THE CIRCULATION OF SCIENTIFIC KNOWLEDGE: 
THE RELATIONSHIP BETWEEN SCHOLARS AND PRINTERS 
(NEW SPAIN, EIGHTEENTH CENTURY) 

MAURICIO SÁNCHEZ MENChERO

ABSTRACT. The representation generated within a specific historical context—
religious or cultural—promotes and inhibits certain cognitive developments. 
In this we follow constructivist epistemology, who studies history as a labora-
tory of knowledge. Hence the interest to locate, contextualize and compare 
cognitive processes in different eras and cultures. The historical narrative 
should explain the spatial and temporal distribution of knowledge, for exam-
ple, between New Spain, the metropolis and the Europe of the eighteenth 
century. Here it is investigated how the scientific information was obtained, 
managed and used by the readers and writers, appealing to their material 
means of communication.

KEY WORDS. Circulation, knowledge, symbolic representations, cognitive de-
velopments, New Spain, eighteenth century, scholars, printers.

1.
Among the adventures narrated in a novel by Mexican author José Joaquín 
Fernández de Lizardi, we find the protagonist as a doctor in the city of 
Tula, where he achieved certain renown and made a comfortable living. 
Then the arrival of an epidemic upset everything: “It came to pass in that 
town [...] a devil of a plague, that I never understood; because the people 
taken ill were smitten by a sudden fever accompanied by retching and 
delirium, and in four or five days they succumbed.” In vain the new doctor 
tried to deal with the epidemic through purges and books: “I read—re-
mark the protagonist—the Tissot, Madame Fouquet, Gregorio López, the 
Buchan, the Venegas ¹ and all the available authors of compendia; but it 
was no use; the afflicted died by the thousands ².” So our character was 
forced to flee the town as best he could.

Centro de Investigaciones Interdisciplinarias en Ciencias y Humanidades, Universidad 
Nacional Autónoma de México. / mauricio_merino@yahoo.com.mx

Until the nineteenth century, it was customary for a doctor starting out in his profession to win over his clientele by prescribing the ailing medicines that, although they did not cure them at all, at least did not have an unpleasant taste. In New Spain, for example, “martial tablets” or “subtle iron” were produced, which boasted a “color, odor, taste (to) reconcile the most delicate of senses,” such as those of “squeamish sick people, who have the bad habit of suffering horror, revulsion and disgust for all kinds of medication without exception.” In principle, those compounds were prepared according to the method of José Ignacio Bartolache of New Spain, and sold in a drugstore in Mexico City.

In any case, the novelty of these “martial tablets” arrived in New Spain twenty years later, as they were already being used in Europe thanks to the formula created by the Genovese doctor Facinio Gibelli. However, the compound had been “considerably advanced and improved,” according to Bartolache. In addition, the novo-Hispanic drafted a guide to the use of these tablets, which he translated into Nahuatl for use by indigenous peoples. Bartolache so trusted his compound that he did not hesitate to call for public sessions of the members of the Protomedicato (medical board), who rose up against him because of the new medicine. Even so, although he was not forced to flee, as was Fernández de Lizardi’s character, the novo-Hispanic saw his tablets fail and his debts mount.

What interests us about this anecdote is to show, through the methodology of cultural history,

how the specific and innovative appropriations of the particular readers [...] depend, in general, on the effects of meaning constructed by the works themselves; on the uses and meanings imposed by the forms of publication and circulation, and the skills, categories and representations that govern the relationship each community has with written culture.

In this instance, we are attempting to formulate questions that will explain how knowledge circulated between Europe and America in the seventeenth and eighteenth centuries. That is to say, what medical news Bartolache read and how he made these his own, since he considered himself a public servant; what was the circuit of novelties that made it possible for some news to reach him and some not; how could he distinguish, within the news arriving from Europe, what was scientific progress and what was mere charlatanry; what was the material presentation—paper size, typography, illustrations—of these novelties, and if he aspired to keep up to date through his readings.

One possible answer to these questions comes from an analysis of scientific books in their materiality and content. Based on the contributions of cultural history, we can rethink the history of science. This is an
appropriate means of studying the practices and representations made, for example, by educated novo-Hispanics like José Ignacio Bartolache.

Hence, it is crucial to analyze the keys to the readings of this novo-Hispanic doctor based on his books—manifest in his library and his writings—that became materialized in his printed works. Bartolache wrote and published at his own expense the medical newsletter *Mercurio Volante*. To do so, he hired the printer and surveyor Felipe de Zúñiga y Ontiveros, whose entry into the world of printing was purely circumstantial. The new editor was unaware of the art of printing, but the commercial success of his *Pronósticos* (Forecasts), which he issued every year since 1751, led him to try his hand at the printing industry. Thus, in early 1761, Felipe, together with his brother Cristóbal, acquired “3 700 pounds of type-letters,” which be bought from don Francisco Leñero for 2 000 pesos.

After ten years of constant use, Zúñiga used those same molds to print the sixteen issues of the *Mercurio* with which—in Bartolache’s words—“one writes and reads in print and shakes the cobwebs from the printing boxes.” If the spiders disappeared, other scratches are visible in the doctor’s gazettes: the worn type, bad cuts as the paper was refined, and even lack of ink on some of them. It was a broadsheet for popular distribution that cost half a real each. All of these material components aid or hinder the reading of printed texts. It was not until 1777, that Zúñiga was able to start to use a new press which he bought and had to ship from Spain. Thereafter, with more experience and new equipment, Zúñiga published for José Antonio de Alzate, another scientist of New Spain, the high quality *Gacetas* (Gazettes), to which he added, for example, very well printed engravings.

We must remember that most of the authors left their manuscripts in the hands of the printer and his typesetters and compositors, or, in the best of cases, in the hands of the proofreader, if there was one. “It is no accident then that most of our writers have neglected to preserve their manuscripts.” Although in the eighteenth century, authorship achieved a prominent role, still,

[...] as a general rule, others, and not him [the author], made a clean copy for the printers, following certain conventions; others, and not him, transferred the text to the mechanical system of moving type; others, and not him, disposed and set the format, appearance, placement on the page, chose the type, decoration, illustrations according to precise strategies of dissemination and specific reading programming, control of which remained beyond the author’s reach. And this is not all: commonly, the new productive process and the laws of the market also influenced the rhythms and modalities of the elaboration of the text, making it necessary to endure mandatory deadlines and pauses between editions, printings, launchings and their times.
The field of history of science has, for quite some time, privileged the study of scientists and their works. Yet, the analysis of their works has focused on them only as containers for ideas, regardless of how they were written, printed or disseminated through books or periodical publications. However, in recent decades, research has broadened to include, for example, the study of how these were received by the public.

Many of the new theoretical and methodological contributions have come from cultural history, the sociology of knowledge, and epistemology, which have sought to rethink history of science. Therefore, it is not only a question of explaining, for example, how the learned produced science and great ideas, this is, the climactic situations where the author alone cried “eureka!” It is a matter of reconstructing temporal and spatial contexts from everyday life and social history in order to discover, for example, the contributions of artisans who made scientific instruments and laboratory assistants who carried out the experiments.

The goal is to show how scientific knowledge has been transferred, translated, innovated and constructed. Thus, the focus must be enriched by multidisciplinary approaches that study periods of the past based on new questions: what works were produced and how—as in our work—by the scholars of New Spain in collaboration with printers? What were the results of the printing of books and periodical publications in New Spain? What socio-cultural factors conditioned the results of the dissemination of scientific ideas?

Now then, why is it important to study the processes set into motion by the circulation of scientific knowledge during the eighteenth century? First of all, because understanding the goals—conscions or not—of the dissemination of thinkers and printers of New Spain can show how knowledge was limited by socio-cultural policies adopted by the monarchy, the church or the university. Clearly any act of communication includes or excludes audiences. Then we must broadly and systematically examine scientific practices to see whether or not they had consequences regarding to the dynamics translation and transmission of ideas, and what these results were. We have to establish the conditions and circumstances that favored certain effects, as well as the processes that led scientific developments to have greater or lesser dissemination and impact.

In any case, what is the purpose of this examination of the consequences of the circulation of knowledge in eighteenth century New Spain? Basically, to understand and contribute to a better understanding of one of the least studied aspects of the history of science that is a basic component of scientific creation and dissemination. In addition, it is worth noting that not all circulation of knowledge has been equal. The possibility for communication in the seventeenth and eighteenth century was not the same
as in the nineteenth, nor were the conditions in Europe equal to those of America or Asia. Thus, it seems necessary to closely examine in what context and through what means these occurred, in order to discover what socio-cultural factors were the conditioners and so gain a more complete picture of scientific practice in eighteenth century New Spain xv.

Therefore, when studying society at a given historical moment, the researcher must ask what basic intellectual categories—such as space, time, good, evil, and so forth—structure awareness in order to find out to what extent these categories are linked with its existence, what horizons [limits] of the field of consciousness they give rise to, and finally, what information lies beyond those horizons and cannot be received without a fundamental social transformation xvi.

3.

We begin with a basic question: “How do human groups represent and present the world around them xvii?” Moreover, representations that have to consider its permanence and changes over time. More specifically framed within our project, how do these representations affect the development and circulation of scientific thought in a period such as the eighteenth century xviii?

Of course, we must realize that in studying human representations there are some structures that resist movement and evolution, but even these permanent arrangements experience flows and currents that affect opinions and moral values. It is up to the researcher to determine and point out the orientation and strength of these social representations by choosing a long term period and through a comparative study in various scales of interaction that are social, racial, generational and gender related.

In our case, the eighteenth century is more than justified since we are dealing with a history that must account for the process by which enlightened institutions concerned with scientific education and dissemination were created and developed, together with their agents and specialized discourse. In addition, it is a period of vigorous growth in the practice of reading and writing in New Spain, with a parallel increase in the production and dissemination of writings. This is a privileged moment to study the processes of cultural transformation that arise from the circulation of knowledge. Historians are interested in cultural exchanges, so our work is an attempt to examine cultural exchanges in their various expressions xix.

We must remember that we are in a period that produces an imbalance between the increase and use of the written word and writings on an upper level of society, and the development of teaching and learning on
a low one. We must bear in mind that written culture can be viewed from several spheres, such as race and gender. Cities witnessed the rise of an intermediate social class, whose culture was between written and oral, made up mostly of guilds of artisans and tradesmen. This social space includes professional practices that were disqualified, even denounced and persecuted, by orthodox religion and secular authorities. For example, agents specializing in conceiving, printing or divulging pamphlets on forecasts or calendars that people bought and consulted for practical knowledge applied to agricultural, medical or navigational chores.

A cultural object such as a book calls for a multiple historical analysis on each and every one of the various stages of gestation, creation and consumption. In the first place, considered as merchandise, the book has been studied from the productive sphere: the location and context of workshops, commercial routes and volume of trade. This dimension includes the social sphere that runs from the author to the book producers and sellers: apprentices, typesetters and pressmen, master printers, book sellers and editors. This stage of distribution and commerce has inspired works on the networks of trafficking, contraband and localization of supply and demand of the markets xxi.

In second place, there are some studies that stress the materiality of the texts. This means that together with the intention of the author or editor, the research includes the features of the book—format, page layout, pagination modes, typographical conventions—as signs of an expressive function aimed at controlling the reception, qualifying the text, structuring the unconscious reading xxii (or listening). Likewise, in the sphere of editing and printing, an analysis is made on the effects of the manual press and its specific work models that modify the texts it produces. That is to say, what changes between the original handed in by the author and the printed work? What truth or falsehood is manifested in the printed texts xxiii? From his part, Roberto Moreno has reconstructed bibliographies within the scientific sphere. We might also note the analysis of the circulation of a book based on the reconstruction of the bibliographies of private libraries xxiv.

In third place, from the point of view of a retrospective of reading, we might study access and the representativeness of the book, not only as it is purchased and used privately, but in terms of oral mediation or its public use in libraries or schools. Of course, the heading of consumption offers interesting approaches that range from forms of censorship and readings—private or collective xxv—to a comparison of library listings xxvi, autobiographical manuscripts in the form of diaries or accounting ledgers xxvii, marginal annotations or comments xxviii. At times, those brief notes could almost be considered commentary, as lengthy opinions were written in the margins and blank pages of books owned by the readers xxix.
Finally, a book as the bearer of a text is, especially, a material which presents a testimonial of everyday practices. Hence, the interest in an object such as the book has appeared in studies attempting to understand what a society writes and reads, as well as the usages based on their readings. However, for some time now, the main focus of the analysis of the history of books has been “practiced as though its techniques and discoveries had no bearing on the history of the producers of texts, or as if this were completely lacking in importance in understanding the works.” This has also been true for the field of history of science.

As we have mentioned, when the history of scientific books has been studied in Europe and the United States, for example, the approach has been to consider only the material expression of the author’s thoughts. In other words, scientific literature has served science historians, by and large, to analyze—from several theoretical approaches to knowledge—the discourse, practice and representations of their authors. Only exceptionally has it dealt with the angle of the editor or bookseller. Being so, it comes as no surprise that, traditionally, more has been studied and taught about the theory of science than about scientific theory as a communication act.

In Mexico, for example, the work of Elías Trabulse has made important contributions in terms of the development of scientific thought. Nonetheless, in general terms, there has been a lack of interest in answering the questions of who, where, when, how and for what purpose scientific books were edited and disseminated, or what was read or how it was received, appropriated and reinterpreted by the diverse range of readers.

This said, an analysis of a book or scientific publication calls for an innovative approach; demands an attempt to penetrate and analyze the dialectical process that studies a book as the result of a socio-cultural context that mediates, impacts and modifies what was thought during some historical period.

One of the main theses regarding the cognitive process is constructivist epistemology developed by Piaget and García, based on the principle of the functional continuity of the constructive processes of knowledge, from childhood through the development of science. Thus, an attempt is made to explain how the representations that arise in a specific historical context promote or inhibit certain cognitive developments, inasmuch as they form the epistemic framework that conditions the characteristics of the conceptualizations and activities of the subjects. Therefore, it is interesting to contextualize and make a comparative analysis of cognitive processes in different periods and cultures.
Lucien Goldman already remarked that his theoretical concepts of understanding and explanation were part of an analytical method that went from the written text and its author to the context of reading in the society as a whole. He said, for example:

If I study Pascal’s Thoughts as an internal meaning structure, I try to understand; but if I then inset as a partial structure a broader structure such as that of the Janseist movement I understand Janseism and explain Pascal’s Thoughts through Janseism. And if I insert the Janseist movement into the global structure of the Nobles of the Robe, I understand the history of the Nobles of the Robe and explain through it the rise of Janseism xxxix.

It is worth taking a moment here to review and criticize a recent historical research proposal. In How to write the history of the New World (Cómo escribir la historia del Nuevo Mundo xli), Jorge Cañizares uses the term “patriotic epistemology” to “provide a reading of Hispano-American culture.” Thus, the author hopes to defy “Eurocentric historiography, obsessed with discovering the precursors of modernity in the old Spanish colonies xli.” He describes how, at the end of the eighteenth century in the American colonies, there arose, “a kind of patriotic epistemology that questioned the ability of foreigners to understand the history of America and its peoples xlii.” To support this claim, he mentions, for example, novo-Hispanic historians such as Juan de Velasco and Xavier Clavijero, who claimed to base their reports meticulously on native sources.

The problem with Cañizares’ approach lies not in his proposal of historical revisionism, but in the limits and inconvenience of using a term such as “patriotic epistemology.” A lack of differentiation between the scientific and political fields lead the author to establish, rather than an explanation for the development of scientific ideas born in American lands, a study of the critical position of the children of spaniards born in the New World toward the Spanish Crown.

To support that statement we need to go no farther than a review of the terms employed by Cañizares using Piaget’s constructivist epistemology. On the one hand, we would have the “epistemology,” which refers to scientific knowledge as the most basic concepts of common knowledge (space, time, causality). On the other—as Piaget pointed out—an activity that deals with issues “much broader than knowledge, and which have to do with the meaning of life, the position of man with regard to the universe and society,” which, he said, “go beyond not only science but knowledge in general,” since they are not only a matter of knowing, but “of making decisions, of obligations, of taking sides” as in the patriotism of the American-born descendents of spaniards xliii.
By contrast, Piaget used the expression “historical-critical analysis of science” to determine with greater accuracy the type of historical documentation required “as empirical material for an epistemological analysis of the development of scientific knowledge.” The Swiss epistemologist wanted to “make a comparative study of the characteristics pertaining to the processes of scientific knowledge acquired in various civilizations and various socio-cultural contexts, as they are reflected in the available historical material, regardless of its limitations.”

One material way to tell how the conjectures and abstractions that are a part of a scientific theory were created is through written culture. In our case, the written production of the novo-Hispanic thinkers contained in manuscripts and printed works is where we can read and study their cognitive processes. Moreover, we must not disregard the interventions of the printers and editors who, consciously or unconsciously, may have somewhat modified the author’s originals. Nor can we forget that the American born authors of Spanish descent themselves were the readers of works of varied origins that they criticized, and from which they appropriated certain scientific ideas. These viewpoints, finally, could later been translated into political attitudes such as a patriotic identity. Therefore, asking who wrote scientific texts implies knowing for whom they were written, in other words, it is productive to study the history of the writings of some learned scholars by linking them to what themselves and others read.

The manuscripts and books printed by the novo-Hispanic scientists, as well as the official administrative documents having to do with permits for printing, buying and selling books, are a crucial material to understand the novo-Hispanic cultural world of the eighteenth century. At issue is the printed matter in its different materiality—typography, illustrations and formats of books, gazettes or almanacs.

Thanks to these materials, we can be observed important trends within the conception of knowledge. For example, Bartolache spoke of the importance of “public or general studies schools established by the monarch, and frequented by the youth of America,” which had “produced a multitude of men of merit.” Therefore, the doctor emphasized that New Spain had to be content if they said they were “highly skilled, resourceful, and fine powers,” and easily learn everything they were taught. He concluded “the rest is born wanting to persuade you taught, as there is no country in the world.”

From his part, José Antonio Alzate noted the importance of knowledge to give an advantage in the nation’s production of goods. Thus, stated that “science is not affecting homeland, nations change their knowledge, and this is the practice of all time. Did the Romans shipping to Greece by the laws of the Twelve Tables?” Even in modern times, no matter the original
language. “Concina, Fleuri, Bosuet and many others are Spanish? But see how quickly they have been dumped into our language that is what I run just for the sake of my nation xlvi.”

In addition to these illustrated novohispanos, other thinkers must be considered who saw their books published under the seal of Felipe de Zúñiga y Ontiveros’ press xlix. He, in turn, also personally made and printed maps and calendars or forecasts.

Here we should also note the importance of the accounting ledgers of Zúñiga y Ontiveros. Year in and year out, the printer recorded the accounts for his workshop, made the drafts for his astronomical calculations and wrote down personal and family events. “These testimonies show the literary response achieved by these books, whose content varied between the annotations he did not wish to leave to the vagaries of memory, and the more thought-out products for setting down accounts, personal and family memories or even others of a more social nature.” It is also important to bear in mind the bibliography of his private library. Finally, there is a universe of papers and ink in which we can seek to explain not scientific theories, but rather the practices of the circulation of knowledge in eighteenth century New Spain.
NOTES

i Tissot, Samuel (1786), *Warning to men of letters and the powerful regarding their health, or treatise on the most common ailments of that class of people* (Aviso a los literatos, y poderosos acerca de su salud, ó tratado de las enfermedades mas comunes á esta clase de personas). Madrid. M. Fouquet (1750), *Medical-Surgical Works* (Obras médico-chirurgicas). Valladolid. López, Gregorio (1674), *A Treasury of Medicine* (Tesoro de medicinas). México. Buchan, William (1785), *Domestic medicine or the complete treatise on the method to prevent and cure illnesses with the regime and simple medicines, and an appendix with the farmacopia needed for personal use* (Medicina doméstica, o tratado completo del método de prevenir y curar las enfermedades con el régimen, y medicinas simples, y un apéndice que contiene la farmacopea necesaria para el uso particular). Madrid. Vanegas, Juan Manuel (1788), *Medical Compendium* (Compendio de la medicina). México [author’s note].


v The case of the German Jew Heydeck, who settled in New Spain at the end of the eighteenth century is similar. Olagüe de Ros, G. (2007) “On falsifications in history: Juan José Heydeck (b. 1755) and his ‘prodigious’ discovery of a vaccine against smallpox” (“De las falsificaciones en la historia: Juan José Heydeck (n. 1755) y su ‘portentoso’ descubrimiento de una vacuna contra la viruela”), *Asclepius* 1: 275-284.


vii For the purposes of this paper, we are considering knowledge to comprise both scientific research and the results of subordinate cultural experiences and memories. In any case, we will specify the adjective scientific when necessary.

viii Although other works by J. I. Bartolache were published, this paper will only deal with the *Flying Mercury* (Mercurio Volante – 16 numbers). Among other works by the doctor, we might note the *Mathematical Lessons taught at the Royal University of Mexico by Josef Ignacio Bartolache. First Notebook dedicated to his Excellency Don Carlos Francisco de Croix* (Lecciones Matemáticas, que en la Real Universidad de Mexico dictaba D. Josef Ignacio Bartolache. Primer cuaderno, dedicado al ec lentísimo señor don Carlos Francisco de Croix), México, Imprenta de la Biblioteca Mexicana (1769). And the *Instruction that may serve to cure those sick with the smallpox epidemic now being suffered by Mexico since the end of summer of this year of 1779* (Instrucción que puede servir para que se cure a los enfermos de las viruelas epidémicas que ahora se padecen en México desde fines del estío en el año corriente de 1779). And the *Guadalupan booklet* (1790) (Opúsculo guadalupano).


xii Burke, Peter (2006), *¿Qué es la historia cultural?* Barcelona: Paidós.

xiii “Sociologists, especially those in the so called ‘ethnomethodology’ school, now tend to consider both practical, local or ‘everyday’ activities, as well as
the activities of the intellectuals”. Burke, Peter (2002), Historia social del conocimiento. De Gutenberg a Diderot. Barcelona: Paidós, p. 20. Thus, the knowledge of the learned of New Spain would be taken into consideration, but also that of the midwives, healers and artisans.

xiv As Schorske says, “the history of science still suffers from the division between the internalizers and the contextualizers. Nonetheless, the presence of both as participants in the same enterprise increases the criteria of achievement”. Schorske, Carl E. (2001), Pensar con la historia. Madrid: Taurus, p. 374.


xvii J. P. Rioux and J. F. Sirinelli (1999: 21). “Cultural changes—says Duby—occur at different faces. Fleeting, and indeed totally superficial, at one level of society, are changes in fashion and taste, while the deep transformations that affect the sensitivity, ethics and functioning of reason pertain to the long term. It is important, then, to carefully distinguish each of the multiple flows that, at their own speed, make up the global current, [...] Cultural history must locate itself in the chronology of these turns that shake the life of a culture”. See G. Duby, “Cultural history” (La historia cultural) in P. Rioux and J. F. Sirinelli (1999), Para una historia cultural. México: Taurus, p. 26.


xix In his notes, Gramsci wrote of the need for a comparative study of common sense, the philosophy of the man on the street and the technique of reflexive thought. Gramsci, Antonio, Op. cit., p. 140.


pluma y la pared. Una historia social de la escritura en los siglos de oro. Madrid: Akal.


xxxvii Such is the case of Eisenstein, who studies the role of the press: “[... ] the printer’s workshop attracted diverse talents in a way that was conducive to cross-fertilization of all kinds. Printing encouraged forms of combinatory activity which were social as well as intellectual. It changed relationships between men of learning as well as between systems of ideas”, Eisenstein, Elizabeth (1997), The Printing Press as an Agent of Change. Cambridge: Cambridge University Press, p. 76.


xxxvi Piaget, Jean and Rolando García (2004), Psicogénesis e historia de la ciencia. México: Siglo XXI.

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xxxvi Piaget, Jean and Rolando García (2004), Psicogénesis e historia de la ciencia. México: Siglo XXI.


xlii Ibid., p. 31.


xlvi Finally, the most widespread writing activity among artisans, and the writings turned to most assiduously, were those closely related to the daily routine: accounting. Amelang, I. S., Op. cit., p. 55.

xlvii Bartolache, José Ignacio, Mercurio Volante, n. 1.

xlviii Alzate, José, Gacetas de Literatura, v. 4, pp. 150-151. T. Todorov retrieves a Bakhtinian concept: “In the field of culture, exotopy is the most powerful lever of understanding. A foreign culture reveals itself more fully and more deeply (though never exhaustive, because other cultures come to see and understand even more) only in the eyes of another culture”, G. Gimenez, Theory and Analysis of Culture, vol. 1, pp. 142-143.

xlxi Over more than thirty years (1761-1792), Felipe de Zúñiga y Ontiveros published close to 800 titles, of which about a hundred can be classified as scientific.