

Mexican Modernity, Science Magazines, and Scientific Personality: Santiago Sierra's *El Mundo Científico* (1877-78)

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The story of Mexico's aspiration to possess a scientific personality during the second half of the nineteenth century is conjoined with the country's desire to take a part, and be seen as playing a role in Western modernity. North Atlantic nations—particularly France, England, and the United States, from which news of scientific innovation flowed into Mexico most frequently during this period—were hubs of professional infrastructures that offered space for careful experimentation and eventual specialization within all the known spheres of science. These infrastructures included everything from working laboratories to scientific societies and publications devoted to disseminating the basics of as well as the latest discoveries in such fields as astronomy, chemistry, and botany. During the second half of the nineteenth century, science columns in papers from Mexico City and beyond, as well as a range of other publications, paid special attention to the developments and advancements that were emerging in Western Europe and the United States; some cast a critical eye on the underdevelopment of the science establishment in the country.<sup>1</sup> During the period known as the *República Restaurada*, which followed the ousting of Habsburg emperor Maximilian I by Benito Juárez's forces in 1867, efforts to develop a scientific culture, and with it an official scientific rhetoric, emerged from within a massive reform of Mexican educational structures. In May 1877, General Porfirio Díaz, the man who would rule the country until the Revolution of 1910, became president and a long, controversial period of vast, if uneven, modernization known as the *pax porfiriana* began taking shape. During these 35 years, many attempts were made to extoll science (most often written with a capital S) as a means to consolidate a sense of the

national position in an industrial and increasingly specialized geopolitical map. The development of a Mexican rhetoric of the modern via science has seldom been studied in terms of its progressive evolution, from the early days of the regime to its unfolding. This is, in part, due to the way the period that began in the late 1870s has been critically perceived: the expanse of time covered by the Porfirian regime has been understood as the consummation of an overwhelming reliance on positivism to produce a faulty politics for the burgeoning republic. Moreover, discussions of the discourse of modernity that are characteristic of this period, whose results were hugely detrimental for the country at large, have been easily juxtaposed against a revolutionary rhetoric that, emerging in the second decade of the twentieth century, has served as a corrective to the naivety, as well as the misdirections, of the *fin de siècle*. While these perceptions are not misguided, they often fail to paint a fuller, more nuanced picture of the many intellectual transactions that led to a complex formulation and idealization of modernity in Mexico. Within these discussions, Mexican thinkers demonstrated an acute concern about their place in the world, as well as within a period that was increasingly offering new, democratized languages shared by the community of Western nations. Science was one such language and many, if not the bulk of these ideas were manifested on the pages of magazines and newspapers that engaged with the different facets of Western modernity. The understanding and uses of science was an important inroad into a increasingly attractive version of modernity for Mexicans; and the magazine form offered an open space in which to experiment with the value as well as the expressive potentials of scientific knowledge.

This essay is a microhistory that explores a brief, yet significant moment in the early days of Díaz's rule, in which the pursuit of a modern position is manifested on

the pages of a magazine that boasted its being the first-ever popular science publication in the country. In what follows, I offer an account of the beginning of a period that has too often been read as homogeneous, and of how the interest in pursuing an extant sense of the modern is organized and illustrated on the pages of a small, yet groundbreaking magazine: Santiago Sierra's *El Mundo Científico* (1877-78). This publication offers an insight into the problems and particularities of the "popular" in Mexico during this period, while illustrating the ways in which the literary and the scientific came together in a time of future-thinking in the republic. As a textual object that condenses the news of scientific, technological, and theoretical breakthroughs from across the world, *El Mundo Científico* represents the cumulative process that is modernized wonder—that is, it is organized according to the logic of ongoing and diverse discovery. As a publishing project that resembles science publications from other global localities, the magazine reveals a conversation, as well as a self-reflection, about the cadences of scientific modernity developing in Europe and the Americas. Setting this account against a wider understanding of late nineteenth-century intellectual and publishing history will in turn allow for a more distinctive perception of the experience of modernity and modernization.

In *Mexico at the World's Fairs* (1996), Mauricio Tenorio-Trillo briefly mentions how the government of President Porfirio Díaz paid the writer Manuel de Olaguíbel 2,000 pesos to "compile a bibliography of Mexican science in the nineteenth century" as propaganda for the 1889 Paris exhibition.<sup>2</sup> The purpose, according to Tenorio-Trillo, was to promote Mexico as a country that could compete with North Atlantic superpowers in terms of its modernization and, thus, could be perceived as a possible venue for future investment and immigration. In the first pages of this *Memoria para una bibliografía científica de México en el Siglo XIX* (Report

*for a Scientific Bibliography of Mexico in the XIXth Century*, published by the Secretaría de Fomento in 1889) we find the official bestowal of this task.<sup>3</sup> It outlines the “patriotism” behind this rather difficult bibliographical assignment. Olaguíbel’s own introduction to the tome sounds like an apologia. After judging himself “unworthy” (“no me juzgo competente para este importante trabajo”), he explains some of the challenges he faced in outlining a history of Mexican science publications. A bibliographer, he posits, is in constant peril of judgment by a “crítica mordaz” (“scathing criticism”); he challenges these pundits, asking them to get to work if they find omissions and errata. The author then moves on to describe the advancements of science beginning in the eighteenth century. As the nineteenth century dawned, he explains, Mexico lagged behind in the world of science, because Spain, the *ex-madre patria* (motherland), had been sluggish herself in this regard, thanks to the disruption the Napoleonic Wars caused the metropolis and its colonies, the latter which faced significant restrictions in the import of books from abroad.<sup>4</sup> The plight for independence in Mexico had been equally counterproductive for scientific investigation. “It was not a time for publishing books,” the bibliographer notes, not least because paper had been such a luxury throughout a large part of the nineteenth century.<sup>5</sup> Thus, the hunt for scientific publications needed to resort to other materials, namely periodicals. Olaguíbel explains:

En lo general, los trabajos científicos se publican en nuestro país en los periódicos que se ocupan de estas materias, y aun en los periódicos políticos ... Mucho es lo que se pierde en los diarios políticos que pocos coleccionan, y sería preciso un trabajo de benedicción para ir coleccionando todos los volúmenes de las publicaciones periódicas y entresacar los artículos referentes á la materia científica que se busca. Sin embargo, esta empresa difícil debe intentarse, *tentanda via est*. (Olaguíbel, 66)

(Generally speaking, scientific works are published here in newspapers that deal with such matters, and even in political dailies... Much of what is published in the latter is lost, given how few people collect them, and it would be beneficent to gather the different volumes of such periodicals and cut out articles on science. This difficult task must be attempted, *tentanda via est*.)

Gazettes, newspapers, newspaper supplements, and magazines continued to be the principal, yet fragile laboratories for science writing (largely conceived) in a Mexico that was finding its own personality within the scientific world. These forms of publication were perhaps the most apposite as well, given the pace at which global science was moving during the century, and the way in which ideas were ratified, contested, or debunked thanks to an international system of intellectual exchange. It is not clear whether visitors to the Mexican pavilion at the Paris exhibition could see samples of the publications that Olaguíbel listed in his *Bibliografía*. Had they been able to, they would have been exposed to what Tenorio-Trillo has called, in a different context, the “networks of scientific communities, of local scientific traditions in constant contrast and interaction with the global project of science.”<sup>6</sup> One of the magazines that received the greatest accolades from Olaguíbel was the short-lived *El Mundo Científico*, led and printed by Santiago Sierra (1850-80), adored brother of the better-known Justo (1848-1912). It was published from 2 June 1877 to 26 January 1878. Olaguíbel calls it a “periódico muy importante, dirigido con notable brillantez, por nuestro malogrado amigo” (“very important periodical, directed with notable brilliance by our departed friend”)— “malogrado”/“departed” because the younger Sierra died at the age of 30 in a duel against Ireneo Paz (great-grandfather of Nobel Prize-winning Octavio) (Olaguíbel, *Memoria*, 41).<sup>7</sup> Unlike other publications such as newspaper supplements, which narrated the histories and innovations of sciences

alongside the arts, *El Mundo Científico* was completely devoted to a project of popularizing the former. Under the epigraph “*C’est l’inifini qui se témoigne*” [“*The infinite is (here) bearing witness to itself*”], taken from Saint-Simonian thinker Jean Raynaud, Sierra opens the first edition of the magazine with the following pronouncement: “Nos hemos propuesto crear una publicacion de un género enteramente nuevo en México: *El Mundo Científico*, destinado exclusivamente á consignar los progresos de la ciencia...”<sup>8</sup> (“We have taken it upon ourselves to create a entirely new genre of publication in Mexico: *El Mundo Científico*, devoted exclusively to documenting the advancements of science...”). This was not entirely true, if one considers already existing, more specialized publications such as *La Naturaleza* (*Nature*, published by the Sociedad de Historia Natural), which nationalized a Humboldtian naturalist tradition in the latter part of the nineteenth century.<sup>9</sup> However, Sierra’s product was indeed singular in that it represented the first attempt to develop a “popularization” (vulgarización) of an expansive conception of science in Mexican periodical culture. The magazine, as we will see, is a snapshot, a version of a specific definition of *mexicanidad* at a moment of political stabilization, during which the makers of public opinion and, later, cultural policy found themselves at the interstices of liberal reform and the beginnings of a new government that would eventually bring them under its tutelage. The magazine frames and, importantly, materializes the project of Mexican science as a dynamic dialogue between the modern and the traditional, and a correspondence between global ideas and local realities. On the pages of *El Mundo Científico*, we recognize a process of discovery and a task of narrative organization of thought at a time in which academic disciplines were being developed across the Western world and in Mexico, and the “hard” sciences were not yet fully disengaged from the social sciences.<sup>10</sup> My aim in this

essay, then, is to analyze the function of such a publication within its time—1877, the first official year of Díaz’s regime—and to ask how it developed a definition of science at this critical moment of transition. By doing this analytical freeze-frame, I want to focus on science/*ciencia* in order to better understand the making of modern Mexico at the beginning of the republican period.

### The Meanings of Science in Late Nineteenth-Century Mexico

Science was, and still remains, an incredibly complex and elusive category through which to interpret the nation at this pivotal time; however, it has been all too often understood either in terms of Mexico’s underdevelopment, or within explorations of Porfirian rhetoric. I want to ask whether it is possible to unhinge the seamless equation of “science” and “Porfiriato” (the period of Díaz’s rule) that critics have commonly employed to describe this period in Mexican history. In the process, I reflect on recent work that studies the birth of the fields of anthropology and archaeology during the fin-de-siècle, and how they figure within a periodical culture engaged with scientific discourses. By understanding how these social scientific discourses work within the wider scope of Sierra’s 1877 magazine, we obtain a more nuanced idea of how modernization was understood in this period, and how this understanding is in turn reflected in innovations in publishing forms. My hope here is to shed new light on the evolution of science as a methodology within periodical culture, in order to better comprehend how the *popular* came to be defined.

Furthermore, it is important to explore how the Mexican *scientific personality* was envisioned as the prime conduit for achieving a recognizably and cosmopolitan status as a modern individual, before it became synonymous with a nationalist ideology.

Science, as it came to be conceived throughout the nineteenth century, was an absolute, secular, universal truth; in the rhetoric of the period, especially the kind displayed in Mexican newspapers, it was the irrefutable, objective methodology that could lead entire countries out of backwardness and into modernity. In the final two decades of the century, the men responsible for this particular area of rhetoric—*la ciencia*’s spin doctors—were those who came to be baptized “*los científicos*” (José Yves Limantour, Justo Sierra, Emilio Rabasa among them). According to historian Roberto Moreno, the name follows the appearance of a document dated 23 April 1892 in which a number of public figures, including Justo Sierra, asked for the reelection of Díaz. The authors of this document claimed that the nation was pleading for intellectual and moral progress, “por la demostración con hechos cada día más notorios de que se conoce el valor de esa fuerza mental que se transforma en incommensurable fuerza física y que se llama ‘la ciencia’” (“given the demonstration, with events that become increasingly visible, of the value of that mental force that is transformed into incommensurable physical strength, and which is called science”).<sup>11</sup> Critics of the regime took this as a cue to dub the signers “scientists,” given their unapologetic conflation of political propaganda and supposed academic objectivity. This brand of rhetoric had been gaining momentum for quite a long time. The *científicos* were the intellectual offspring of figures like Gabino Barreda, who introduced positivism into the curriculum at the Escuela Nacional Preparatoria (ENP), founded in 1868, Mexico City’s principal higher education institution in the liberal age. In the early 1880s “science” was a recurrent theme in the articles on the pages of *La Libertad* (established in January 1878), Justo Sierra’s liberal-conservative newspaper, where Santiago was also on the editorial board, and in a number of other newspapers where the branch of knowledge was proposed as the source of political,



social, and aesthetic progress. In *La Libertad* in particular, a “*criterio científico*” that could impose order in the country was proposed as an alternative to the political *personalismo*, *caudillaje*, and factionalism that abounded in the country.<sup>12</sup>

But what did this science really look like in fin-de-siècle Mexico? Recent studies dealing with the intersections of science and politics in this period, while hugely detailed in their descriptions of the problematic scientific cultures in the country, have had little to say about what this word really meant. In their works on Mexican monumentalization and the burgeoning field of archaeology during the Porfiriato, for example, Christina Bueno and Shelley Garrigan have noted how this universal concept was used to formulate an equally wide-reaching, irrevocable concept of the Mexican nation. Writing about the promotion of national patrimony in the Museo Nacional, Garrigan recognizes an active “dialogue between *patria*... and *ciencia* ...”, in which Mexico as a newly autonomous political entity affirms itself publicly by asserting a specifically national claim to a universal discipline.”<sup>13</sup> For her part, Bueno notes the limitations inherent in this conjugation of nation and science in the establishment of Mexican archaeology when she writes, “To claim that a unified, modern Mexican nation existed was to grasp at straws . . . Elite appeals to science were tentative, as the archaeologists carried out their work with little agreement and often much confusion . . .”<sup>14</sup>

Synopses of scientific history written at the time of the Porfiriato reflect Bueno’s judgment. The *científicos*’ tour-de-force and also their swan song (according to historian Roberto Moreno) was a multi-volume publication entitled *México: su evolución social* (*Mexico: Its Social Evolution*, 1900-1901). Full of lavish illustrations, this collaborative project explores the different areas of Mexican culture (e.g., agriculture, literature, pre-Columbian history). Porfirio Parra, better known for his

work proselytizing positivism in a number of magazines such as *La Revista Positiva*, was in charge of the section on science. Echoing Manuel de Olaguíbel's tone in his *Bibliografía*, Parra offers both a celebration and lamentation of the state of the scientific enterprise in Mexico.<sup>15</sup> Despite the "deficiency" in a scientific system, Parra claims, Mexico was not lacking in individual thinkers, capable of conversing, and even "competing" with their European counterparts. Why had the scientific enterprise failed, then, according to Parra? The instruments, books, and machines were there, but the educational infrastructure did not exist.<sup>16</sup> Moreover, as it progressed, the Porfirian regime consolidated its exclusionary and racist cultural policies. A well-documented illustration of this is how the regime tried to sever ties between the glorious and monumentalized pre-Columbian past and the indigenous populations living in the country. (A further offense to the contemporaneous indigenous population was the celebration of the Aztecs above all other groups, despite the diversity of cultures in Mexico.)<sup>17</sup> This had significant ramifications in the fields of anthropology and archaeology, which were only beginning to blossom in the country in the latter part of the nineteenth century. For one, figures within the Porfirian generation of archaeologists would employ Spencerian theories to dissociate the idealized and (to them) *extinct* indigenous predecessors to the contemporaneous indigenous cultures living in Mexico, whom they considered racially inferior.<sup>18</sup> In an attempt to raise the international visibility of the country's past, many would compare the artifacts of the Aztecs to those of classical, Egyptian, and even Chinese antiquity (Bueno, "*Forjando*," 223). It would be the task of the (post-)Revolutionary generations of anthropologists—especially Manuel Gamio, a student of Franz Boas, who, together, founded the International School of Archaeology and Ethnology in Mexico City in 1910—to establish continuities between past and present, and use anthropology for

the well-being of indigenous communities.<sup>19</sup> Justo Sierra proclaimed that archaeology “para nosotros es lo único que caracteriza la personalidad de México ante el mundo científico” [“is, to us, the only thing that distinguishes Mexico’s personality in the scientific world (*el mundo científico*)”].<sup>20</sup> While the interest in building Mexican archaeology was undoubtedly *there* during the Porfirian regime and gained momentum in the 1890s and first decade of the twentieth century, it would take a different sensibility and the improvement of education and disciplinary methodologies to make it a truly successful enterprise in the country.

All of these contradictions, oversights, and misjudgments lead one to ask important, if frustrating, questions: How were the builders of public opinion able to explain science as both a material and an ideological pursuit if the reality pointed to a divided and largely disenfranchised population? What, indeed, constituted the popular in Mexico, and how could science connect to it? The answer, one can easily conclude, thanks to the gift of hindsight, is that it was a matter of rhetoric that some promoted, while others understood it as a load of hot air. Take, for example, the recollections of writer Alfonso Reyes (1889-1959), in “Pasado inmediato” (“Recent Past”), of his early years in the hands of the Porfirian educators: “Se oxidaba el instrumento científico. A nuestro anteojo ecuatorial le faltaba nada menos que el mecanismo de relojería y las lentes, de suerte que valía lo que vale un tubo de hojalata...” (“Our scientific instrument was beginning to oxidize. Our telescope was missing none other than its internal mechanism and lenses, so that it was all worth as much as a tin can...” (quoted in Moreno, *Ensayos*, 148). As time passed, then, the machinery of the regime and its preferred *modus operandi* of style over substance became increasingly evident. Seen from this end of the telescope, the project of popularizing science—making it a widely understood field—collapsed precisely because of its complicity

with a profoundly flawed system of government and its accompanying nationalist ideology.

But I have fast-forwarded to the endpoint of the Porfiriato; let us rewind now. If we turn to the other end of the Porfirian temporal spectrum we get a somewhat different view. One of the intriguing problems with recent histories of Porfirian proclamations of science to which I refer above (often related to questions of national patrimony) is the impulse to read them as a full and unbroken ideological arc connecting science and nationalism, and the country's rather misguided race toward modernization, rather than in terms of a series of moments, individual and collective impulses, which together can spell out a number of interesting contradictions.<sup>21</sup> At the opening of this essay, I expressed my intention to capture the moment of *El Mundo Científico* in order to ask how such a publication defines and problematizes science, as well as the conception of the public sphere, at a time when the República Restaurada is *moving toward*, but hasn't yet arrived at, the politics of *porfirismo*. Risking a dip into the world of scientific analogy, which is, after all, the way that the popularizers of science have explained the processes at work in nature, the body and the mind, let me refer briefly to Jimena Canales's fascinating book, *A Tenth of a Second: A History* (2009), in which she explores the importance of this fraction of time within nineteenth-century ideas of physics and philosophy. Here, she also documents how the technologies that were able to record this slice of time completely changed the way we think of the observer, measures, and measurement itself. Canales argues that, "[b]y the middle of the nineteenth century the temporality of cognition was widely recognized." With this recognition came the idea that variations in "speed of thought" and the "speed of sensory transmission caused alarming errors in astronomy, metrology, and physics."<sup>22</sup> The brain and its connections to the human

senses became the subjects of immense debates among scientists in the latter half of the century. Looking at Locke's idea of the brain as a magic lantern in which images change according to the positioning of a candle, Canales explains how these scientists would begin to debate the "*pace* of the brain as magic lantern" (Canales, *Tenth of a Second*, 10). Taking Canales as my inspiration, this latter part of the paper considers Sierra's *El Mundo Científico* as one moment, one tenth-of-a-second in the history of science in Mexico.

### Magazines and the Development of Scientific Personality

When Justo Sierra stated at the turn of the century that Mexico's archaeological culture would be the only thing that gave the country a *personality* in the world of science, he was speaking from the point of view of a seamless equation between science and modern nation. In other words, the "mundo científico" to which he alluded was a geopolitical category, in which a number of key North Atlantic nations (e.g., France, Great Britain, the US) were seen to be the most powerful because of the success of their colonial campaigns in the nineteenth century, and the (related) breadth of their scientific and technological development.<sup>23</sup> In this "scientific world," archaeology offered a sense of individuality to Mexico, because of the presence of artifacts that other nations have long coveted for their collections. Thus, Sierra sought to promote Mexico as a locally secured repository of objects *and* as a laboratory that would be critical to the expansion of archaeology as a global discipline. As Shelley Garrigan explains, "By nationalizing the field of archaeology, Mexican scholars intended not to turn away foreign specialists or other cultural consumers but rather to secure their own position as *producers* of their own intellectual traditions and the rightful guardians of Mexican cultural capital" (Garrigan, *Collecting Mexico*,

88-89). Significantly, Sierra here spoke out of an interest in what the country could become if it adapted to the methodologies of archaeology and other sciences employed in Western Europe and the United States. In actual practice, it should be noted, efficient fieldwork systems were lacking. Christina Bueno offers a good illustration of the faulty methodologies employed by the scientists working during Díaz's regime: "Porfirian archaeologists spent much of their time scrutinizing individual artifacts rather than the context in which they were found" (Bueno, "*Forjando*," 234). This effort to label, categorize, and interpret betrays the wider impulse by the *científicos* to impose order by numbering, measuring, and mapping.

By the time the older, surviving Sierra made his claim about the country's scientific personality, Mexican public culture had experienced what Tenorio-Trillo calls a "a scientific turn," which had come into full effect in the 1880s. At this time, the ruling classes had bought into the idea that all facets of public and private existence had become explainable through the secular lens of science (Tenorio-Trillo, *Mexico*, 126). When Justo's brother Santiago decided to start publishing *El Mundo Científico* out of his own printing press in late 1877, things looked slightly different in terms of the widespread employment of science as a political tool. Take, for instance, the example of archaeology and anthropology (the main areas of science explored by recent critics) to see where Mexico's *personality* qua archaeological patrimony stood in the public sphere. In 1877 the number of newspaper articles in popular dailies like *El Monitor Republicano* devoted to archaeological findings was minimal; it only began rising sharply in the 1880s, when there was a major push to secure the sites and objects of national patrimony. By the first decade of the twentieth century, the number of articles devoted to archaeological activities had risen dramatically. The Porfirian government was the first in Spanish America to impose legislation to safeguard

national patrimony objects and also the first to install guards at ruins.<sup>24</sup> *El Mundo Científico* emerged at a time of national self-inspection in which archaeology was still a developing discipline. The publication of the first number of Sierra's magazine predated the launch of the *Anales del Museo Nacional de México* (*Annals of the National Museum of Mexico*) by one month. The latter was the principal, state-sanctioned publication with information about archaeological digs and the wider history of the pre-Columbian past. It included articles such as “Idolo azteca de tipo chino” (“Aztec God Figurine Resembling Chinese Style”) by Gumesindo Mendoza, director of the Museo Nacional at that time, which Sierra then reprinted on 1 September 1877.

Many of the articles in Sierra's magazine were translations of previously published articles by European scientists. The issues of *El Mundo Científico* contain serialized articles by well-known figures like Helmholtz, Darwin, Tyndall, Flammarion, and Spencer, and lesser-known popularizers of science such as the Spanish paleontologist Emilio Huelin. But, interspersed through these foreign acquisitions we also find articles written by Mexican men of science, and what we now know as social science (e.g. Francisco Pimentel's “Clasificación de las lenguas indígenas de México” [“Classification of Mexican Indigenous Languages”], published on 30 June 1877). There are numerous articles by Sierra himself, among them biographies of scientists and histories of disciplines—for example, “Le Verrier y su influencia en la Astronomía moderna” (“Le Verrier and his Influence on Modern Astronomy”) from 1 December 1877—and other pieces in which, for example, the author proposes a series of changes in the scientific infrastructure of the country. To recall his older brother's later statement, Santiago Sierra shapes his understanding of science in terms of the formation of scientific personality in this period of Mexican

transition. The magazine sets into motion a definition of “popular” science as “[la] difusión ... de todo lo que es susceptible de pasar al conocimiento de la masa general de la población culta, sin gran aparato de frases y palabras desconocidas ó de fórmulas y conceptos que solo los especialistas pueden comprender” (“the dissemination of everything that is subject to become general knowledge among the educated mass, without recurring to unknown words and phrases or to specialized formulas and concepts”).<sup>25</sup> This passage is revealing in its formulation of the popular: Sierra is addressing a “general mass” of people, but they are a literate mass, which was far from immense. In 1877, the literacy rate in Mexico was well below 20%.<sup>26</sup> I can only speculate about the number of copies of *El Mundo Científico* that were circulating in the capital during the magazine’s six-month stint. Olaguíbel’s allusion to its “importance” and Charles Hale’s mention of it as a “prominent example” of the “changing scientific climate” (Hale, *Transformation*, 153) in the country are small clues as to its dissemination amongst a group that could have well been limited to the usual suspects (e.g., the magazine’s collaborators—there were 35 listed on the cover page to the first volume, writers on staff at newspapers like *El Federalista*, where Sierra was a regular contributor, those who would later comprise the editorial board of *La Libertad*, perhaps even the students of the Escuela Nacional Preparatoria. What is clear from Sierra’s prospectus in this first number is that *El Mundo Científico* was an answer to overly specialized publications—one thinks of *La Naturaleza*, mentioned earlier in this essay, or other single-industry magazines, such as those devoted to mining, like *El Minero Mexicano*. This was also Sierra’s attempt to bring to Mexico the format of the popular science magazine, which had blossomed in Victorian England and the U.S. in the early 1870s.<sup>27</sup>



*El Mundo Científico*—with its hybrid combination of translated texts, science news and chronicles, expositions of local scientific and technical studies, its reflections on the state of disciplines and education in Mexico, as well as more romantic reflections on nature itself—was also a profoundly individual project.<sup>28</sup> Emerging fortnightly from Sierra’s private printing press, the magazine was a reflection of the young editor’s voracious reading habits, his friendships and networks of influence, as well as his own experimentation with the still malleable genre of popular science writing. Sierra’s writing style fluctuates from straightforward science reportage to freestyle musings about the night sky. If we think of his position within the wider scope of scientific thinking in Mexico, and what it would become in the fin-de-siècle, we recognize a process of introspective questioning, proposal-building, and a general advocacy of the acquisition of knowledge through reading and experimentation. Put another way, the magazine is an expression of modernized wonder.<sup>29</sup> Seen synoptically, this attitude locates Sierra at the center of what Pablo Piccato has addressed as the specific brand of romanticism among the writers, journalists, and specifically “combat journalists” (among which he includes Sierra) in Mexico City.<sup>30</sup> This was not only demonstrated by Sierra’s spirit of introspection in the pages of *El Mundo Científico*. It also had to do with Sierra’s formulation of a public image as someone with a clear vision who could take a stab at understanding what was as-yet unintelligible, and who could also freely assume a critical public position against the institutional status quo. This is still quite distant from the strategic conception of science as it was promoted by the *científicos* in later years, and its focus on the individual within the nation is subtly distinct from the conflation of *patria* and *ciencia*. Justo was concerned with the scientific personality of the country in the eyes of the world. Santiago was, in his time, inventing a personality for the Mexican man

of science, as well as questioning the future of the nation within a comparative map of scientific advancement. The magazine thus constituted an entry into that conversation with the world, by way of a public and private practice of self-scrutiny and the observation—at times penetrating, at others fiercely individual—of the local landscape.

Among the articles in which Sierra stages an institutional critique we find one of the few he devotes to the pre-Columbian past. Here, he notes an oversight in the “vigente plan de estudios” (“current curriculum”)—the dearth of anthropological and ethnological studies, both of which have “indissoluble” links to biology. Sierra employs language that resonates with contemporaneous articles devoted to archaeology. Mexico’s landscape is unique because “es en nuestro inmenso territorio donde aun descuellan imponentes las ruinas de Papantla, Mitla, Palenque, Uxmal, Labnah y Chichen-Itzá, restos grandiosos de antiguas civilizaciones cuya memoria solo vive en piedras ininteligibles” (“it is in our immense territory where we can still find the imposing ruins of Papantla, Mitla, Palenque, Uxmal, Labnah and Chichen-Itzá, the grandiose remains of ancient civilizations whose memory only lives in unintelligible stones”)<sup>31</sup> Sierra’s “piedras ininteligibles” sound a lot like the “obscure” (“oscuro”) annals of primitive pasts described in the article from *El Monitor Republicano* I quote above, printed two months after Sierra’s editorial. Curiously, what interests Sierra the most is not so much the exploration of the “pueblos conquistados por Cortés,” but of even earlier generations and species (“En estudio necesario,” 105-106). He is keen to know whether prehistoric man was autochthonous to America, or whether there was a link with the cave dwellers of Europe or the “mound-builders” of North America. His curiosity is directed toward the possibility of finding in Mexico an answer or rebuttal to controversial theories, such as those put

forward by the likes of Brasseur de Bourbourg (1814-74), as well as the debates about the autochthony vs. polygenesis of species established by Agassiz and Darwin. Here we see Sierra insisting on turning Mexico into a laboratory (staffed by Mexican scientists) to test theories moving within larger international scientific circuits. He proposes Mexico as a site for an “original” archaeological and ethnographic study in which different layers of the ancient past can be stripped back, unearthed from below and beyond the ancient pyramids standing throughout the landscape. In the discrete space of this proposal, Sierra plots to bring together emerging disciplines with an invitation to local observation, which can produce discoveries that then reverberate back into a transnational intellectual context.

At this point in time (1877), Sierra perceives the question of scientific discovery as one of vision, largely conceived. Take, for example, his article “Un Museo de Historia Natural” from 7 July 1877, in which he writes:

Un Museo no es hoy un simple almacen ó coleccion de curiosidades separadas en grupos especiales y en el mejor órden; sino un laboratorio en grande escala *en donde se procura sorprender* á la naturaleza en sus obras mas secretas y misteriosas, trayendo ante los ojos del estudiante no solo rocas y animales disecados, *sino los organismos en plena actividad*, el árbol con su fruto, el animal con su nido, el bosque y el rio, la caverna y el mar con todas sus condiciones de habitalidad .... Las salas de nuestro actual Museo no comprenden aún sino una pequeña parte de los ejemplares que pueden suministrar nuestras minas y nuestras montañas, nuestra flora y nuestra fauna que cuentan entre las mas ricas y variadas del mundo ... en esas salas tan sabiamente pobladas de cadáveres, apenas hay campo para los estudios anatómicos, y aún estos tienen que limitarse á las familias, porque los géneros y las especies no están ni remotamente representados todos.<sup>32</sup> (my italics)

(Today, a Museum is not a simple warehouse or collection of well-ordered curiosities, but a large-scale laboratory in which one looks to catch nature in its most secret and mysterious deeds, thus showing the student not only rocks and dissected animals, but organisms in full activity, the tree with its fruit, the animal with its nest, forests and rivers, caves and seas with all their conditions for habitation... The halls in our Museum offer but a small sample of objects and organisms from our mines, our mountains, our flora and fauna, which are among the richest in the world... in these halls so wisely populated by dead beings, there is hardly room for anatomical studies. These, in turn, have to limit themselves to families, because all the different genera and species are not even remotely represented here.)

Sierra's critique of the state of museology in the country, and his proposal to move from "cabinet of curiosities" to a "large-scale laboratory," reflect a widespread opinion about the need to revamp and rethink institutions which, as the author of an editorial about the Museo Nacional notes, "son un libro abierto en que un pueblo estudia sus orígenes" ("are an open book in which a population studies its origins").<sup>33</sup> In Sierra's own editorial, however, we find a will toward observation and capturing a world in the midst of movement. Instead of halls full of dead organisms, his utopian museum is full of living specimens that one can catch in medias res, each creature in the midst of its individual development. The purpose here is not mere exhibition, but an exploration that is inextricable from experimentation. For Sierra, the will to observe was pertinent to all the disciplines of science, from biology and anthropology, to the fields of optics and astronomy.

If scientists exploring cognition in the late nineteenth century were returning to reinterpretations of Locke's concept of the magic lantern—the quick transformation of impressions tempered by movement and light—in his magazine Sierra was formulating a recalibration of vision in all its connotations. The magazine was a way

of making Mexico visible in the scientific world. It was also an attempt, however problematic or quixotic, to provide a wider readership with the tools for intelligent observation of the world, and changing nation, around them. In an article on indigenous sailors during the Conquista, Sierra concludes the piece by stating that the purpose of the magazine is that to widen “los conocimientos entre las personas que por circunstancias particulares no puedan procurarse una biblioteca numerosa y escogida” (“knowledge, among people who, given their circumstances, do not have access to a vast library”).<sup>34</sup> If his magazine acted as a small substitute for nonexistent, capacious libraries, it was also Sierra’s attempt to offer instruments for observation to those who did not possess them. From the late eighteenth century and the earlier decades of the nineteenth century, exciting discoveries in astronomy in Europe were revealed to an increasingly fascinated reading public across the world. Astronomers such as eighteenth- and early nineteenth-century telescope designer William Herschel—a figure who fascinates Sierra—assiduously “swept” through the cosmos with his telescope, developing an intimate knowledge of every aspect of the night sky. Such figures were the paragons of the intelligent observer—the subject who sees, can fully grasp, and de-mystifies what he is watching. This moment in the history of scientific observation, as historian Richard Holmes has commented, coincides with a radical reinterpretation in Western thought of the mechanics of perception: “Classical physiology was wrong. Visual images did not simply fall upon the optic nerve, in the same sense that they fell upon a speculum mirror. The eye constantly interpreted what it saw...”<sup>35</sup> Astronomers, with their manipulation of instruments to enhance clearer vision of distant bodies, and with their painstaking insistence on discovering unique bodies lost in what to others is a sea of darkness, became models of this new practice. We can thus consider the observation of the night sky as a paramount activity in the

process of developing the educated eye, enlightening as it does the dark and obscure mysteries of the surrounding natural world.

Every month of its publishing run, *El Mundo Científico* featured an article series entitled “El cielo de... [any given month’s sky].” Written by Sierra himself, these essays represent a species of freestyle meditations on the nature of observation. They were ostensibly about astronomy, the constellations that one can see more clearly at any given point in the year, but they could also range into other areas of science, and even borderline spiritualism.<sup>36</sup> In the primers that are the “Cielo” articles, Sierra draws his readers’ attention to the sky and space as evidence of an intricate natural world that needs to be deciphered with eloquent observation. What Sierra needed to reconcile, in the context of a Mexico that was only gradually equipping itself with instruments and a scientific language, was how one could become an informed observer—how one could accomplish the highest level of cognition—without the same level of advancement as other countries:

A falta de telescopios, usad simples anteojos; y si ni aun esos instrumentos teneis para reducir á vuestro dominio los campos de estrellas, usad tan solo el maravilloso aparato que el Optico Supremo colocó bajo vuestras frentes, y... siempre sentireis que hay en vosotros alas invisibles y poderosas, y la ambicion de llegar al vértigo sublime de la ciencia se despertará vivaz y emprendedora en el yo intimo.

Lacking telescopes, use spectacles; and even if you don’t have these instruments to bring the stellar fields into your grasp, simply use the marvelous apparatus that the Supreme Optic has placed under your foreheads and... you will always feel that you possess powerful, invisible wings within you, and the ambition of arriving at the sublime vertigo of science will awaken in the deepest recesses of your self.<sup>37</sup>

Sierra, using oratorical language, promotes a complete democratization of educated vision: any subject can be trained to see intelligently with the naked eye, and the object of vision—the sky—hovers over anyone who wants to pay attention.

Sierra's optical writing, we could say, attempts to compensate for the absent instrument by merging the different modes of scientific vision. In *El Mundo Científico*, we thus get a glimpse of the conditions that can frustrate vision (the absence of immediate means to see the minute and the distant with sophisticated tools), but we also have a blueprint, expressed through writing, of how one can begin to bring the unknown elements of the surrounding world into sharp and informed focus. Sierra proposes astronomy, that science of the most obvious of mysteries (distant sights and other worlds), as a first step in a progressive unveiling of the different intricacies of vision.

It is significant that the first edition of the night-sky articles, from September 1877, is titled “Kaleidoscopio” (Kaleidoscope).<sup>38</sup> This instrument, as Jonathan Crary has observed, represented one of the departures, in the nineteenth century, from the fixity of the camera obscura. It was a metonym for what Crary calls “the increasing abstraction of optical experience from a stable referent.”<sup>39</sup> The kaleidoscope's “trick” of setting two long mirrors to reflect the changing shapes of small particles as they change position through the viewer's manipulation puts the viewer in command of an optical illusion, making her/him the owner of the process of projection. Read metaphorically (as Baudelaire and, later, Bergson do), the kaleidoscope is a reminder of how the quickened pace of modern life challenges stable perception: a movement, a change in position, like the quick tap on a kaleidoscope, can reorganize, fragment, and ultimately transform what we see and understand.<sup>40</sup> If the pace of science is quicker than that of any other aspect of culture, as Sierra writes in his inaugural essay in *El*

*Mundo Científico*, then that reader (that potential viewer) must be prepared to understand and emulate the refractions in experience that are constitutive of fin-de-siècle Mexican modernity. These essays about the night sky are a meditation on what science can offer a nation in the midst of modernization, as well as a reflection on how science can lend new breath to a modern subject's aesthetic, and even spiritual, introspection.

### Rethinking Mexican Modernity

This essay looks backward and forward across a 30-year span that has left a contentious legacy in the intellectual history of modern Mexico. By the close of the Porfirian period, science came to represent an aspirational rhetoric employed to justify an elitist mode of governance. The period has mostly been understood according to the history of the men eventually known as *los científicos*—a group that Charles Hale defends as “constitutionalists and not merely as apologists for the authoritarian regime of Porfirio Díaz” (*Transformation*, 246)—and also the emergence of the first sites from which a “scientific politics,” as Hale has called them, was broadcast. To nuance an understanding of this eventful span of time, I have offered a freeze frame of a particular moment in Mexican periodical culture—the publication of Santiago Sierra's *El Mundo Científico*—that elucidates the workings of an intellectual and political culture in constant transition. Sierra himself appears rather like an all-too-brief episode in the long narrative history of the Porfiriato, as he did not live long enough to see how the government would incorporate his peers into the depths of its folds. He represents the eclectic intellectual class inhabiting the capital at a time in which many were considering the constitution of modern Mexican subjectivity. Seen from the point of view of its limitations, it was a period of hardships in publishing, scant higher



education institutions, and a cultural infrastructure in need of widespread reform. On the upside, it was a time of proposals, of intense cosmopolitanism, and of measuring the capabilities of a country that finally felt independent. The sciences, which were elsewhere becoming more accessible to wider audiences, were now increasingly housed within discrete disciplines—disciplines that, in turn, were booming thanks to transnational collaborative networks, and improved technologies.

Sierra's brief, yet significant, magazine project was an attempt to bring a formula of the popular science format to Mexican audiences, to a "mass" of readers that was smaller than elsewhere, yet keen to take part in a global scientific community. *El Mundo Científico* defined science as both a personal and a collective pursuit that had both utilitarian and aesthetic gains for the subjects who undertook it. It was, as I have been arguing, a blueprint for the building of the personality of the Mexican scientific subject—one that could absorb information from outside, and sharply and intelligently observe the surrounding natural and institutional environment. In other words, the magazine offers a precise snapshot of the way scientific culture was reaching Mexico, and a processing of how this culture could be put to use in the country.

Capturing this moment in Mexican periodical history recalibrates and nuances our understanding of a period full of contradictions. It also offers an insight into Mexico's position within the wider networks of nineteenth-century Western intellectual history, and how Mexican subjects perceived and processed the concept of scientific and technological modernity. In a critique of Peter Gay's account of British nineteenth-century society in *Schnitzler's Century* (2002), historian Jorge Cañizares-Esguerra notes how, for Gay, the term "Victorian" "encompasses 'all of Western civilization'" to the point of becoming interchangeable with "nineteenth century."<sup>41</sup>

Cañizares-Esguerra calls for a “rescue” of other “Victorian” experiences from across the globe, as a way of countering what he calls the “flatten[ing]” of “the historical experience of places other than the United States and Europe” (Cañizares-Esguerra, *Nature*, 168). This observation elucidates how singular our perception of nineteenth-century modernity can be, and how much it needs to become cognizant of other versions of the modern. The recovery of Sierra’s *Mundo Científico* is a step toward recognizing the multiple senses of modernity that emerged globally throughout the nineteenth century. It is an experiment in connecting with an increasingly pervasive and powerful way of making sense of the world, as well as a meditation on science’s potential influence over other areas, including literature and the arts. Sierra’s magazine exists at a crossroads between old and new governments, romanticism and positivism, traditional ways of looking at the world, and fast-paced, modern perceptions of the self in that world. If, by the latter days of the Porfiriato science had become “a coveted aura” (Bueno, *Forjando*, 224), in Sierra’s *Mundo Científico* we see it laid out as a project that eagerly considers how its multiple perspectives can be conveyed to a wider audience. And if, by the end of this period the “anteojo ecuatorial” was oxidized, broken down, and lens-less (to recall Alfonso Reyes’s verdict), Sierra’s observational sensibility offers a critical yet optimistic, and democratic, scientific panorama at a moment his circle cautiously perceived as a new beginning.

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<sup>1</sup> Two examples of publications entirely devoted to science that offered critiques of Mexican scientific infrastructures is *El Mundo Científico*, the focus of this essay, and *La ciencia recreativa* (*Recreational Science*), written by José Joaquín Arriaga, and which began its run in 1871. In *El Mundo Científico*, for example, Sierra proposes an “Instituto Nacional” (National Institute) that parallels the scientific societies of western Europe, among them Britain’s Royal Society and the Smithsonian Institute in the

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United States. Santiago Sierra, “Asociación Politécnica Mexicana. Instituto Nacional,” *El Mundo Científico* (July 14, 1877), 97-99. For his part, Arriaga offered “novelitas científicas” [little scientific novels] to teach central principles within different areas of science, from astronomy to optics and botany. In his introductory number, entitled “La primera semilla” (“The First Seed”), the narrator happily recalls his past voyages to foreign lands, where he witnessed what to him was a beautiful form of progress. This advancement came in the shape of advanced agricultural methods, factories, schools, and “establecimientos científicos” (scientific establishments). José Joaquín Arriaga, *La ciencia recreativa. Publicación dedicada a los niños y a las clases obreras* (Mexico: J.M. Aguilar Ortiz, 1873), 5-6.

<sup>2</sup> Mauricio Tenorio-Trillo, *Mexico at the World's Fairs: Crafting a Modern Nation* (Berkeley: University of California Press, 1996), 58.

<sup>3</sup> The *Memoria* is dated 12 December 1888.

<sup>4</sup> For a vivid account of these restrictions, see Raúl Coronado, *A World Not to Come: A History of Latino Writing and Print Culture* (Cambridge, MA: Harvard University Press, 2013).

<sup>5</sup> Manuel de Olaguíbel, *Memoria para una bibliografía científica de México en el Siglo XIX* (México: Oficina Tip. de la Secretaría de Fomento, 1889), 66.

<sup>6</sup> Mauricio Tenorio Trillo, “Stereophonic Scientific Modernisms: Social Science Between Mexico and the United States, 1880s-1930s,” *Journal of American History* 86.3 (Dec. 1999), 1156-87; 1158.

<sup>7</sup> Historian Daniel Cosío Villegas describes this incident as representative of a “resaca romántica” (“romantic hangover”) still rampant among Mexican intelligentsia. See Cosío Villegas, *Historia general de México*, vol. 4 (Mexico City: Editorial Hermes, 1955), 428. In a more recent study, Pablo Piccato highlights it as an insight into how the makers of the Mexican public sphere during the República Restaurada made a transition “from a romantic notion of the self... to a new ethical model associated with positivism.” Piccato’s observation is an important one, which I will take up later in this essay. Piccato, *The Tyranny of Opinion: Honor in the Construction of the Mexican Public Sphere* (Durham, NC: Duke University Press, 2010), 9.

<sup>8</sup> Santiago Sierra, “Las ciencias, las artes y la industria” (opening editorial statement), *El Mundo Científico* 1.1 (2 June 1877), 2.

<sup>9</sup> *La Naturaleza* featured articles that corrected European assumptions about fauna and flora found in the Americas. As Fiona Clark has noted, the spirit of such articles dates back to José Antonio Alzate y

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Ramírez's *Gazeta de Literatura de México*, published between 1788 and 1795. She writes that, in this particular periodical, "Alzate is simultaneously attempting to awaken the Mexican national consciousness... by printing extracts so that his readers can see firsthand what is being published about them in Europe... and ... by encouraging his readers to become more aware of and involved with their surroundings, to own their natural resources and the traditional knowledge available to them, and to look for ways to exploit these riches that are beyond the reach of the average European." Fiona Clark, "'Read All About it': Science, Translation, Adaptation, and Confrontation in the *Gazeta de Literatura de México*, 1788-1795," in Daniela Bleichmar, Paula de Vos, Kristin Huffine and Kevin Sheehan, eds., *Science in the Spanish and Portuguese Empires, 1500-1800* (Stanford: Stanford University Press, 2009), 147-77; 174-5.

<sup>10</sup> For discussions of discipline formation, and the development of a social-science model during the late nineteenth and early twentieth centuries, see Rick Rylance, *Victorian Psychology and British Culture, 1850-1880* (Oxford: Oxford University Press, 2000), Brad Evans, *Before Cultures: The Ethnographic Imagination in American Literature, 1865-1920* (Chicago: University of Chicago Press, 2005), and Tenorio Trillo's "Stereophonic Scientific Modernisms."

<sup>11</sup> Roberto Moreno, *Ensayos de historia de la ciencia y la tecnología en México* (México: UNAM, 1986), 147.

<sup>12</sup> Leopoldo Zea, *Apogeo y decadencia del positivismo en México* (México: Colegio de México, 1944), 28.

<sup>13</sup> Shelley E. Garrigan, *Collecting Mexico: Museums, Monuments, and the Creation of National Identity* (Minneapolis: University of Minnesota Press, 2012), 66.

<sup>14</sup> Christina Bueno, "Forjando Patrimonio: The Making of Archaeological Patrimony in Porfirian Mexico," *Hispanic American Historical Review* 90.2 (2010), 215-45; 218.

<sup>15</sup> Porfirio Parra, Justo Sierra, ed., *México: su evolución social* (México: J. Ballezá y Compañía, 1901), 461.

<sup>16</sup> Pablo Piccato explains how, in 1878, only 3% of the budget went to education; by 1910 it had risen to 7%. Piccato, *Tyranny*, 136.

<sup>17</sup> Both Garrigan and Bueno address this in their works cited above. See also Rebecca Earle, *The Return of the Native: Indians and Myth-Making in Spanish America, 1810-1930* (Durham, NC: Duke

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University Press, 2007) and Barbara A. Tenenbaum, "Mexico and the Royal Indian – The Porfiriato and the National Past," *University of Maryland Latin American Studies Center Series*, no. 8 (1994).

<sup>18</sup> Claudio Lomnitz writes that Herbert Spencer was "the ideologist who most influenced educated racist thought in Mexico" given his belief "in the fundamental importance of social evolution and in the inheritance of acquired characteristics." Claudio Lomnitz, *Deep Mexico, Silent Mexico: An Anthropology of Nationalism* (Minneapolis: University of Minnesota Press, 2001), 50.

<sup>19</sup> Enrique Florescano, "La creación del Museo Nacional de Antropología," in Florescano, ed., *El patrimonio nacional de México*, vol. 1 (México: Fondo de Cultura Económica, 2004 [1997]), 70-71.

<sup>20</sup> Quoted in Sonia Lombardo de Ruiz, *El pasado prehispánico en la cultura nacional (memoria hemerográfica, 1877-1911)*, vol. I (Mexico City: Instituto Nacional de Antropología e Historia, 1994), 27-28.

<sup>21</sup> Charles A. Hale makes an important distinction about the group that comprised the *científicos*, particularly the emergence from the editorial chairs of *La Libertad* to Díaz's inner circle: "The men of *La Libertad* came together as journalist-intellectuals in support of a new presidency that promised stability and progress after years of contention. They were seekers, politically as well as intellectually... By 1880 Justo Sierra and Hammeken had become deputies. Cosmes, [Carlos] Olaguíbel, and Santiago Sierra all received government appointments, but they were short-lived or of minor importance. The *Científicos*, on the other hand, were virtually all either deputies or appointees to high government posts in 1893... [T]he *Científicos* were well within the official circle from the outset of their reform campaign. By comparison, the men of *La Libertad*, despite their intellectual support for the government, were still outsiders in 1878." Charles A. Hale, *The Transformation of Liberalism in Late Nineteenth-Century Mexico* (Princeton: Princeton University Press, 1989), 128.

<sup>22</sup> Jimena Canales, *A Tenth of A Second: A History* (Chicago and London: University of Chicago Press, 2009), 9-10

<sup>23</sup> While France, England, and the US led the way in the development of specialized science, and later popular science, other European nations faced challenges not wholly dissimilar from those faced in Mexico in terms of the distance between the pursuit of a solid scientific culture and disadvantageous economic realities. For example, Paola Govoni explains how, in Italy, the elites in the newly unified country "were determined to foster an image of the close links between education and development in public opinion," a pursuit that went hand-in-hand with offering the country "a social and economic

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infrastructure comparable to that of the leading European countries.” As Govoni notes, however, this ideal of a “widely diffused scientific culture coincided with the need to aid an economy that was in fact timidly progressing along the industrial road only in parts of the north of country” (30). Paola Govoni, “The Historiography of Science Popularization: Reflections Inspired by the Italian Case,” in Faidra Papanelopoulou, Agustí Nieto-Galan, and Enrique Perdiguero, eds, *Popularizing Science and Technology in the European Periphery, 1800-2000* (Aldershot: Ashgate, 2009), 21-42.

<sup>24</sup> See Lombardo de Ruiz, *El Pasado prehispánico en la cultura nacional*, 30.

<sup>25</sup> Santiago Sierra, “Las ciencias, las artes y la industria” (opening editorial statement), *El Mundo Científico*, 1.1 (2 June 1877), 4.

<sup>26</sup> Moreno notes that before the Revolution erupted in 1910, 17% of the population could read. Moreno, *Ensayos*, 155.

<sup>27</sup> Jonathan R. Topham explains that, in the British case, that the term “popular science” emerged as a reaction to the “increasingly specialized and disciplinary condition of natural enquiry in Britain at the end of the eighteenth and start of the nineteenth century, as tangibly represented by the burgeoning of specialist scientific societies and the rapid development of both society transactions and commercial periodicals” (8). Topham, “Rethinking the History of Science Popularization/Popular Science,” in Papanelopoulou et. al., eds, *Popularizing Science and Technology in the European Periphery, 1800-2000*, (Aldershot: Ashgate, 2009), 1-20. In Mexico, it would seem the process of producing a popular science as an effect of a highly specialized scientific culture was much more temporally compressed, given the limitations in the social and educational infrastructure that came with independence. We get a sense of this in the way Sierra uses his own popular publication to propose scientific institutions that he felt were absent from the Mexican intellectual landscape.

<sup>28</sup> The title page of the first magazine number contains an endorsement from the Ministerio de Fomento (“*El Mundo Científico... honrada con la protección especial del Ministerio de Fomento*”). Currently I do not have any information on the level of financial subsidy Sierra received for the printing. However much he did receive, it does not appear to have been very much. In the issue that closed the first volume (29 September 1877), Sierra writes the following: “A pesar de la brillante acogida que le han dispensado las personas que en México se interesan por el progreso de las ciencias y la difusión de los conocimientos útiles, hemos tropezado en esta empresa con graves dificultades y obstáculos, que solo á fuerza de constancia y de sacrificios de todo género, hemos logrado superar. Los cuantiosos gastos que

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necesita erogar una publicacion de esta clase para sostenerse á la altura a que desde un principio la hemos colocado, la necesidad de cumplir con nuestra oferta, teniendo á nuestros favorecedores al tanto de las cuestiones que se debaten en el mundo de la ciencia, y el deseo de que “El Mundo Científico” adquiriera las simpatías de la fraccion ilustrada de la sociedad mexicana, han sido motivo de una lucha tenaz entre nuestros propósitos y los medios de que disponíamos” (“Despite the brilliant reception by people in Mexico who are interested in the progress of the sciences and the diffusion of useful knowledge, our project has been faced with grave difficulties and obstacles, which we have overcome only through sheer persistence and all manner of sacrifices. The costs involved in distributing a publication of this kind, and maintaining the level that we have envisaged from the beginning; the need to comply with our offer, keeping our subscribers up to date with the issues that are debated in the world of science, and the desire that *El Mundo Científico* will be welcomed by the illustrated sectors of Mexican society, have been the catalysts for a tenacious struggle between our purpose and our means”) Santiago Sierra, *El Mundo Científico*, (29 September, 1877), 273.

<sup>29</sup> Writing about the *científicos*, Tenorio-Trillo argues that they practiced what he terms “pragmatic mimetism,” for “intellectual and political ends.” He explains: “It was mimetic because their essential concerns (nation, race, science) were not conceivable without translation, imitation, and dialogue with cosmopolitan ideas. It was pragmatic because it was useful in view of their political interests both as knowledge authorities and as nation builders. They learned methods and techniques to present their own nation, society, and state in a modern scientific fashion. More important, they were determined to catch up to, and enter into dialogue with, mainstream Western science in order to open the spectrum of cultural and economic possibilities of the modern Western world to a poor, nonwhite, Spanish, Catholic, and agricultural nation” (Tenorio-Trillo, “Stereophonic Scientific Modernisms,” 1169). The contents of Sierra’s magazine reflect the beginning—or better, the formulation—of this pragmatic mimetism. The short life and singularity of this magazine project (as one of the “techniques” that manifest a modern scientific nation) also demonstrate an exercise in looking outward into the world, and inward into the creation of the scientific individual in the country at the opening of the Porfiriato.

<sup>30</sup> For an exploration of “combat journalism,” see Piccato, *Tyranny of Opinion*, 63-95.

<sup>31</sup> Santiago Sierra, “Un estudio necesario,” *El Mundo Científico*, (14 July, 1877), 105.

<sup>32</sup> Santiago Sierra, “Un Museo de Historia Natural,” *El Mundo Científico*, (7 July, 1877), 85.

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<sup>33</sup> “El Museo Nacional,” *El Monitor Republicano* (15 September 1877), in Lombardo de Ruiz, *El pasado prehispánico*, vol. 1, 54.

<sup>34</sup> Santiago Sierra, “Navegantes Indígenas en la Época de la Conquista,” *El Mundo Científico*, (17 November, 1877), 99.

<sup>35</sup> Richard Holmes, *The Age of Wonder: How the Romantic Generation Discovered the Beauty and Terror of Science* (London: Harper Collins, 2008), 116.

<sup>36</sup> Among other things, Sierra was a noted spiritualist medium in the capital. He published articles for *La Ilustración Espírita*, Mexico City’s spiritualist newspaper, under the pseudonym “Eleútheros.” One of his peers in this particular circle was the author Pedro Castera, who describes Santiago (nicknamed “Chano”) thus in a pseudo-biographical story: “Sabía yo que el hijo de la ilustre Yucatan era filósofo, escritor, poeta, espiritista, discípulo de Allan Kardec, magnetizador, medium, doctor magnópata, y qué sé yo cuántas cosas mas!” [“I knew that this illustrious son of the Yucatan peninsula was a philosopher, writer, poet, spiritualist, a disciple of Allan Kardec, a magnetist, and who knows what else!”] Pedro Castera, “Ultra-Tumba,” *El Federalista* 5.13 (17 May 1874), n.p.

<sup>37</sup> Santiago Sierra, “Kaleidoscopio. El cielo de septiembre,” *El Mundo Científico* (1 September 1877), 213-15; 213.

<sup>38</sup> Invented by David Brewster in 1815.

<sup>39</sup> Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, MA and London: MIT Press, 1990), 113.

<sup>40</sup> Henri Bergson, *Matter and Memory*, in Crary: “Here is a system of images which I term my perception of the universe, and which may be entirely altered by a very slight change in a certain privileged image – *my body*. This image occupies the center; by it all the others are conditioned; at each of its movements everything changes, as though by a turn of the kaleidoscope.” Jonathan Crary, *Suspensions of Perception: Attention, Spectacle, and Modern Culture* (Cambridge, MA and London: MIT Press, 1999), 354n.

<sup>41</sup> Jorge Cañizares-Esguerra, *Nature, Empire, and Nation: Explorations in the History of Science in the Iberian World* (Stanford: Stanford University Press, 2006), 167-8.