move from a history of science focused on local studies, which has been dominant for decades under the slogan “science in context”, to a new stage defined by the “knowledge in transit” (Secord, 2004).

Far from closing the debates on the meaning and significance of the circulation of knowledge, scholars criticized the fact that the emphasis on the circular nature of communication could invisibilize power relations in science and could suggest that people, information, and material objects flow smoothly along networks and channels (Fan, 2012; Kapil, 2013). Two previously coined concepts dealing with the communication of knowledge between different groups can help to overcome this misleading representation: Mary Louise Pratt’s contact zone and Peter Galison’s trading zone. These two concepts will be central to this project.

Pratt defined the contact zone as the space of colonial encounters in which people from different geographies (and even temporalities) come into contact with each other and establish relationships that can involve coercion, inequality and conflict (Pratt, 1992). Since then, the concept of contact zones has been used extensively by scholars in postcolonial studies to analyze colonial encounters, but it has also permeated the work of historians of science. Authors such as Fa-ti Fan (2007), Londa Schiebinger (2004), Lissa Roberts (2010) and Kapil Raj (2011) have drawn on Pratt’s concept in their publications on science in imperial/colonial contexts. Yoshiyuki Kikuchi has applied it in his study of interactions between Japanese students and their British and American teachers in the field of chemistry

(Kikuchi, 2013). In the framework of our project, contact zones will be defined as spaces of interaction between groups approaching the same problem from disparate disciplinary, professional and political subcultures, expressing themselves in different languages and yet needing to communicate with each other in order to advance in solving that problem. Neither Pratt nor other authors went far in defining the limits of the concept of contact zone. It has therefore remained a flexible concept and this allows us to reframe it as an adequate analytical tool for the framework of our research project.

The concept of contact zone is of special interest when articulated with the other abovementioned concept, trading zones, which was proposed by Peter Galison. The concept of trading zones was described in the book *Image and Logic: A Material Culture of Microphysics* published in 1997. Galison applied it to the study of the interactions between three subcultures within high-energy physics (theorists, experimentalists and engineers or instrument builders) (Galison, 1997). In Kuhnian terms, these subcultures could be considered incommensurable because there was no agreement among them about what entities existed, how they should be classified, and how their existence could be demonstrated (Galison, 1999). However, these subcultures had to dialogue together and reach a certain level of coordination and mutual understanding. In order to analyze this interaction, which would usually require the establishment of a common language, Galison proposed the concept of trading zones, understood as sites (partly symbolic and partly spatial) in which the local coordination of beliefs and actions between epistemic subcultures would take place.

This first conception of trading zone received a good number of objections in subsequent years (Fan, 2012) on the grounds that: it assumed an excessive stability of the subcultures that interacted; it made power relations invisible; it reduced the sort of exchanges (it was even criticized for imposing a neoliberal conception of science in which exchanges were associated with profit-making). These criticisms were convincingly answered in later works by Galison (2010). Authors such as Michael E. Gorman (2002) were able to identify the potential of this analytical category and developed it further by bridging it with concepts such as Collins and Evans' "interactional expertise" and Star and Griesemer's "boundary objects" (1989).

In 2010, Gorman edited a book to further develop the theoretical framework of trading zones (Gorman, 2010). This work identified up to 5 different types of trading zones which not only involved different degrees of cooperation or coercion between groups in their exchanges, but also different degrees of homogeneity or heterogeneity among the cultures or subcultures involved. In addition, that book assumed a historical conception of trading zones and emphasized how a specific trading zone could change from one type to another in the interaction process. The trading zone, as such, could even disappear once it evolved into a disciplinary community.

Despite the sophistication of the literature on trading zones, both the proponents of the new classification (Collins, Evans and Gorman) and Galison himself stressed the open nature of these concepts and classifications, which were not intended to be prescriptive. They invite a novel appropriation of these concepts and we intend to do so in the context of this project focused on the zones of encounter beyond laboratories and university departments. In the work of Gorman et al., there are key elements that are clearly in dialogue with the research themes we have developed in the last two decades of collaboration IILP-IHC, such as the classification of expertise proposed by Collins and Evans and the study of the circulation of knowledge taking into account power relations (HAR2015-66364-C2-2-P; HAR2012-36204-C02-01 / HIST, and HAR2009-12918-C03-03/HIST). Moreover, the flexibility of the model will allow us to enrich it with research lines that the above mentioned authors do not have taken enough into consideration and we have extensively been developing in our previous research, e.g. agnotology or the study of the ignorance (PID2019-106743GB-C21). Trading zones can mobilize and establish not only new knowledge and practices but also new ignorance and by considering this fact we shall delve into the vibrant ignorance studies (Gross and McGoey, 2023).

The concepts of contact zone and trading zone will be critically used and articulated through a new hybrid category that we call exchange zones. In developing this category, we will pay attention to the zones of interaction between academics, activists and the industry. In considering these interactions, we will build on the studies of expertise (Collins and Evans, 2003; Collins 2014) and of the building of truth and doubt (Oreskes and Conway, 2010). More specifically, we shall consider the bibliography focusing on academia, activism and industry in technoscience.

With regard to academics, several research lines of this project deal with the role of science faculties in technoscientific innovation and regulation. This is particularly relevant for the Valencian subproject which will work on a commemorative book on the history of the Science Faculty at the University of València. Through these research lines we will go into the history of universities, which is a well-established field with its own journals (History of Universities), as well as with numerous publications in the field of history of science (Anderson 2015; Durst 2010; Gaspar and Simões 2011; Powers 2006). The recent volume of the journal *Ambix* (2021), dedicated to the history of chemistry in universities, is another international example. As for science faculties in the Iberian Peninsula, some recent studies have been published considering cases in Madrid, Lisbon, Sevilla and Santiago de Compostela (Ribagorda and López-Ocón, 2022; Gurriarán, 2021). Most of these studies, however, have not delved into exchange zones beyond academia, as we will do in this project (Shibarshina, 2019).

In relation to the role of scholars have explored the multifaceted ways in which corporations shape expertise, regulation, and decision-making on issues like toxic risk, energy production, food quality or public health (Henry et al., 2021). Moving away from simple conspiracy narratives, several studies have shown the “pervasive power” of industry and the different macro and micro dimensions in different social arenas, including courts, professional circles or academic disciplines. Powerful economic actors can also be relevant in many ways in the production and circulation of knowledge (and ignorance) and in the making of standards or quality control processes. These powers are never established forever and everywhere; they require intensive and continuous actions and go-betweens at both local and global levels. Some authors have argued that “these historically shaped powers” constitute what they call “corporate authority”, underlining the unequal forces between corporations and other historical actors (NGOs, trade-unions, for example) in accessing mass media and decision makers (Aguiton et al., 2021). These studies will certainly contribute to fine-grained analysis of the role of industry in the exchange zones.

The project will also extend the concept of exchange zone to the spatial and epistemic spaces in which activists, grassroots groups and lay-people participated in the production of scientific knowledge. Activism and resistance to science and technology have traditionally been associated with irrational fears, backwardness, post-truth standpoints or even psychological pathologies of illiterate people (Bauer 1995). Paradoxically, this narrative has often been created through historical myths, with no empirical data and for biased political purposes (Fressoz 2012). Nonetheless, scholars in the history of science and STS studies have largely demonstrated the crucial role that science plays and the large amount of knowledge deployed when specific innovations are contested: more than standing on ignorance, this opposition has usually sought to overcome the production of ignorance by co-producing new knowledge. The case of nuclear radiation, for example, has highlighted the epistemic role of shepherds in British Cumbria, fishermen in Catalonia, miners in North-Portugal, housewives in Japan, Navajo communities in New Mexico and ecologists in Australia: all of them actively participated in informed debates about radioactive contamination alongside nuclear physicists, engineers and oncologists. These stakeholders often become so-called “lay-experts”, that is, lay people who turn themselves into experts in specific fields in order to challenge or balance scientific ideas (Wynne 1992; Topçu 2008). Case studies on health issues like AIDS and breast cancer have also underlined the role of US patients and their families in deciphering other invisible particles such as viruses and in (re)defining diseases and medical protocols. These patients fostered a close dialogue between both physicians and members of gay liberation and women’s rights organizations

(Epstein 2023). These are classic examples that shed light on the multi-social process of producing authoritative knowledge through contact zones (Collins 2014). Moving away from rigid definitions of lay-expertise, Steven Epstein has emphasized its collective character and its critical role in the contemporary struggles around knowledge, technology, civic engagement, and democratization (Epstein 2023).

Like “activism”, “expertise” is usually referred in the singular, obscuring the diversity of experiences and actors behind the term and its changing, contingent, historical meaning. In many scientific controversies, many physicists, engineers, physicians and nurses, among others, have actively participated as counter-experts (or even “dissident experts”) in contact with activists and lay-actors. As David Edgerton (2011) put it clear in an article in *Nature*, scientists and engineers have historically cultivated scientific resistance as rigorous, everyday practitioners and that opposition to specific novelties for particular reasons is indispensable for the sake of science. To a large extent, proper sociotechnical choices have depended (and depend) on them.

Nonetheless, lay-actors have not only been involved in contesting and blocking scientific ventures and technological objects (Jarrige, 2016). In dialogue with scientists and engineers, many social networks such as community groups, consumers’ associations and neighborhood movements have provided a standpoint from which technological alternatives have been imagined, invented and appropriated, promoting what David J. Hess has called “alternative pathways” in science and technology (Hess 2007). The exchange zones between activists and experts have often been crucial to the success of both activist politics and scientific endeavors. On the one hand, as Eric Schatzberg (2017) argues, in almost every critique of contemporary technology, experts have played a crucial role and without their contributions, critiques of technology would have been “nothing but a cultural curiosity, being unable to profoundly shape public policy and public opinion”. On the other hand, without activism and grassroots movements, many scientific domains would have been a “scientific curiosity” for decades or simply they would have remained “undone” (Hess, 2017). The case of “green knowledge” is one of the most studied examples (Jamison 2004; Valentines, 2022). Current energy landscapes and possibilities for green transitions are indebted to the debates about nuclear energy: many pioneering designs of wind turbines were produced, appropriated and used as symbolic “weapons” against nuclearization all over Europe and in the US (Heymann 1998: 644; Kirk 2001: 382; Maegaard et al. 2013: 131-140). In this sense, social opposition to technology can be key in encouraging technological innovation. In turn, wind turbines lent legitimacy to social protest by demonstrating that working alternatives were indeed available (Tompkins 2016).

Despite the traditional portrayal of activism as an obstacle to technological innovation, recent historiography is increasingly showing the multifaceted and complex contribution of activism in its interaction with governments, policy makers, private companies and scientific institutions. The study of the relationships that they all have established in the exchange zones is therefore crucial in order to understand socio-technical innovation.

Period and Framework

The project will focus on Spain and Portugal from the 1930s to the 1990s, paying special attention to the period after the fall of the two long-lasting right-wing dictatorships. The decades of the 1970s and 1980s were a period strongly marked by multiscale crises (local, national and global crises) as well as multidimensional crises (political, economic and environmental crises) which triggered key social debates on science and technology. The history of science has only recently looked at the Spanish Transition and the following years in a comprehensive way and in an international dimension. Most earlier works reproduced a standard narrative of “modernization”. Based on new narratives on the political role of science and technology during the Second Spanish Republic and Francoism (developed by authors such as Valentines, Camprubí, Nieto-Galan, Guillem and Florensa), a growing body of researchers, such as Hochadel, Carandell, Fajula, Perdiguero and Sastre-Juan, is problematizing the period of the Transition by putting the focus on a variety of issues ranging

from the national construction of natural heritage to the gender dimension of family planning centers.

This new project also goes beyond the geographical framework of the previous coordinated projects, extending it to the Iberian Peninsula and benefiting from the large Portuguese network of Valentines. Refraining from writing an international comparative history, the subproject intends to recognize (and problematize) the common political background of these countries during the 20th century (González-Fernández, 2015), to think beyond nation-centered analytical frameworks and to produce transnational narratives (Vleuten, 2008; Rubio-Varas et., 2018).

Subproject 1: Exchange Zones of Epistemic Resistance and Alternative Innovation: Activism, Grassroots Movements and Expertise

This subproject will delve on the highly significant “exchange zones” between activists, grassroots groups and experts in the Iberian Peninsula during the last decades of the 20th century. Looking at them allows us to understand in a deeper historical perspective key current scientific debates that are strongly shaped by lay actors, such as green transitions, circular economies, post-colonial politics, gender identities, and AI. The subproject will draw on the theoretical framework of the coordinated project and will focus specifically on two interrelated domains: 1) Activism as an epistemic actor; 2) Activism as an innovation driver.

1. *Activism as an epistemologically active actor.* Like users, consumers, patients, civic organizations and citizens exposed to enviro-technical risks, activist movements have played a decisive active role in the co-production of scientific knowledge and technological artifacts (Cowan, 1994; Oldenziel, 2005; Nieto 2016; Strasser, 2018; Valentines, 2022). When contesting specific innovations and scientific programs, activists have deployed a rich repertoire of visual, audio, textual and performative means as forms of epistemic resistance (Gaudillière, 2006; Corburn, 2005; Smith et al. 2018). As part of their local practices and transnational networks, the circulation of scientific knowledge has been crucial to their demands and arguments (Tilly, 2006; Valentines & Macaya 2019). In particular, scientific knowledge has often been appropriated in the making of what has been called “activist knowledge” and “green knowledge”, which, in turn, has been appropriated by (and shaped) technoscience (Jamison 2004; MacCormick, 2009). Alongside experts (especially, but not exclusively, counter-experts), activists have constituted “exchange zones” bridging different knowledge and standpoints, different political and epistemic practices, and different scientific languages and dreamscapes. In this sense, these “exchange zones” of epistemic resistance shed light on the multi-directional, multi-scale dimensions of the co-production of science and society (Sheller, 2018), that is, on how, expert and lay networks are mutually shaped from home labs to universities and from local to transnational scales. This subproject will focus on the socially blurred epistemic zones where activists exchange knowledge, face scientific ignorance and produce epistemic tools for political purposes across a wide range of scales and topics, in particular, the environment, the city and the body (the three lines of the subproject, as we will see).

2. *Activism as a driving force of sociotechnical innovation.* Economic historians have dealt with resistance as an external factor (and an independent variable) which has to be taken into account when writing the complex equation explaining technological choice (Mokyr 1998). They have devoted efforts to develop analytical and taxonomic frameworks regarding its (direct, indirect expected or unexpected) effects (Bauer 1995). However, there is no comprehensive framework for tackling these processes in the perspective of the history of science, even though resistance to artifacts has implicitly been at the core of the Social Construction of Technology (SCOT) program from its inception (Bijker et al. 1987). To take two classic examples, early SCOT studies explained how gendered and industrial resistances to bicycles and gas lighting were developed in parallel with the making of new artifacts. Scholars such as Thomas P. Hughes, Sheila Jasanoff and Jean-Paul Gaudillière have shown the multiplicity of efforts required to introduce a new artifact in society as well as

the number of resistances from very different social forces they must face (Hughes, 1989; Gaudillière 2006; Jasanoff 2005).

Without present or imaginable alternatives, no resistance is understandable (Edgerton, 2006). Of course, not all the protests against science and technology have led to scientific endeavors and innovative technologies. In many cases, technological alternatives already existed and new ones were not considered necessary, or imaginable, as Marc Bloch already demonstrated decades ago. Nonetheless, in many other cases, protests against scientific and technological projects do have triggered a fair amount of ingenuity and innovation (Smith et al. 2018). An important part of the heterogeneous practices behind what is labeled as “Citizen science”, “Civic Science” and “Street Science” are closely related to alternative pathways of doing science (Hess, 2007; Corburn, 2005; Strasser et al. 2018).

To address the first goal, this subproject will draw on the various coordinated projects (co-coordinated by Agustí Nieto-Galan, member of the Research Team) during two decades. The results of these projects demonstrated the epistemic role of the “publics of science” and the building of expertise as a broad social process (Nieto 2016). Besides, the second goal of the project will be guaranteed by four research projects previously led (as IPs) by new members of the team (Armiero, Valentines, Sousa and Sastre) (see “Previous results of the team”).

Subproject 2: Exchange Zones in the regulation of technoscience: Universities, Industries and the Public Sphere

This subproject will deal with a rich variety of case studies to analyze interdisciplinary interactions among academic institutions, industries, and lay people discussing safety and quality issues in Franco’s dictatorship (1930s-1977), and during the democracy period (1977-1990s). Our approach to quality and safety encompasses various aspects of environmental, chemical, medical, agricultural and industrial history. It does so by focusing on pesticides, food, drugs, and other industrial products, as well as by considering natural sites. This analysis will be built on a rich bibliography that analyzes the issue of quality and safety for pesticides (Jouzel, 2019; Davis, 2019; Bertomeu, 2019), food (Stanziani, 2005; French and Phillips, 2000; Cohen, 2019; Rees 2021, Creager and Gaudillière, 2021), drugs (Gaudillière and Hess, 2013, Carpenter and Tobbell, 2011; Daemmrich, Greene y Elhauge, 2010, Cambrosio, Keating, Schlich y Weisz, 2009), industrial toxic substances (Boudia & Jas, 2014) and urban and natural spaces (Frickel and Elliot, 2018; Guillem-Llobat and Nieto Galan, 2020).

The specific characteristics of the period (moving from Franco’s authoritarian regime to a neoliberal democracy) and the novelty of the cases considered, as well as the opportunities offered by the abovementioned framework of the exchange zones, will definitely lead us to new insights on the topic. We will revisit stakeholders and sites of exchange, usually marked by unequal power relationships of some sort (epistemic, economic and in terms of social prestige, etc.), and try to shed new light on the complex characterization of quality and safety while understanding better the nature of the interactions that made these characterizations possible.

This subproject includes two main research lines dealing with the negotiation of either quality or safety through a number of case studies (see point 4.1). However, one must note that the different cases are connected by similar sources, historical actors, regulatory framework, political contexts and medical and environmental issues. They are thus complementary in multiple ways and will clearly contribute to the general aims of the subproject and coordinated project.

Concerning the sources, we will use academic papers in medical, chemical, agronomic and engineering journals, articles published in newspapers and a broad range of documents (including sources from activists and social movements) preserved in national and institutional archives (such as the Archivo General de la Administración or the Sanatorio

Fontilles, and República CRAI Library, the UAB's Centre Documental de la Comunicació or the Arquivo 25 Abril in Coimbra), as well as local and personal archives (like the ones located at the Biblioteca Valenciana, the editor Pepe Ribas' home in Northern Catalunya and activist José Carlos Marques' office in Porto). In order to balance the unequal distribution of sources, we plan to study archives of environmental organizations as well as new fresh data from activists, social movements, victims, subaltern classes thanks to the methods of oral history. The project counts with the participation of one of the most specialized researchers on oral history of the period in Spain, David Beorlegui. Moreover, the extensive, multifaceted, previous and ongoing work of the other members of the team with this kind of sources and archives as well as with heritage management programs will secure the goals of the project.

Project cross dimensions

This new approach to “exchange zones” permits to shed light on key dimensions of science and technology that are of special interest for historians of science today. They will become transversal dimensions in all the project lines:

1. *Invisible lay-actors*. Examining social resistance to technology helps us to broaden the array of actors, spaces and practices that are involved in the process of scientific negotiation and the emergence of technological fields. In this sense, this subproject will contribute to making the past (and the discipline) more inclusive in terms of gender, class or racialization, as demonstrated by outstanding work (Harding, 2008; Nieto, 2016; Saraiva, 2022).

2. *Cognitive emotions*. Following the perspectives of the history of emotions, concepts like “passionate politics” and “social movement emotions” allows us to explore the significance of emotions in scientific controversies (Goodwin, Jasper & Polletta, 2001; Flam & King, 2005). Cognition and affect as well as macro- and micro-politics cannot be disentangled when studying social responses to science policies.

3. *Sociotechnical imaginaries*. The co-production of science has always depended on “sociotechnical dreams” (Jasanoff & Kim 2015). Activism has played a role in building ideas about the future and utopia, which in turn, have been a stimulus for innovation (Heymann 2017; Kaiser and McCray, 2016).

4. *Transnational networks*. Looking at activism expands our view of the transnational dimension of science while providing insights on the scientific dimension of transnational contention (Vleuten 2008; Tilly & Tarrow 2015: 193-212). The activist networks reveal “connected histories” that are more attentive to historiographically peripheral objects and geographies (Macedo and Valentines 2016; Kaijser and Meyer, 2018).

4. OBJETIVES, METHODOLOGY AND WORK PLAN

In this research project we aim to:

- a) Explore the concepts of contact zone and trading zone when applied to different case studies
- b) Revise and deconstruct the concepts of contact zone and trading zone in order to work on the hybrid concept of exchange zones
- c) Reevaluate the role of academics, industries and activists in the regulation and production of technoscience
- d) Promote the tracing, cataloging and accessibility of primary sources linked to activists and other social groups that do not usually leave such a trace in archives.
- e) Generate primary sources for under-represented groups in the archives, such as activists or patients, through oral history and private documentation.
- f) Explore new opportunities for cross-fertilization between academic research, social activism and artists (as new “exchange zones”), while fostering and enlarging the uses of history in public affairs and policy-making.

And more specifically:

- a) To study the transformation of universities as research and knowledge transfer entities in the late-Francoist regime and the Spanish transition to democracy.
- b) To explore the role of industry in dealing with risk and in regulating or de-regulating safety controls
- c) To analyze the contribution of women and subaltern and social groups (activists, workers, patients, etc.) to the definition and control of safety of products, cities, rural areas and the environment.
- d) To trace the complex and changing identities of quality and safety throughout time and space.
- e) To trace how exchange zones of science and technology shape bodies and gender and post-colonial identities from a historical perspective.
- f) To assess the interdisciplinary interactions between academics, industrialists and activists and identify pitfalls and successful strategies of communication.
- g) To assess the interactions between activists and counter-experts and concerned scientists and identify their epistemic and political strategies of mutual aid.
- h) To evaluate continuities and change in the so-called “transition to democracy” and to understand how debates on science and technology played a key political debates in this period.
- i) To promote the social communication of the project through digital resources and social media.
- j) To produce a wide range of outreach outputs and activities bridging academics, communities and activists as new “exchange zones”.

4.1. Descripción de la metodología. *Description of the methodology.*

SUBPROJECT 1: Exchange Zones of Epistemic Resistance and Alternative Innovation: Activism, Grassroots Movements and Expertise

Research Lines and Case Studies. Drawing on the theoretical framework and historiographical approach described above, the subproject 1 consists in three closely entangled research lines, developed by the different members:

1. Environment, energy and communities

This line will focus on activism and environmental justice and will be coordinated by Marco Armiero. Marco **Armiero** will deal with affective and embodied knowledge of contamination. The assumption is that in communities exposed to environmental injustice, people learn about contamination through their biographies and bodies (Iengo and Armiero). It is an affective knowledge because it involves emotions and emotional connections, nonetheless it is extremely material, produced by relationships connecting people and their environment. Research will focus on industrial accidents as “contact zones” for activists/experts exchanges and industrial accidents as epiphanies of the otherwise hidden wasting relationships (Armiero 2021). Agustí **Nieto-Galan** will focus on the 1972 UN Conference on the Human Environment, held in Stockholm. It gathered official delegates from more than hundred countries, but also a good number of environmentalists and other activist groups. In a global, multilayered urban public sphere, the city of Stockholm witnessed alternative conferences, exhibitions, teach-ins and assorted happenings and demonstrations. Nieto will pay particular attention to their influence in the rise of environmentalism and fight for democracy in Spain and Portugal. In close dialogue with Nieto-Galan, Jaume **Valentines** will study the production and transnational circulation of alternative exhibitions on alternative technologies between 1974 and 1982 in Portugal and Spain.

Inês **Gomes** will explore how the official ideals about the countryside during the Portuguese dictatorship, which shaped Portuguese landscapes and communities during decades, were contested after the 1974 Revolution. Gomes will analyze the discourses that portrayed the

rural communities as a pristine and idyllic space in the agendas of various social groups, including architects, policymakers, environmental activists and, of course, the rural communities themselves. Jaume **Sastre-Juan** will study “professional activism” and the critiques to technology at the Barcelona Association of Industrial Engineers between 1970 and 1977. Its sections of culture, urban planning, environment and human ecology became “contact zones” between professional engineers, intellectuals, and a wide array of neighborhood, feminist and ecological activists. Judit **Gil-Farrero** will focus on the social and environmental impacts of hydroelectric dams built during Francoism and the associated reforestation plans at the headwaters of rivers or on the slopes of reservoirs. The public debate and protests that arose from 1975 were led by local communities but were actively supported by engaged scientists and students. Francisco **Pinheiro** and **Guarda Rios art collective** will put its focus on the socio-environmental impact of the Bemposta Dam in the transnational Douro River since the 1970s with the aim of discussing about the desertification of Iberian Peninsula, the transformations of fauna and flora at riverside lands, and the importance of the legacies of fishing communities for future. Environmental historians have usually focused on this kind of natural protection struggles far from big urban centers. Miquel **Carandell**, however, will study the case of Gallecs, a 700 hectares rural area surrounded by industrial and working class towns in the Barcelona metropolitan area. In the 1970s, the dictatorship authorities planned the construction of a big residential town which raised a popular opposition in the neighboring towns. This research will analyze Gallecs as a rural exchange zone between activists, farmers, neighbors' associations, local politicians, and amateurs and professional scientists.

2. The body, gender and identities

This line will focus on activists proposing other understandings on the body, gender and identities. and will be coordinated by Jaume Valentines. With tight connections with line 1 and drawing on his most recent research, **Valentines** will research the role of women in the promotion of solar energy and alternative technologies in Spain and Portugal and on the pitfalls they had to overcome in a wide range of “exchange zones”, including counter-culture, professional and business milieus such as the world's pioneering Cooperative Ecotècnia, created in Barcelona in 1981. Laia **Iturrizaga** will focus on another key gender issue at this period: the clandestine abortion networks between 1976 and 1985. In Spain, abortion was prohibited and persecuted until 1985, but that did not stop it from being practiced. Through oral testimonies (activists, women who aborted and/or practiced abortions) and private documentation of feminist groups in Madrid and Barcelona, this research will highlight the transnational networks organized to illegally practice abortion and the co-production of knowledge by grassroots activists, health professionals and women of different socioeconomic profiles. Closely related to Iturrizaga's work, Ana **Macaya** will study key debates on sexuality and health in Spain in the 1970s and 1980s and the contribution of the feminist movement to them, in particular from counterculture milieus. In dialogue with physicians, psychologists, nurses and other medical professionals, this movement built local and transnational networks of circulation of knowledge and brought into question the medical practices ideas on the female body, gender dichotomies and sexual identities. The rich amount of publications, documentation and oral testimonies of feminist activists will be crucial to develop this research.

Anyeli **Marín Cisneros** will propose a research-action which consists of imagining alternative classifications of the documentary holdings and the collection of the Museu Marítim de Barcelona, taking the Fifth Centenary of the Conquest of America of 1992 as the key topic of the search. In collaboration with the museum, this research-action will shed light on the (hidden) presence of the slave ship in the museological narratives. Entangling approaches of the history of science with tools of decolonial analysis and looking at feminist archival dissidence strategies by activists, the project will explore the ship as a techno-nationalist object, as an agent of local-global mediation, and as a device of body politics (labor, racial, sexual, sanitary, food, migratory). In this line, Andrea **Álvarez** will focus on national and international identities by looking at the remaking of the idea of Ibero-America through

satellite data in the 1980s and 1990s. Satellites are usually linked with big, high-budget, expert institutions, but the data they produce have been used, appropriated and contested by activists and lay-experts. This is specially relevant for the case of the Atlas “Ibero America from Space” (1992), assembled by remote-sensing specialists from 14 different Peninsula and Latin American countries with two main objectives: first, to make aware of the environmental and resource challenges; second, to rebuild a new Ibero-American identity. This research will explore the tensions between experts and lay-experts in the shaping of the Ibero American territory as a sociopolitical and environmental space.

3. The City, Urban Mobility and Urban Sustainability

This line will be centered on the material building of the city and the debates on the right to the city and will be coordinated by Jaume **Sastre**. Jaume Sastre-Juan will be behind an innovative research on the contemporary recycling technopolitics and the digital management of domestic waste in Barcelona. The use of individualized garbage bags (equipped with RFID tags) has to be understood in the context of a specific sociotechnical imaginary around “digital democracy” which was strongly shaped by local activists in the 2010s but has its roots in the cybernetic utopias of the 1960s and 1970s. The analysis of the activist dynamics of collaboration between computer scientists, engineers and lay experts will be key. Luísa **Sousa** will focus on the revolutionary period of 1974-76 in Portugal, when there was a vigorous debate in Portugal about the urban modes of mobility in the new society, which was intensified by the preceding international oil crisis and closely associated to the rising social movements, the professional associations and the car lobby. Strong ideological rhetoric was used either to defend the potentially liberating role of the automobile or to condemn its “bourgeois” and “pollution” underpinnings. Other modes of mobility were also part of this debate, namely what are now called “active” modes (cycling, walking) and also public transport, which were often presented in opposition to private automobility in terms of environmental, safety and traffic concerns in order to gain what Edward Soja has called “spatial justice”. In the other side of the Iberian Peninsula, in Barcelona, activist groups reclaimed the creation of cycling infrastructure since the late 1970s, including the first projects of cycling lanes, authored by industrial engineering undergraduate students and presented at the Associació d'Enginyers Industrials de Catalunya in 1979. From a diverse range of cycling, anti-nuclear and environmental groups, several activists joined in 1981 to form Amics de la Bici (“Friends of the Bicycle”). Santiago **Gorostiza** will delve into the origins of this organization during the 1980s to explore cycling activists as epistemologically active actors and the “contact zones” established between the recently established democratically elected city council, engineering students and cycling activists. Valentines will tightly collaborate in both Sousa’s and Gorostiza’s researches and will be in charge of the integration of these case studies in a wider transnational perspective.

The 1970s and 1980s was a time period marked by the flourishing of grassroots campaigns laying claim to the ‘right to the city’, as well as a time period of urban transformations linked to de-industrialization. Here, a comparative analysis will be used to explore the ways in which concepts of ‘heritage’ and ‘recognition’ (reivindicación) were proposed and contested by activists and experts of various stripes like urban geographers, pedagogues, industrial archaeologists, architects and engineers. In turn, the concept of ‘demanded heritage’ will be developed in order to analyze these ‘contact zones’. Roger **Fernández Tudela** aims at studying the transformation of the post-industrial neighborhood Poblenou in Barcelona in order to understand how it was closely associated with the co-construction of alternative experiences of temporality between neighbors, historians of technology and social sciences academics. The case of Can Felipa, a factory which was vindicated by neighbors’ and social movements as heritage in 1984 is an enlightening case to look at these questions.

Connecting the three lines (and the Barcelona and Valencian cases as well), contracted personnel will develop the production of the The Environmentalist Heritage Catalog and The Iberian Heritage Map on Scientific Activism (see Outputs). Eva **Jove** as a research

technician will manage the project communication regarding the outreach activities and outputs through several social media.

SUBPROJECT 2: Exchange Zones in the regulation of technoscience: Universities, Industries and the Public Sphere

The studies on quality and safety regulations in the exchange zone that have been introduced in section 3 will be carried out through the following research lines:

- 1) Negotiating safety, coordinated by Ignacio Suay Matallana and with the participation of José Ramón Bertomeu, Antonio García Belmar, David Beorlegui, Silvia Pérez and Sofiya Kamalova.
- 2) Negotiating quality, coordinated by Ximo Guillem Llobat and with the participation of Salvador Calatayud, Francisco Collado, Ignacio Suay Matallana, Mar Cuenca Lorente and Miguel García-Sancho.

Each research line include the following case studies:

1) Negotiating safety

Following his previous works on pesticides, **José Ramón Bertomeu** will explore the changing sociomaterialities of pesticides and their role in creating contact zones among different disciplines and professions (chemistry, agriculture engineering, occupational medicine) and stakeholders (industry, workers, agriculture engineers, doctors, activists, decision-makers). In this multifaceted context, he will discuss pesticides as vehicles of unequal exchanges among different groups and social spaces. His aim is to move on until the next decades in order to study the new Spanish policies that emerged after the “stabilization plan” of 1959, in connection with international trends associated with the so-called “Green Revolution” (Harwood 2018; Kumar et al. 2017; Fitzgerald 2010). By focusing on particular pesticides, he will explore how the new socio-political context created new exchange zones and different circulations of chemicals, risks, knowledge and ignorance among the mentioned historical actors. Concerning sources, the main group of documents is nowadays stored at the Archivo General de la Administración de Alcalá de Henares, particularly the reports generated by agriculture engineers on pest control and the files of the Official Register of Phytosanitary Products. He will also explore the available historical documents still stored at the archive of the Ministry of Agriculture, and the documents of the Phytopathological Plant of Burjassot at the historical archive of the University of Valencia and the archives of activists and trade unions, starting by the documents stored at the “Casa Verda” archive at the Institut Interuniversitari López Piñero. He will also use agronomy journals (*Boletín de Fitopatología*, *Agricultura*), medical publications on occupational medicine and historical legislation, particularly the 1960s-1970s regulations concerning pesticides.

Ignacio Suay Matallana examined in previous works customs laboratories in the USA and Portugal, viewing them as spaces where chemical, political, and economic knowledge, including quality issues, were negotiated (Suay-Matallana, 2022 & 2023). These laboratories served as arenas for discussions on the authority of different agents. They were crucial battlegrounds against fraud, combining both economic and scientific concerns. Consequently, they provide an exceptional opportunity to investigate the regulation of various substances and merchandise. His research will focus on the customs laboratories of Madrid and Valencia. In Madrid, the emphasis will be on efforts to coordinate scientific work, including the development of a standardized customs nomenclature that eventually integrated into the Harmonized Customs System. In Valencia, the study will concentrate on Francisco Bosch Ariño, the long-time laboratory director and Falange's pharmacy representative in the area. Bosch played a pivotal role in controlling imports and exports through the port of Valencia, negotiating chemical and economic issues related to these products, overseeing pharmacy surveillance, and participating in discussions regarding the

safety of various products. The Bosch Ariño archive, housed in the Nicolau Primitiu Valencian Library, comprising 28 boxes of documentation referencing the university, industry, customs, and Francoist politics, will be a significant source for this research.

Antonio García Belmar will study the trials and therapeutic uses of chaulmoogra oil and clofazimine as specific treatments for leprosy in Spain, during the first and second half of the 20th century, respectively. The comparative study of these two substances will allow them to analyse the way in which the terms “trial” and “therapeutic use” mutate throughout this period, as do the actors involved and the reasons and interests that determine their complex relationships, in particular, that of the national and international pharmaceutical industry and the associated chemical laboratories, the medical community of leprologists, the philanthropic associations and the sanatoriums themselves as parts of the infrastructure and health policies designed by public institutions. Leprosy sanatoriums become a key scenario in the interaction between all these agents, whose action was inevitably conditioned by the availability of patients on whom to test the safety and efficacy of pharmaceutical products. The work will focus on the study of the experimental and clinical, diplomatic, and economic activity developed at the Sanatorio San Francisco de Borja de Fontilles, from its foundation in 1909 until the 1970s.

David Beorlegui Zarranz will concentrate in the toxic legacies of deindustrialization, paying special attention to communities exposed to the harmful impacts of industry after the closure of factories. In these debates and in the management of risks and toxic waste, exchanges between experts and lay-people, academics and non-academics, institutions, activists and organized civil society are essential. The most relevant sources for this study will be oral, focusing on the Basque Country, and more specifically Bizkaia, due to the magnitude that the phenomenon of “noxious deindustrialization” had (and still has, to a certain extent) in that region. More specifically, he intends to address the problems arising from the production and use of lindane and other HCH isomers, a highly carcinogenic and invisible pesticide that was manufactured in the town of Barakaldo and that constitutes, today, one of the main environmental problems in Spain and Europe (present in 14 countries). In this sense, the construction of a significant collection of oral sources called “toxicity and socio-environmental conflict in Bizkaia” is foreseen, formed from an estimated number of 40 interviews that will be deposited in the Archive of the Memory of the Basque Country (AHOA), after indexing and archiving. Other sources to be used are institutional documents extracted from web pages or administration libraries, as well as “grey literature” published from the movements, newspapers and periodical sources.

Silvia Pérez Criado will study how Rachel Carson's renowned work *Silent Spring* stirred environmental discourse but also drew criticism for her opposition to DDT which spurred changes in US environmental policies, leading to the establishment of the EPA in 1970 (Pérez Criado, 2017). This research delves into the “contact zones” within Carson's Spanish legacy (1960-1980), exploring how her ideas influenced discourse and practices. She will focus on complex interactions between expert knowledge and activism, especially in academic-industrial dynamics related to environmental and public health issues. Her study will investigate diverse expert-non-expert contacts and various academic and non-academic spaces. Special attention is given to understanding how Carson's ideas shaped language, practice, and spaces, particularly in managing toxic risks tied to DDT. In the Spanish context, the study analyzes how Carson's ideas were received and integrated into environmental policy within local “contact zones,” shaped by global awareness. Regarding the sources, the General Archive of Administration (AGA) in Alcalá de Henares stands out as a key repository, housing crucial documentation from the General State Administration on environmental policies of the time. The Ministry of Agriculture Archive focuses on the intersection of agriculture and the environment, serving as a crucial source for understanding environmental policies during the transition to democracy. Further enrichment of the study will come from the Archives of Environmental Organizations and Groups, offering a societal perspective through documents, pamphlets, and correspondence.

Sofiya Kamalova will develop a section of her PhD thesis that studies a case of workplace poisoning with aerosolized paints at textile factories in the Alcoy area (Spain) in late 20th century, also known as “Ardystil Case”, named after the factory with most poisoning registered. The research covers two outbreaks with respiratory poisoning symptoms caused by the same products (paints containing Acramin FWN, Acramin FWR). The first outbreak occurred in the regions of the Alcoià and Comtat (Alcoy, Muro de Alcoy, Cocentaina). More than seventy people had alarming symptoms and six people died due to lung failure in 1992. This outbreak received the most attention from the press and from the expert community. The second outbreak occurred in 1993 in Tlemecen (Algeria) where the products from Alcoy were transported. The case is analyzed from four different perspectives: 1) the personal experience of the workers who have experiential expertise about their occupational disease; 2) the narrative of public health experts, who performed the official epidemiological study, 3) the perspective of the toxicology experts that focuses on toxic properties of the products rather than the working conditions, 4) the legal framework of safety at the workplace, the registering of the occupational diseases and the legal case. This case allows us to explore different “contact zones” between experts and non-experts, workers and doctors, public health experts and toxicology experts, industry and academia, workers and lawyers, and public health experts and lawyers. With the use of oral history sources (interviews conducted with ex-workers and experts) combined with academic articles, newspaper articles and official government documents will allow the study of the complex network between different stakeholders involved in this case following the pre-established methodology that studies the sociomaterial entity of chemical substances and their influence on society.

2) Negotiating quality

Building on their previous research on rice and food quality, **Ximo Guillem and Salvador Calatayud** will focus on the crucial role of the Department of Plant Chemistry and the Institute of Agrochemistry and Food Technology (IATA) in the development of modern food technology in Spain. The former was linked to the Patronato Juan de la Cierva (CSIC) but located at the Science Faculty of the University of Valencia and it gave birth to the IATA in the 1950s. Its creation was promoted by renowned chemists such as Eduardo Primo Yúfera, but also by representatives of food producers such as, Juan Antonio Gómez Trenor, president of the rice federation. At these centres, important research on food quality and on strategic crops -like rice and citrus fruits- was carried out. They thus went into topics which had been, and were still, tackled by experts from other disciplines such as pharmacy (from municipal laboratories, university research units on food science, etc.) or engineering (from the Rice research station at Sueca (EAS), the Orange research station at Burjassot, etc.). This research line will consider if specific trading or exchange zones always emerged in order to deal with these topics and, where they did so (among different academic disciplines, but also involving agricultural and industrial producers), how did they evolve. The project will pay special attention to research on rice considering the motivations and characteristics of this research both locally and internationally. The international dimension was very important in the context of the Green revolution (Cullather, 2011; Fitzgerald, 2008; Harwood, 2012; Kloppenburg, 2005; Perkins, 1997) and of initiatives such as the establishment of the International Research Institute in Philippines (Bray et al., 2015). But one must also note that research on rice at the IATA was funded by the USDA for decades and led to international agreements with Cuba and other Latin American countries. These initiatives led to other exchange zones which will be analysed in this research line of the project. The main sources will be the archives and libraries of the EAS, IATA and IVIA, the historical archives at the CSIC and the University of Valencia, the General Archive of the Administration (AGA) and the David Lubin Memorial Library of the FAO.

Ximo Guillem-Llobat and Paco Collado will deal with the origins of modern environmentalism (and with it of the fight for high quality natural sites) in the Valencian Country by focusing on the contact zones for academics and activists that made possible its emergence. The research that several members of the group are carrying out on the history of the Science Faculty of the University of Valencia also intersects with this research line. In

the period we will be considering (1960s to 1980s) professors and students at the Economics and Science Faculties were very active in promoting several of the first environmentalist groups (AEORMA, Margarida, AVIAT, GEL, Acció Ecologista-Agró, etc.). The history of these initiatives is thus intimately linked to the history of the University and more specifically of these faculties. However, each of these initiatives can be understood as an exchange zone involving different academic disciplines and environmental activist cultures (such as conservationism, environmental justice, communist and anarchist environmentalism, expert activists and working-class environmentalism, etc.). And in the analysis of these exchange zones that were focusing on the quality of natural sites, we shall consider if specific contact languages emerged or if the object of their campaigns can be characterized as boundary objects. These categories shall shed new light on the complex process that led to the establishment and resignification of environmentalism. In order to study these exchange zones, we will build on the existing bibliography (Corral Broto, 2015; Hamilton, 2018; Martínez-Alier, 2003; Soto Fernández, 2019, among others), and analyse the primary sources kept in institutional archives, such as the historical archive at the Universitat de València, as well as in popular archives such as El Punt and Casa Verda. However, for this research line it will also be especially relevant the production of new primary sources through a project on the oral history of the environmental movement inspired by that led by Dr Toby Butler at Royal Holloway (University of London).

Ignacio Suay Matallana will explore the interactions between the academic and industrial spheres in the Valencian case, particularly focusing on works related to technical chemistry and engineering. Attention will be given to the public image of chemistry projected by the teaching staff during the decades of 1940-1970 and their involvement in industrial projects. Another research line will consider the role of the first female professors in science and pharmacy at the University of Valencia, analyzing issues such as the impact of the dictatorship on their scientific careers. The study will also incorporate interviews with professors from the Faculty of Sciences, including Francisco Tomas (professor of physical chemistry and rector), Francisco Bosch Reig (professor of chemical analysis), Agustín Escardino (professor of technical chemistry), and Rosario Domingo (the first female professor of sciences).

Mar Cuenca Lorente will study the establishment of the Faculty of Pharmacy of the University of Valencia and analyse its role in the training of those pharmacists involved in the production, distribution and regulation of drugs and dealing in multiple ways with quality standards.

Her research will focus on the period prior to the resumption of studies leading to the degree in Pharmacy, which is particularly relevant for understanding the relationships established between the academic framework and the legal framework. It can also shed new light on the interactions of the academic, professional, and industrial sectors of Pharmacy. This analysis will be based on the archives of the University of Valencia (Arxiu Intermedi nº8738), which contain the reports and background information on the petitions made from 1972 until the beginning of the first course in 1974-1975.

Miguel García Sancho will contribute to this project through the methodological approach that he developed within his last research project funded by the European Research Council (2017-2022). This technique consists in the establishment of network models and he will apply it to the institutions and stakeholders of this research line on quality in order to visualize diverse knowledge exchange processes through co-authorship relationships, joint patent applications, PhD thesis supervision, etc. This approach will allow researchers, mainly those working on the histories of the science and pharmacy faculties, to work with large amounts of data and successfully combine the qualitative and quantitative analyses.

Several of the case studies included in the subproject and mainly in the line on quality are linked to ongoing work in order to publish two commemorative books on the history of the Science Faculty and the Pharmacy Faculty of the University of Valencia, and therefore find in

this fact another point of connection. Miguel's work can be better understood in this context. With the research project we are now presenting we aim to further develop this research and contribute to the books by examining the interactions of these faculties with the industry, agricultural stations, customs laboratories and environmental activists. The commemorative books that the corresponding faculties (the Faculty of Pharmacy and in the case of the Faculty of Science those that were born from the latter in 1978: Biology, Chemistry, Physics and Mathematics) will be partially funding, will be one of the major outreach results of this subproject and will add to the numerous academic outputs we expect to produce by developing the above-mentioned research lines.

4.2. Plan de trabajo y cronograma. *Work plan and schedule.*

(IP-Principal Investigator; ME-Research Team; ET-Working Team)

Subproject 1 & Subproject 2	Year 1				Year 2				Year 3				Year 4			
Initial meetings to discuss the integration of the different research lines IP 1 & IP2s; ME1 & ME2; ET1 & ET2																
Literature discussion: secondary sources and reading groups IP 1 & IP2s; ME1 & ME2; ET1 & ET2																
Literature analysis: primary sources IP 1 & IP2s; ME1 & ME2; ET1 & ET2																
Developing case studies, IP 1 & IP2s; ME1 & ME2; ET1 & ET2																
Sketching and presenting preliminary results IP 1 & IP2s; ME1 & ME2; ET1 & ET2																
2 Project Workshops (subprojects 1+2) IP 1 & IP2s; ME1 & ME2; ET1 & ET2																
Writing results / Project Workshops IP 1 & IP2s; ME1 & ME2; ET1 & ET2																
Publishing results / Project Workshops IP 1 & IP2s; ME1 & ME2; ET1 & ET2																
International Workshop on Exchange zones and activists IP 1 & IP2s; ME1 & ME2; ET1 & ET2																
Writing results / International Workshop																

held at the 11th International Conference on History of Science (Trondheim, 2017), as well as in the 12th & 13th International Conference on History of Chemistry (Maastricht 2019 & Vilnius 2023). We have explored the limits of the history of science with environmental history, STS and with agricultural history by organizing multidisciplinary workshops such as: “At the intersection of disciplines: History of Science and Environmental History” held at the IHC-UAB in 2017, “Encuentro de la Red ES CTS y la Societat Catalana d’Història de la Ciència i la Tècnica (SCHCT) ‘Ciencia, política, activismo y ciudadanía’” held at the IILP-UV in 2018 and “Zonas de Contacto entre la historia agraria y la historia de la ciencia” held at the IILP-UV in 2019. These disciplinary limits have been crossed in the current project proposal.

The multidisciplinary and even interdisciplinary approach was also a key feature of the symposium organized by several members of the group in Valencia in 2022 in order to initiate one of the lines of action envisaged in the project, that dealing with the memory and archives of environmental activists (Jornada de estudios: archivos y memoria histórica del ambientalismo en España, abril 2022). And this line of action has also had continuity as part of the “XII Escola europea de primavera d’història de la ciència i la divulgació. Repensar les transicions ecològiques des de les humanitats i les ciències socials” that we organized in Maó in 2023, as well as in the workshop “From the Archive to the Atlas” that we organized with our colleagues of the Tracts Cost Action (2021-2025).

Besides, the project will benefit from the convergence of the abovementioned long-lasting coordinated project program with four previous national and international projects developed by new members of the team. 1) The projects on environmental history and political ecology led by Marco Armiero as head of the at KTH Environmental Humanities Laboratory in Stockholm (since 2022, research professor at the iHC-UAB), 2) The research projects led by Jaume Valentines in Spain, Portugal and Switzerland on Technology, Governance and Citizenship in Southern Europe, 1929-1975 (2014-2019), 3) The project “History Lab for Sustainable Urban Mobilities”, 2022-2023, coordinated by Luísa Sousa; and 4) The project “Museums, classrooms and politics: Scientific and technological culture in the Spanish Transition”, 2020-2024, co-coordinated by Jaume Sastre-Juan. Concerning point 3), the most important output is probably the book *Cycling Cities: The Lisbon Experience* (Eindhoven: Foundation for the History of Technology, 2024, in press; within *Cycling Cities* series edited by Ruth Oldenziel). The results of the other projects can be checked in the specific information provided on the Research Team (subproject 1).

4.4. Recursos humanos, materiales y de equipamiento disponibles para la ejecución del proyecto. *Human, material and equipment resources available for the execution of the Project.*

The Valencian venue of the Interuniversity Institute López Piñero is located in the Cerveró Palace, a centrally situated building in a fully renovated 18th-century palace. This center brings together 23 researchers (including 5 full professors and 11 senior lecturers), as well as 9 students and visiting professors, and a staff of 4 members for the library, the museum, and administrative services. It is equipped with the following material resources necessary for research and teaching: an auditorium with a capacity for 55 people (with internet connection, projection screen, blackboard, projector, and audio-video player), a boardroom for 15 people, a training room with 8 workstations, a library, and a museum. The institute also has spacious offices, photocopiers, a cafeteria, its own computer and maintenance service, as well as services provided by the Universitat de València. The Vicente Peset Llorca Library is a reference both in Spain and internationally, with its own scholarship program to host about 5 foreign professors and researchers each year. It consists of 40,000 volumes, including updated collections incorporated into the library through a policy of acquiring new bibliographic releases. The library includes the following collections: a historical-medical library with 30,000 volumes of medical books from the 16th to the 20th centuries, covering all medical areas and specialties; a collection of medical and scientific journals from the 18th to the 20th centuries, spanning various scientific disciplines; and a secondary literature library with 10,000 volumes of monographs on the history of medicine and science, primarily,

although it includes books related to scientific communication and other aspects related to social studies on science. Additionally, there is a collection of almost 1,000 reference works, including dictionaries, encyclopedias, manuals, treaties, bibliographic directories, biographical directories, catalogs, etc. Furthermore, the institute has two privileged spaces for communicating the history of science, open to the public throughout the day with access control. On the one hand, there is a large room dedicated to temporary exhibitions that are periodically renewed and have previously allowed the public to view the results of previous projects (like the exhibition *(In)visible Toxics*). On the other hand, the institute has a museum that was recognized as an Official Museographic Collection in 2022. It includes objects of various origins: from instruments from the faculties of Medicine and various faculties of Sciences at the Universitat de València to pieces originating in some hospitals in Valencia, as well as donations from individuals (especially doctors). The museum has a curator, students who use it for their thesis projects, and volunteers dedicated to its preservation and conducting visits. Therefore, it is a fundamental space both to enrich the academic results of the project and to showcase them to society.

In Barcelona, the History of Science Institute crowns a long trajectory of research and teaching in the History of Science in the UAB: from the creation, in 1983, of the Seminari d'Història de les Ciències, its transformation into the Centre d'Història de la Ciència (CEHIC) in 1995, to its current conversion into a research institute in its own right. The IHC combines the knowledge, expertise and scope of the years of activity of the CEHIC, and of its research groups and staff in the field of the history of science.

The new *Institut* is established as the fundamental core of the teaching (degree, master and postgraduate) research and communication of the History of Science with a vast international scope. The IHC has become an integrative and dynamic space, devoted to the analysis of the role of science and scientific culture in a broad sense, fully integrated in our society, the past and the present. It is a notably multidisciplinary and inclusive space, open to innovative perspectives and regularly welcoming teachers, researchers and students from different countries.

During the last years, Nieto-Galan has managed, as a director of the iHC, to strengthen its research group with high quality new research staff: Dr Gemma Cirac (ERC, Starting Grant); Professor Marco Armiero (ICREA-Senior and former Director of the Environmental Humanities Laboratory at the Royal Institute of Technology, Stockholm); Dr Stefan Pohl-Valero (Maria Zambrano fellow); Dr Vincenzo Politi (Beatriu de Pinós Fellow); Dr Elena Serrano (Ramon y Cajal fellow); Dr Laura Valls (Margarita Salas fellow); Dr Jaume Valentines-Alvarez (associate professor). This has been a crucial period to place it in the international map of history of science. As director, he has managed to make new relevant appointments in our research group. The iHC has also built new alliances with STS scholars, philosophers, environmental historians, and other fields that, in the forthcoming years, will probably constitute a new field of "scientific humanities".

The iHC research focuses particularly on the History of Science in the 19th and 20th centuries, from diverse perspectives: the relations between science, politics and power; the role of science audiences as active agents in the construction of knowledge; the material, spatial and urban dimensions of science; the history of medicalisation processes and of human science; and the relations between science, health and gender. The iHC also focuses on the relations of the history of science with disciplines such as philosophy, anthropology, sociology and science and technology studies (STS). The abovementioned institutional career, field approaches and interdisciplinary commitment makes the iHC an excellent host research center to develop the objectives of the project.

5. IMPACTO ESPERADO DE LOS RESULTADOS

IMPACT OF THE RESULTS.

5.1. **Impacto esperado en la generación de conocimiento científico-técnico en el ámbito temático de la propuesta. *Expected impact on the generation of scientific-technical knowledge in the thematic area of the proposal.***

The coordinated project will impact mainstream academic research dealing with regulatory science, alternative sociotechnical innovation, the circulation of knowledge, experts and expertise, activism, interdisciplinary research and trading and contact zones. We will begin by discussing the opportunities and limitations of the concepts of "contact zone" and "trading zone", as well as outlining more precisely our concept of "exchange zone", in an internal meeting of the group. In this way, we want to establish a solid theoretical framework for the development of the project; a framework on which we shall continue to reflect throughout the project leading us to a more theoretical collective publication in an international journal.

With these tools and our background in historiographical debates on knowledge circulation, experts and activism, we will deepen in the analysis of our case studies, mainly focused on the Francoist dictatorship and the Spanish transition. This will lead us to dialogue with the growing bibliography on science and technology in authoritarian regimes and provide new clues for understanding the magnitude of changes and continuities in the context of the Spanish Transition.

As stated in this report, each subproject will have its particularities, but we will also exploit the complementarities of both proposals. In order to do so, we have planned two joint meetings dealing with the interaction between activists and expert-activists in the regulation and production of technoscience which will take place in Barcelona and Valencia respectively in the second and third year of the project. These meetings will serve as a basis for the preparation of a collective publication in the form of a book or a special issue in a journal of international impact. But this line of work will also be complemented by the organization in 2028 of an international congress focused on technoscientific activism with which we want to produce a reference book in this field while strengthening our relationship with authors of international impact such as Bruno Strasser, Stefania Barca, Stéphane Frioux, Anaël Marrec, Frank Uekoetter, Sarah Hamilton, Alexandre Elsig, Judit Rainhorn, Renaud Becot, Catherine Cavalin, Arthur McIvor, etc.

Subproject 1: These case studies will be presented as individual contributions or in organized panels in national international meetings such as: Spanish Network of Environmental History, Granada 2024 RUEDHA, European Society for Environmental History, Uppsala 2025; ESHS Barcelona 2024, Trobada SCHCT Olot 2024, History of Science seminars Oxford 2024, Italian Society for Environmental History, Naples 2024, History of Science Society 2025 Conference, Congreso de la Asociación Española de Historia Contemporánea 2025, VII Encontro Nacional de História das Ciências e da Tecnologia, Aveiro 2026, American society for environmental history, TBD 2025, European Rural History Organisation EURHO TBD 2027, International Association for the History of Traffic, Transport, and Mobility, and SHOT Annual Conference. The subproject will also result in more than 25 articles in indexed and non-indexed journals (mostly in indexed journals), 12 book chapters and 5 books, one of which will be the first Spanish volume of the series *Cycling Cities: The Global Experience*, a research and publication project that covers 100 years of cycling policy and practice around the world in 50 cities in 25 countries and is a resource for studying (and creating) exchange zones between policymakers, community groups, students and other social actors. Following the new regulation of the UAB, most of the papers will be accessible in the university repository. The international network of the group (strengthened thanks to the transnational dimension of the project and the integration of new members, with a long research career in European countries such as Sweden, Switzerland and Portugal) will have a very positive impact in the internationalization of the project. The proposed meetings to discuss the co-construction of activism and science and to articulate the 3 subproject's research lines (see Chronogram) will count with the participation of internationally-renowned invited scholars as a strategy for impacting in other international research agendas.

Subproject 2 will delve into the history of regulatory science and concentrate on the role of exchange zones in defining the quality and safety of substances (drugs, food, pesticides, pigments) and sites (natural and urban sites). These case studies will be presented in international meetings such as those of the European Society for the History of Science, the European Society for Environmental History, the European Social Science History Conference, the International Oral History Association Conference and the International Conference on the History of Chemistry (which we will host in Valencia in 2025). In these and other meetings we plan to organize special symposia, as well as to present our individual communications. And with these studies we will produce more than 15 articles in indexed journals, 16 book chapters and 2 books. Some of them will be accessible in the university repository. This work on safety and mainly on quality intersects with the research work we will carry out for the production of the commemorative books of the faculties of science and pharmacy of the University of Valencia. These books will be part of our outreach activity but will also enrich our academic research by contributing to locate new primary sources and by promoting the discussion among the researchers involved in this project as well as in the abovementioned area of the history of universities. A first workshop on the history of the faculty of science has been planned for 2024.

5.2. Impacto social y económico de los resultados previstos. *Social and economic impact of the expected results.*

The project will make a significant contribution to fostering a more critical approach towards the role of science in contemporary societies. It aims to examine the various actors involved in the production, circulation, legitimation, regulation, and control of science, as well as their engagement in problematization, resistance, and critical reflection. In doing so, the project will surely contribute to present trends of “democratic science”, in which beyond the “deficit model” legacy of passive receivers of scientific knowledge, a new paradigm of public participation in science in gaining influence in the 21st century. It expresses a profound change in terms and conditions under which scientific knowledge is produced, discussed and legitimated today, from concerned experts, to activists and simple citizens. As citizen-historians, the members of both subprojects work very much in line with new trends described as “History matters”, in which very ambitious and rigorous historical investigation should contribute to contemporary debates on environmental problems, public health concerns, and democratic demands of citizens’ participation in expert knowledge. A new way of being a “presentist”, as American historian Naomi Oreskes described recently (Oreskes 2013). We would like to connect our research project with current issues and environmental struggles, demonstrating the “utility” of history and in particular of environmental history to understand the present and build a better future (Armiero, 2014; Bertomeu-Guillem, 2017). For that goal the project is organized in two complementary subprojects that benefit from the different expertise of both groups: the study of scientific expertise and the role of experts at the Valencia group, and the work done on environmental history and science in Francoism, at the Barcelona group. Furthermore, the specialized training provided by the master's programs managed by the IILP and the IHC will allow for a direct channeling of the results of this project into the education of future professionals in the fields of history and science communication.

5.3. Plan de comunicación científica e internacionalización de los resultados (indicar la previsión de publicaciones en acceso abierto). *Plan for scientific communication and internationalization of the results (indicate the forecast of open access publications.*

As indicated in section 5.1 and section 5.4, the project envisages communicating the results both within the academic sphere and transferring them to society. To achieve this, specialized seminars have been proposed with the participation of international scholars, along with the publication of special issues in high-impact international journals in the field. The project members' participation in international conferences and committees also underscores their commitment to internationalizing their research. Project members are accustomed to publishing their work in open-access journals such as *HoST*, *Dynamis*, *Asclepio*, *Enseñanza de las Ciencias*, or book chapters, as seen in *Compound Histories* (Brill, 2017). On the other hand, most of the results of the project will be included in the UAB Repository of Documents, and the Roderic Repository of the UV, that include academic research outputs, as well as its digital and institutional heritage collections. Similarly, efforts will be made to communicate the results to society on an international scale. This includes creating universally accessible and free digital tools (such as the *Iberian Heritage Map on Scientific Activism*) and conducting workshops and popularization seminars with various groups, with special attention to contacts in Portugal.

5.4. Plan de divulgación de los resultados a los colectivos más relevantes para la temática del proyecto y a la sociedad en general. *Plan for dissemination of the results to the most relevant groups for the theme of the project and to society in general.*

The subproject will develop a diverse number of digital resources and activities in order to make the results available to a wide range of publics, from academics and historians of science to community associations, schools and the society at large. This is an important novelty of this new coordinated project. The results will be developed in eight areas/actions:

- A. **“Toxic Bios” Oral Testimonies Data-Base.** This online output will resume the multidisciplinary media project “Toxic Bios” led by Research Member Armiero at KTH Environmental Humanities Laboratory in Stockholm. Built on Richard Newman’s definition of Toxic Autobiography and Gregg Mitman’s ideas of body and environmental justice, this multifaceted data-base will now take a broader historical perspective under the wing of the UAB’s History of Science Institute.
- B. **The Open-Access Environmentalist Heritage Catalog.** It will aim at searching, registering and preserving documentation and oral testimonies of activists, ecologist groups and concerned experts. It will focus on the documentation and testimonies related to the case studies of the subprojects. However, other documentation relevant to the project will also be considered. The archives of Martorell Viu local environmental group and of the nuclear physicist Antoni Lloret, author of the official report on the 1979 Three Miles Island accident, are of special interest. The catalog will expand the number (and kind) of sources available to historians of science and will benefit from integrating the results of previous projects (in particular, the resources “Servei d’Arxius de Ciència” and “Patrimoni i Memòria”, managed by the History of Science Institute in Barcelona, and outputs of the Iberian Commission of Scientific Instruments, by the López Piñero Institute in Valencia).
- C. **The Iberian Heritage Map on Scientific Activism.** It will be an easy-to-use, open mapping digital tool aiming at visualizing the public and private archives that are currently preserving and digitizing the legacy of activist groups involved in science and technology debates. Among many other archives, we could mention the UB’s Pavellón de la República CRAI Library, the UAB’s Centre Documental de la Comunicació, La Casa Verda in Valencia, and the Arquivo 25 Abril in Coimbra. This Iberian Heritage Map will be built on the previous research of the team as well as on the new works that will be developed. More importantly, it will benefit from the dialogue with international networks promoting the heritage of environmental groups, such as TRACTS Climate Change Working Group which recently organized the workshop “From the Archive to the Atlas” in Lausanne (which counted with the participation of three members of the coordinated project)

- D. **Documentary on Epistemic Resistances.** Like former coordinated projects, this new project intends to produce a documentary for the general public. The documentary will focus on a specific case of the research lines. However, it also will present the general framework, concepts and results of the project. Collaboration with filmmaker Arturo Hortas and the application for external funding will secure the achievement of this goal.
- E. **Community Workshops.** Art collective “Guarda Rios” will hold a workshop about the impact of dams on riverside lands in Portugal, through games and sensorial exercises, sharing testimonies from fishermen and grassroots movements. To think about how rivers and their communities became “energy sacrifice zones” (in terms of Nick Estes) will be the cross-cutting topic of this workshop. The testimony of fisherman António Velho will serve as a pretext to reflect on issues like the invasion of exotic fishes and “eutrophication of tradition”.
- F. **Debates on Science, Technology and Medicine in the Square.** Valentines has been in charge of this outreach activity since 2012. Relocated in Lisbon during his Portuguese stay between 2014 and 2023, now there is an opportunity to bring back this space to Barcelona. This space has been conceived as an “exchange zone” in itself from its conception, bringing academics, activists and the general public together. Last sessions have been devoted to a wide range of topics, from transsexualism to energy transitions. The new sessions will be devoted to the three main lines of the subproject 1 (one per year).
- G. **Rethinking the environmental transitions meetings.** In 2023 we organized the 12th Spring School on the History of Science and Popularization which was titled “Repensar les transicions ecològiques des de les humanitats i les ciències socials”. The meeting successfully joined environmental historians, historians of science, technology and medicine, STS scholars, environmental sociologists, archivists and activists in order to discuss the potential contributions of our areas in order to rethink the environmental transitions. We will organize a second meeting in 2025 in Valencia and continue consolidating this initiative.
- H. **Commemorating the Faculties of Science and Pharmacy.** We will produce these two commemorative books of these two faculties of the University of Valencia with a special attention on the role of exchange zones and will also produce an exhibition on the history of the faculty of science by building on the rich materials that are being identified and recovered in this project. We will thus address the whole University community and aim at a collective reflection on our identity as an academic institution and part of our society.

A research technician (Eva Jove) will coordinate the project communication of the academic and outreach activities by using international and national mailing lists, our institutional web pages and blogs and social media.

5.5. Efectos de la inclusión de género en el contenido de la propuesta. *Effects of gender inclusion in the content of the proposal.*

History of science is a discipline that has paid special attention to the study of gender biases in science, medicine, and technology. It has considered how the scientific work of numerous women (scientists, engineers, lay women, etc.) has been marginalized at different historical moments, as well as how gender biases have been scientifically constructed and perpetuated. This research project integrates these reflections to follow the guidelines of the Horizon Europe Programme and the Spanish Strategy for Science, Technology, and Innovation (2021-2027) with the aim of addressing gender integration and gender equality in all research areas. The project's methodology takes into account works by international historians such as Margaret Rossiter, Londa Schiebinger, and Donna Haraway, and, in a closer context, Carmen Magallón, María José Santesmases, and Montserrat Cabré, who have developed analytical and conceptual tools for the study of women's roles in science. The goal is to make visible the scientific activity carried out by women in both academic and activist settings. The research results –interviews conducted with women, case study

developments, and the role of women in various sites– will promote understanding of gender stereotypes in any field, to reduce resulting inequalities, as well as their intersection with other aspects of human and social diversity. Finally, another fundamental objective is for the research project to contribute to consolidating the academic careers of the team members who are more precarious, mainly female members at the working team, thereby helping to reduce existing gender imbalances in the discipline.

6. JUSTIFICACIÓN DEL PRESUPUESTO SOLICITADO. **JUSTIFICATION OF THE REQUESTED BUDGET.**

The justification of the requested budget has been detailed in the application form. The budget of this coordinated project has increased compared to previous coordinated projects of the group due to two main reasons: 1) The number of members of the team. The subproject 1 (Barcelona), for example, has increased from 8 to 16 researchers (among other goals, to achieve a balanced gender rate); 2) The typology of results, which now includes a wide variety of both academic and outreach outputs: besides publications in indexed journals and prestigious publishers, the project will result in heritage data-base catalogs, digital humanities tools, community-scholars meetings, interdisciplinary workshops and a documentary (see 5.1 and 5.4). The budget does not include those costs totally or partially paid by other institutions (e.g. the total budget required for publishing the book of *Cycling Cities* is the double of the specific cost assigned in this project).

The main subproject 1's expenses are in three areas (see Application): 1. Travels and stays (45%): to attend conferences, public archives and brief research stays to consult documentation (Stockholm, Oxford, Alcalá de Henares, Lisboa and Coimbra. Concerned with environmental and energy impacts, we will try to reduce the number of long trips and we have reduced the expense/person rate. However, the two-faced transnational dimension of the project (in terms of the team members and the framework) makes this expense necessary; 2. Personnel/Contracts: To technically assist and help the members of the team with the various expected outputs (Actions A, B, C, D, E and F; see 5.4), auxiliary personnel will be hired; 3. Material/Publication: Digitization and registration of oral and unpublished sources (especially important as the project deals with a wide range of actors and practices), hardware, international books (unable to be accessed in university libraries in Barcelona), editing costs.

7. CAPACIDAD FORMATIVA. **TRAINING CAPACITY.**

7.1. Programa de formación previsto en el contexto del proyecto solicitado. **Training program planned in the context of the requested Project.**

The two institutions leading this project provide an excellent frame to foster a specialized training in the history of science. At the Universitat Autònoma de Barcelona, the Institut d'Història de la Ciència (IHC) has become a fundamental axis in research, teaching but also in popularization of the history of science. The institute is an integrative and dynamic space organized around a core of researchers from the Universitat Autònoma de Barcelona, open to new perspectives and which regularly receives teachers, scholars and students from different countries. Research focuses on critical analysis of the role of science, technology and medicine in different social contexts, through research on the history of contemporary science and medicine, the publics of science or the history of psychology, among other subjects. Members of the IHC constitute an active academic community that performs joint research projects, organizes seminars and courses, and maintains an electronic communication network on subjects related to the discipline. Bibliographical resources for research and teaching are very valuable at the UAB. The UAB History of Science Library holds about three thousand monographs, journals and the microfilm series *Landmarks of*

science-Landmarks II and *Archive for History of Quantum Physics*. The series *Landmarks of science-Landmarks II* is a collection of full texts by 2,900 scientists of all periods, from Euclid to Einstein. It allows a direct approach to primary sources, often not available in Catalan libraries. The library also contains the collection of the philologist and science historian Josep Maria Millàs i Vallicrosa, and the personal archive of mathematician Ferran Sunyer i Balaguer. More recently it has established a collection specifically devoted to the history of computing and another collection on the history of science popularization.

At the Universitat de València, the López Piñero Interuniversity Institute (IILP) is an academic institution which supports research projects and outreach activities on historical and social studies on medicine, technology, science and the environment. After a very positive report by the state agency (ANECA), the IILP was restructured in 2017 as a joined inter-university centre including groups from the Universities of Alacant, Miguel Hernández (Elx), València and Jaume I (Castelló). The new López Piñero Interuniversity Institute for Social and Historical Studies on Science, Technology, Medicine and the Environment combines long academic tradition with the novelties of the latest trends in the area, the centre continues to support academic research, critical thinking, pedagogical innovation, equal opportunities, innovative outreach activities, as well as the preservation and study of the bibliographic heritage and material culture related to science, technology and medicine. For many decades, the centre has offered graduate and postgraduate education to a large number of students coming from many different backgrounds. Courses on the history of medicine and science are offered in a large number of subjects (medicine, biology, history, chemistry, etc.). The faculty staff includes a large group of historians of science with many different backgrounds (science, medicine, linguistics, history, philosophy, etc.), who work in different historical periods, context and topics, covering from early-modern to twentieth-century. Thanks to several fellowships, a growing number of pre-doctoral and post-doctoral students have joined the staff during the last three years.

Both institutes offer **PhD programs** on history of science. The Doctorate programme in History of Science (UAB-UB), coordinated by the IHC, is the only one in Spain to merit the Mention to Excellence of the Spanish Ministry of Education from its first edition. Earlier, it had been awarded the Mention of Quality (2003-2010). It is a pioneering programme, which was established in the 1980s, and grew out of the seminal History of Science Seminar at the UAB. For decades it has been a fundamental tool for the professional training of future historians of science. In 2000-01 it became an interuniversity programme offered jointly with the Universitat de Barcelona (UB). On the other hand, the doctoral program on history of science and scientific communication offered by the IILP is the oldest one in Spain and has successfully produced a large number of dissertations on history of science, technology and medicine. Both programmes aim to train researchers on the history of science, technology, and medicine, as well as in scientific communication. Its privileged interdisciplinary status allows the acceptance of students from widely diverse backgrounds. The programme offers the following career options: an academic career in STM; science pedagogy; museology; conservation and management of scientific heritage; science communication; science journalism; science popularization; scientific terminology.

The two institutions also offer two official **Master programs** fully integrated in the European Higher Education. The IHC coordinates the Master in History of Science: Science, History and Society, which is amongst the strongest in the discipline in Spain, and dates back to the 1980s. It evolved from the courses offered at the PhD programme in the History of Science since its introduction in the academic year 1986/87. Since its first edition in the academic year 2006/07, it is now one of the best established, longest running masters at the UAB. It is an interdisciplinary program offered together with the Universitat de Barcelona (UB), with the participation of the Universitat Pompeu Fabra (UPF), the Universitat Politècnica de Catalunya (UPC), and the Institució Milà I Fontanals (IMF-CSIC), together with prestigious invited scholars from abroad. On the other hand, the IILP organizes the Master in History of Science and Scientific Communication, which also is amongst the strongest in the discipline in Spain, and the only offered fully online. The programme responds to a growing social demand for

more rigorous knowledge on scientific activity and its social and cultural consequences. The important role of science, technology and medicine in contemporary societies makes it necessary to investigate the social and cultural meaning of such activities and their relationship with society as a whole. The master intends to tackle these questions from the dual perspective of historical research on science and the studies on science communication and dissemination. The goal is to train professionals and researchers with critical skills and refined and updated methods of analysis, for them to work and research in areas related with history of science, technology and medicine, science communication and dissemination, scientific information management, and the preservation of science's cultural heritage.

Apart from those official programs, both institutes are involved in the organization of research seminars and advanced training for historians of science and students. One of the most enduring and valuable activities has been the European Spring School of History of Science and Popularization. Members of the project organized previous meetings devoted to the history of toxics (Guillem and Bertomeu in 2015) and Ecological Transitions (Guillem and Bertomeu in 2023). Members of the two subgroups have also collaborated in the organization of the annual research seminars and the meetings of the Catalan Society for the History of Science and Technology (like the *Trobada* organized in 2020 by Suay-Matallana, and the series on Science, technology and medicine at the street organized by Valentines and Sastre) The seminars of the Catalan Society (coordinated by Suay-Matallana since 2020) are organized both in Barcelona and Valencia and included the participation of outstanding scholars (see Arban: <http://www.metode.cat/noticies/katherine-watson>) such as Ian Burney, Cassie Watson, Frank Uekoetter, Nathalie Jas, Peter Rosental, etc., just to mention four examples of the last years which are closely related to the current research project.

The group has a clear commitment to the training of two PhD students requested in this application, who would be integrated into the PhD programs of both institutions, as well as in the research lines and publication plans proposed in this project. These students would also have the support and material and human resources offered by both universities, as well as by the two research institutes. The project integrates faculty members who have supervised a significant number of doctoral theses, as well as many master's theses. The presence of other graduate students in both institutes will facilitate their integration into the academic environment. Similarly, project members have international experience and contacts (in countries such as Portugal, the United States, France, Canada, the United Kingdom, and Japan) that will facilitate the realization of stays abroad for the predoctoral students contracted. The number of PhD students indicated in the following section, as well as the academic trajectory of former students who were part of previously funded projects, are a strong endorsement of the training capacity of the group.

Our commitment to the training of young researchers has also been evidenced in recent years by our fundraising to support the always challenging early stages of their careers. In the case of the University of Valencia, for instance, previous research on the history of the faculty of science has been supported by the Institution by funding two one-year predoctoral contracts (one in 2022 and one in 2024). However, these activities would clearly benefit from a whole PhD fellowship.

7.2. Tesis realizadas o en curso en el ámbito del equipo de investigación (últimos 10 años). *Theses completed or in progress within the scope of the research team (last 10 years).*

Theses in subproject 1

Supervised by Marco Armiero: **1.** Santiago Gorostiza Langa, "Mobilising nature between democracy and fascism. An environmental history of the Spanish Civil War and the legacies of the Francoist autarky", University of Coimbra, 21/12/2017; **2.** Daniele Valisena, "Coal Lives: Italians and the Metabolism of Coal in Wallonia", Belgium 1945-1980, KTH Royal Institute of Technology, Stockholm, 02/06/2020; **3.** Alexandra D'Angelo, [Environmental

Justice approach to Disasters]; **4.** Elisa Privitera, [Potential of small data to produce a counter-knowledge in risk landscapes]; **5.** Maria Isabel Perez Ramos, A Quest for Environmental Sovereignty: Chicana/o Literary Experiences of Water (Mis)Management and Environmental Degradation in the US Southwest. KTH Royal Institute of Technology, 02/06/2017; **6.** Jesse Peterson, Excessive Seas: Waste Ecologies of Eutrophication, KTH Royal Institute of Technology, 16/10/2020.

Supervised by Nieto-Galan: **1.** Carolina Granado, El rol dels experts en l'assessorament de les primeres negociacions sobre el canvi climàtic (1985-1992) (in preparation); **2.** Josep Molas, Del laboratori a la indústria i a la societat: Els plàstics a Espanya a la 2a meitat del segle XX (in preparation); **3.** Judit Gil-Farrero, "La protecció de la natura a Catalunya: del Franquisme a la Transició democràtica", UAB, 15-06-2018; **4.** Marta Pujadas, "La creació d'un passiu ambiental a Catalunya: Historia de la planta química de Flix al riu Ebre (1897-2013)", ICTA, UAB, 15-07-2015; **5.** Jordi Ferran Boleda, "Els públics de l'electricitat a Catalunya (1929-1936): De la Font Màgica de Montjuïc a la difusió dels electrodomèstics", CEHIC-UAB, 05-02-2013; **6.** Jaume Sastre Juan, "Un laboratori de divulgació tecnològica: el New York Museum of Science and Industry i la política de la museïtzació de la tecnologia als Estats Units (1912-1951)", CEHIC-UAB, 25-09-2013.

Supervised by Jaume Valentines: **1.** History of Rewilding: Origin, Development and Practice in the Iberian Peninsula, by Sergio Arias (co-sup.: Lino Camprubí). NOVA University Lisbon, Observatório do Antropocénico [until being employed at UAB, due to NOVA's PhD program regulations]; **2.** Política y tecnociencia: Disputas en torno a la emancipación, by Victor Hermoso. Universitat Oberta de Catalunya, 2021- (as Supervising Committee's member).

Supervised by Jaume Sastre: **1.** Oriol Roig Vilaseca, "Joc de Ciència: La comunicació científica a TV3 als seus inicis", to be defended on: 05/09/2028; **2.** Roger Fernández Tudela, "Construint un nou temps: patrimoni i museïtzació científicotècnica en la transformació urbana del Poblenou, Barcelona", UAB, to be defended on: 26/10/2028.

Theses completed in subproject 2

Supervised by José Ramon Bertomeu: **1** Luis Moreno Martínez. 2020. Ciencia en las aulas: prácticas pedagógicas, cultura material e historia de la ciencia en la obra de Modesto Bargalló en España (1894-1939). **2** Mar Cuenca Lorente. 2015. El veneno de María Bonamat: juicios, peritos y crimen en la España del siglo XIX. **3** Rosa Muñoz Bell. 2015. Los manuales de química en España (1788-1845): Protagonistas, terminología, clasificaciones y orden pedagógico. **4** Ignacio Suay-Matallana 2014. Análisis químico y expertos en la España contemporánea: Antonio Casares Rodríguez (1812-1888) y José Casares Gil (1866-1961).

Supervised by Miguel García Sancho: **1** José Gómez. 2020. Time, expectations and the future in action in Ecuador's Yachay.

Thesis in progress in subproject 2

Supervised by José Ramon Bertomeu: **1** Silvia Pérez Criado. La historia del DDT en España (1939-1978). **2** Sofiya Kamalova: El caso Ardystil (1990-2010). Un episodio de envenenamiento industrial".

Supervised by Ximo Guillem: **1** Susana Pérez Holgueras. Cincuenta años de historia del Centro de Biología Molecular Severo Ochoa 1975-2025 desde la perspectiva de género.

Supervised by Miguel García Sancho: **1** Jarmo de Vries. The influence of genomic medicine on medical work. **2** Cristina Moreno Lozano. Antimicrobial resistance (AMR) protocols: Optimization, hospital infrastructures, and care practices in democratic Spain.

7.3. Desarrollo científico o profesional de los doctores/as egresados/as. Scientific or professional development of graduate doctors.

In the case of subproject 1, Prof. Nieto Galán supervised the PhD thesis of Jaume Sastre-Juan and Judit Gil-Farrero. Dr Sastre is currently serves as Associate Professor Serra Hünter at the Universitat Autònoma de Barcelona. Nieto, Sastre and Valentines have previously collaborated in previous national and international projects and in the publication of three books. Dr Gil is now postdoctoral researcher at the Universidad de Zaragoza. In the

case of subproject 2, Prof. Bertomeu supervised the PhD theses of two members of this project and included both of them in his previous research project. This is the case for Mar Cuenca (a member of this new research project) who currently holds a permanent teaching position at the Universidad CEU Cardenal Herrera, and Ignacio Suay-Matallana (one of the principal investigators) who currently serves as a senior lecturer at the University of Valencia. We also note the cases of three female members of the working team, who are former students of the Master's program. Sofiya Kamalova and Silvia Pérez Criado now hold prestigious predoctoral fellowships (such as an FPI and a CIACIF, a 4-year Valencian fellowship).

BIBLIOGRAPHY

AGUITON, S. A., DÉPLAUDE, M. O., JAS, N., HENRY, E., & THOMAS, V. (eds.). 2021. *Pervasive Powers: The Politics of Corporate Authority*. Routledge

AMBIX, 2021. 68, (2-3).

ANDERSON, R.G.W. 2015. *The Cradle of Chemistry. The First Century of Chemistry at the University of Edinburgh*. Edinburgh: John Donald.

ARMIERO, M., Lisel SEDREZ, (eds.) *A History of Environmentalism: Local Struggles, Global Histories*. London: Bloomsbury, 2014

BAUER, M. (ed.) 1995. *Resistance to New Technology: Nuclear Power, Information Technology and Biotechnology*. Cambridge: Cambridge University Press.

BERTOMEU SÁNCHEZ, JR. 2019. 'Pesticides, Past and Present. A review of current literature'. *HoST - Journal of History of Science and Technology* 13 (1): 1–27.

———. 2022. 'The Making of the Spanish Pesticide Industry During the Early Francoist Dictatorship: Experts, Autarky, Agnotology, and Fascism'. In *Pervasive Powers: The Politics of Corporate Authority*, edited by Sara Angeli Aguiton, Marc-Olivier Déplaupe, Nathalie Jas, Emmanuel Henry, and Valentin Thomas, 89–122. New York, NY: Routledge.

BERTOMEU SÁNCHEZ, J.R., and GUILLEM-LLOBAT X. 2017. 'Following poisons in society and culture (1800-2000): a review of current literature'. *Actes d'història de la ciència i de la tècnica* 9: 9–36.

BIJCKER, W E., HUGHES, TP; TREVOR, J. PINCH (eds.) 1987. *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*. Cambridge: The MIT Press.

BOUDIA, S., & JAS, N. 2014. *Powerless Science?: Science and Politics in a Toxic World*. Berghahn Books.

BRAY, F., COCLANIS, P. A., FIELDS-BLACK, E. L., & SCHÄFER, D. (2015). *Rice: Global Networks and New Histories*. Cambridge University Press.

CAMBROSIO, A.; KEATING, Pr; SCHLICH, T.; WEISZ, G. 2009. "Biomedical conventions and regulatory objectivity: A few introductory remarks." *Social Studies of Science* 39 (5): 651-664.

CARPENTER, D.I; TOBBELL, D.A. 2011. "Bioequivalence: the regulatory career of a pharmaceutical concept." *Bulletin of the History of Medicine* 85 (1) : 93-131.

CARSON, R. 2016. *Primavera silenciosa: Edición y traducción de Joandomènec Ros (J. Ros, Trad.)*. Barcelona: Editorial Crítica.

COHEN, B.R. 2019. *Pure Adulteration: Cheating on nature in the age of manufactured food*. Chicago: The University of Chicago Press.

COLLINS, H. M., & EVANS, R. 2003. King Canute meets the beach boys: Responses to the third wave. *Social studies of science*, 33 (3), 435-452.

COLLINS, H. 2014. *Are we all scientific experts now?* Polity.

CORBURN, J. 2005. *Street Science: Community Knowledge and Environmental Health Justice*. Cambridge MA: MIT Press.

- CORRAL BROTO, P. 2015. *Protesta y ciudadanía: Conflictos ambientales durante el franquismo en Zaragoza (1939-1979)*. Rolde de Estudios Aragoneses.
- COWAN, R. S. 1994. *The Consumption Junction: A Proposal for Research Strategies in the Sociology of Technology*. In *The Social Construction of Technological Systems*, edited by Wiebe E. Bijker, Thomas P. Hughes and Trevor J. Pinch, 261-280. Cambridge, Mass.: The MIT Press.
- CREAGER, A. N. H.; GAUDILLIÈRE, J.-P. (eds.) 2021. *Risk on the Table: Food Production, Health, and the Environment*. New York: Berghahn Books.
- CULLATHER, N. 2011. *The Hungry World: America's Cold War Battle against Poverty in Asia*. Harvard University Press.
- DAEMMRICH, A; GREENE, J; ELHAUGE, E. 2010. "From visible harm to relative risk: Centralization and fragmentation of pharmacovigilance." In: *The Fragmentation of US Health Care: Causes and Solutions*. Oxford: Oxford University Press: 303-324.
- DAVIS, F. R. 2019. 'Pesticides and the Perils of Synecdoche in the History of Science and Environmental History'. *History of Science* 57 (4): 469–92. <https://doi.org/10.1177/0073275319848964>.
- DAVIS, F. R. (Ed.) 2012. *Silent Spring after Fifty Years*. *Endeavour*, 36 (4), 125-190.
- DURST A. 2010. "'Venturing in Education": Teaching at the University of Chicago's Laboratory School, 1896--1904'. *History of Education* 39: 55–73.
- EDGERTON, D. 2011. In praise of Luddism. *Nature* 471, 27–29. <https://doi.org/10.1038/471027a>
- EPSTEIN, S. 2023. "The Meaning and Significance of Lay Expertise". In: Eyal Gil and Thomas Medvetz. *The Oxford Handbook of Expertise and Democratic Politics*. New York NY: Oxford University Press
- FITZGERALD, D. 2010. *Every Farm a Factory: The Industrial Ideal in American Agriculture*. New haven: Yale University Press.
- FAN, F. T. 2007. Science in cultural borderlands: methodological reflections on the study of science, European imperialism, and cultural encounter. *East Asian Science, Technology and Society: An International Journal*, 1(2), 213-231.
- FAN, F. T. 2012. The global turn in the history of science. *East Asian Science, Technology and Society: An International Journal*, 6(2), 249-258.
- FLAM, H; KING, D.(eds.). 2005. *Emotions and social movements* (pp. 19–40). New York, NY: Routledge.
- FRENCH, M; PHILLIPS, J. 2000. *Cheated Not Poisoned? Food Regulation in the United Kingdom, 1875–1938*. Manchester: Manchester University Press.
- FRESSOZ, J. B. 2012. *L'apocalypse joyeuse. Une histoire du risque technologique*. Paris: Editions Seuil.
- FRICKEL, S. & ELLIOTT, J. R. 2018. *Sites Unseen: Uncovering Hidden Hazards in American Cities*. New York: Russell Sage Foundation.
- GALISON, P. 1997. *Image and logic: A material culture of microphysics*. University of Chicago Press.
- GALISON, P. 1999. *Trading Zone. Coordinating Action and Belief*. In: Biagioli, M. (ed.). *The science studies reader*. Routledge.
- GAUDILLIERE, J.P; HESS, V. (eds.) 2013. *Ways of Regulating Drugs in the 19th and 20th Centuries*. London: Palgrave Macmillan.
- GAUDILLIÈRE, JP 2006, "Globalization and Regulation in the Biotech World. The Transatlantic Debate over Cancer Genes and Genetically Modified Crops", *Osiris*, 21, pp. 251-272.
- GASPAR, J; SIMOES. 2011. 'Physics on the Periphery: A Research School at the University of Lisbon under Salazar's Dictatorship'. *Historical Studies in the Natural Sciences* 41: 303–43.
- GAVROGLU, K., PATONITIS, M., PAPANELOPOULOU, F., SIMOES, A., CARNEIRO, A., DIOGO, M. P., BERTOMEU SÁNCHEZ, J. R., BELMAR, A. G.; NIETO-GALAN, A. 2008. Science and Technology in the European Periphery: Some Historiographical Reflections. *History of Science*, 46(2), 153-175. <https://doi.org/10.1177/007327530804600202>
- GONZÁLEZ-FERNÁNDEZ, A. (ed) 2015. *Ayer. Revista de Historia Contemporánea* [Special issue "Las transiciones ibéricas"], 99, 13-150.

- 13–150. GOODWIN, J., JASPER, J.; POLLETTA, F. 2001. Why emotions matter. In J. Goodwin, J. Jasper, & F. Polletta (Eds.), *Passionate politics: Emotions and social movements* (pp. 1–24). Chicago: University of Chicago Press.
- GORMAN, M. E. 2002. Levels of expertise and trading zones: A framework for multidisciplinary collaboration. *Social Studies of Science*, 32(5-6), 933-938.
- GORMAN, M. E. (Ed.). 2010. *Trading zones and interactional expertise: Creating new kinds of collaboration*. MIT Press.
- GROSS, M., & MC GOEY, L. (Eds.). 2015. *Routledge International Handbook of Ignorance Studies* (1st ed.). Routledge
- GUILLEM-LLOBAT, X; NIETO GALAN, A. 2020. *Tóxicos invisibles: la construcción de la ignorancia ambiental*. Barcelona: Icaria editorial.
- GURRIARÁN, R. 2021. 'A Facultade de Ciencias Da Universidade Galega (Sección de Química, 1922): Principal Foco Científico Renovador Do País.' In *O Pasado Por Vir. Achegas 'a Historia Da Pontevedra Que Desbotou o Franquismo*, edited by R. Fajardo, 159180. Pontevedra: Memoria Histórica.
- HAMILTON, S. R. 2018. *Cultivating Nature: The Conservation of a Valencian Working Landscape*. University of Washington Press.
- HARDING S G. 2008. *Sciences from below : Feminisms Postcolonialities and Modernities*. Durham: Duke University Press
- HARWOOD, J. 2012. *Europe's Green Revolution and Others Since: The Rise and Fall of Peasant-friendly Plant Breeding*. Routledge.
- HARWOOD, J. 2018. 'The Green Revolution as a Process of Global Circulation: Lants, People and Practices'. *Historia Agraria: Revista de Agricultura e Historia Rural*, no. 75: 7–31. <https://dialnet.unirioja.es/servlet/articulo?codigo=6448284>.
- HENRY, E. (2021). Governing Occupational Exposure Using Thresholds: A Policy Biased Toward Industry. *Science, Technology, & Human Values*, 46(5), 953–974. <https://doi.org/10.1177/01622439211015300>
- HESS, D J. 2007. *Alternative Pathways in Science and Industry. Activism, Innovation, and the Environment in an Era of Globalization*. Cambridge, Mass: The MIT Press.
- Hess D. J. 2017. *Undone Science : Social Movements Mobilized Publics and Industrial Transitions*. Cambridge Massachusetts: MIT Press.
- HEYMANN, M (ed.) 2017. 1970s: Turn of an Era in the History of Science? (special issue). *Centaurus*. 59(1-2), 1–9.
- HEYMANN, M. 1998. Signs of Hubris: The Shaping of Wind Technology Styles in Germany, Denmark, and the United States, 1940-1990. *Technology and Culture* (39:4): 641-670.
- HUGHES, T.P. 1989. *American genesis: A century of invention and technological enthusiasm 1870-1970*, New York: Penguin Books.
- JAMISON, A. 2004. *The Making of Green Knowledge: Environmental Politics and Cultural Transformation*. Cambridge: Cambridge University Press.
- JARRIGE, F. 2014. *Technocritiques: Du Refus Des Machines à Contestation Des Technosciences*. Paris: La Découverte.
- JASANOFF, S; SANG-HYUN, K. 2015. *Dreamscapes of Modernity. Sociotechnical Imaginaries and the Fabrication of Power*. Chicago: University of Chicago Press.
- JASANOFF, S. 2006, "Biotechnology and Empire: the Global Power of Seeds and Science", *Osiris*, 21, 273-292.
- Jouzel, J-N. 2019. *Pesticides: Comment Ignorer Ce Que l'on Sait*. Paris: Sciences Po.
- KAISER, D; MC CRAY, WP (eds.) 2016. *Groovy Science: Knowledge, Innovation and American Counterculture*. Chicago: University of Chicago Press.
- KAISER, A; MEYER, J.H (eds.) 2018. Siting Nuclear Installations at the Border (special issue). *Journal for the History of Environment and Society* (3): 1-173.
- KIKUCHI, Y. 2013. *Anglo-American Connections in Japanese Chemistry: The Lab as Contact Zone*. New York and Basingstoke: Palgrave Macmillan.

- KIRK, A. 2001. Appropriating Technology: The Whole Earth Catalog and Counterculture Environmental Politics. *Environmental History* (6:3): 374-394.
- KLOPPENGURG, J. R. 2005. *First the Seed: The Political Economy of Plant Biotechnology*. Univ of Wisconsin Press.
- KUMAR, P, LOREK, T; TOLSSON, TC, SACKLEY, N, SCHMALZER,S; SOTO LAVEAGA, G.. 2017. 'Roundtable: New Narratives of the Green Revolution'. *Agricultural History* 91 (3): 397–422. <https://doi.org/10.3098/ah.2017.091.3.397>.
- LYTLE, M. H. 2007. *The Gentle Subversive: Rachel Carson, Silent Spring, and the Rise of the Environmental Movement (New Narratives in American History)*. Oxford: Oxford University Press.
- MC CORMICK, S. 2009. *Mobilizing Science: Movements, Participation, and the Remaking of Knowledge*. Philadelphia: Temple University Press.
- MACEDO, M; VALENTINES-ÁLVAREZ, J. 2016. Technology and Nation: Learning from the Periphery. *Technology and Culture* (57:4): 989-997.
- MAEGARD, P, KRENZ, A.; WOLFGANG, P. (eds.). 2013. *The Rise of Modern Wind Energy Wind Power for the World* (Singapore: Pan Stanford Publishing).
- MARICHALAR, P. 2010. La médecine du travail sans les médecins?: Une action patronale de longue haleine (1971-2010). *Politix*, n° 91(3), 27. <https://doi.org/10.3917/pox.091.0027>
- MARTÍNEZ-ALIER, J. 2003. *The Environmentalism of the Poor: A Study of Ecological Conflicts and Valuation*. Edward Elgar Publishing.
- MARTINEZ RICHART, G. 2017. *Veinticinco años después: Caso Ardystil*. Editado Contigo.
- MOKR, J. 1998. "The Political Economy of Technological Change: Resistance and Innovation in Economic History", In *Technological Revolutions in Europe*, Maxine Berg e Kristin Bruland (eds.), 39-64. Cheltenham.: Edward Elgar.
- MOYA, C., & Martí Boscà, J. V. 2022. Treinta años del síndrome Ardystil. *Archivos de Prevención de Riesgos Laborales*, 25(4), 353–357. <https://doi.org/10.12961/apr.2022.25.04.02>
- MOYA, C., NEWMAN TAYLOR, A. J; ANTÓ, J. M. 1994. Outbreak of organising pneumonia in textile printing sprayers. *The Lancet*, 344(8921), 498–502. [https://doi.org/10.1016/S0140-6736\(94\)91896-1](https://doi.org/10.1016/S0140-6736(94)91896-1)
- MUSSELMAN, EG. 2009. Indigenous Knowledge and Contact Zones: The Case of the Cold Bokkeveld Meteorite, Cape Colony, 1838. *Itinerario*;33(1):31-44. doi:10.1017/S0165115300002692
- MUSIL, R. 2014. *Rachel Carson and Her Sisters: Extraordinary Women Who have Shaped America's Environment*. New Brunswick: Rutgers University Press.
- NIETO-GALAN, A. 2016. *Science in the Public Sphere*. London: Routledge.
- OLDENZIELI, R, DE LA BRUHÈZE, AA; DE WIT, O. 2005. "Europe's Mediation Junction: Technology and Consumer Society in the 20th Century." *History & Technology* 21, no. 1:: 107-139.
- ORESQUES, N; CONWAY, E.M. 2010. *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues From Tobacco Smoke to Global Warming*. Bloomsbury Press.
- ORESQUES, N, "Why I Am a Presentist", *Science in Context* 26 (4):595-609 (2013)PÉREZ CRIADO, S. (2017). El legado de Rachel Carson. *Anales de Química*, 113(4), 242-246.
- PÉREZ CRIADO, S. 2017. El legado de Rachel Carson. *Anales de Química*, 113(4), 242-246.Dedieu, François. 2022. *Pesticides: le confort de l'ignorance. Anthropocène*. Paris XIXe: Éditions du Seuil.
- PERKINS, J. H. 1997. *Geopolitics and the Green Revolution: Wheat, Genes, and the Cold War*. Oxford University Press.
- PRATT, M.L. 1992. *Imperial Eyes. Travel Writing and Transculturation*. London & New York: Routledge.
- PROCTOR, R., & SCHIEBINGER, L. (eds.). 2008. *Agnotology: The making and unmaking of ignorance*. Stanford: Stanford University Press

- POWERS, John C. 2006. 'Chemistry Enters the University: Herman Boerhaave and the Reform of the Chemical Arts'. *History of Universities* 21 (2): 77-87.
- RAJ, K. 2007. *Relocating Modern Science. Circulation and the Constitution of Knowledge in South Asia and Europe, 1650-1900*. New York: Palgrave.
- RAJ, K. 2011. The historical anatomy of a contact zone: Calcutta in the eighteenth century. *The Indian Economic & Social History Review*, 48(1), 55-82.
- RAJ, K. 2013. Beyond postcolonialism... and postpositivism: circulation and the global history of science. *Isis*, 104(2), 337-347.
- REES, Jonathan. 2021. *The chemistry of Fear. Harvey Wiley's Fight to Pure Food*. Baltimore: John Hopkins University Press.
- ROBERTS, L. 2009. Situating science in global history: Local exchanges and networks of circulation. *Itinerario*, 33(1), 9-30.
- ROMERO, A. 2022. *Economic Poisoning: Industrial Waste and the Chemicalization of American Agriculture. Critical Environments : Nature, Science, and Politics* 8. Oakland, California: University of California Press.
- RIBAGORDA, A; LÓPEZ-OCÓN, L. 2022. *La Universidad Central durante la Segunda República: las facultades de ciencias y su contexto internacional*. Madrid: Dykinson.
- RUBIO VARAS, M.M; CARVALHO, A.; DE LA TORRE, J. 2018. Siting (and mining) at the border Spain-Portugal nuclear transboundary issues. *Journal for the History of Environment and Society* (3): 33-69.
- SARAIVA, T. 2022. Black Science: Amílcar Cabral's Agricultural Survey and the Seeds of African Decolonization. *Isis* 113 (3):597-609.
- SCHIEBINGER, L. 2007. *Plants and empire: Colonial bioprospecting in the Atlantic world*. Harvard University Press.
- SHELLER, M. 2018. *Mobility Justice. The Politics of Movement in an Age of Extremes*. London: Verso.
- SHIBARSHINA, S. 2019. New Trading Zones in Contemporary Universities *Philosophy of the Social Sciences* 49 (6): 510-527. 2019.
- SIVASUNDARAM, S (ed.). 2010. 'Global Histories of Science'. *Isis* 101 (1): 95-158.
- SMITH, A. et al. *Grassroots Innovation Movements*. New York: Routledge, 2007.
- SOTO FERNÁNDEZ, D. 2019. Orígenes y consolidación del movimiento ecologista en Andalucía (1975-1990). *Ayer. Revista de Historia Contemporánea*, 115(3), Article 3. <https://doi.org/10.55509/ayer/115-2019-11>
- STANZIANI, Alessandro. 2005. *Histoire de la qualité alimentaire: xixe-xxe siècle*. París: Editions du Seuil.
- STAR, S.L; Griesemer, J.R. 1989. "Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39." *Social Studies of Science*, vol. 19, no. 3, 387-420.
- STRASSER, B J. et al. 2019. "Citizen Science"? Rethinking Science and Public Participation. *Science & Technology, Studies* (32:2): 52-76.
- SUAY-MATALLANA, I, 2023, Chemistry, trade and the economy: exploring the history of customs laboratories in the US (1870s-1930s), *History of Science*, 0 (0), 1-25 (online first) <https://doi.org/10.1344/sn2023.27.40418>
- SUAY-MATALLANA, I., 2022, The Customs Laboratory of Lisbon from the 1880s to the 1930s: Chemistry, Trade and Scientific Spaces. In: Simões, Ana; Diogo, Maria Paula, (eds.), *Science, Technology and Medicine in the Making of Lisbon (1840-1940)*, Brill, pp. 179-202.
- TILLY, C; TARROW, S. 2015. *Contentious Politics*. New York: Oxford University Press.
- TOMPKINS, A.S. 2016. *Better Active than Radioactive! Anti-nuclear Protest in 1970s France and West Germany*. Oxford: Oxford University Press.
- TOPÇU, S. 2008. Confronting Nuclear Risks: Counter-Expertise as Politics Within the French Nuclear Energy Debate. *Nature and Culture* (3:2): 225-245.

VALENTINEZ ÁLVAREZ, J. 2022. Tilting at 'Nuclearmills'? Wind Energy, Grassroots Networks and Technologies of Protest in Spain, 1976–1984. *NTM Zeitschrift für Geschichte der Wissenschaften, Technik und Medizin*, 30:3: 311-344.

VALENTINEZ ÁLVAREZ, J; MACAYA, A. 2019. Making Fun of the Atom: Humour and Pleasant Forms of Anti-nuclear Resistance in the Iberian Peninsula, 1974-1984. *Centaurus*, 61:1-2: 70-90.

VLEUTEN, E. 2008. Toward a Transnational History of Technology: Meanings, Promises, Pitfalls. *Technology and Culture* (49:4): 974-94.

VOGEL, L. 1995. El descubrimiento del síndrome de Ardstyl: Discurso médico y relaciones entre precarización y salud. *Sociología Del Trabajo*, 23, 111–127.

WYNNE, B. 1992. Misunderstood misunderstanding: Social identities and public uptake of science. *Public Understanding of Science* (1:3): 281-304.