EARLY SPANISH SCIENTIFIC WRITINGS ON THE ORIGIN OF LIFE

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1. The general context

The reception of new scientific developments –in general, of materialistic or positivist inspiration– in the field of natural sciences in XIX-Century in Spain was conditioned by the particular social and ideological coordinates. The Spanish society was moved away from the course of historical development of modernity. This situation was obvious in the general absence of suitable structures for developing an original experimental research activity (**Núñez** 1977: 14). Furthermore any significant progress was hindered by the growing ideological polarization.

The influence of the ecclesiastic organization was very strong as they used efficient mechanisms of ideological and educational control, and were allied with traditional classes that ruled the basic productive tissue. Nevertheless the freethinker groups opposed to them a rising and radical response, as apostles of the new political and cultural streams and in association, sometimes in an unnatural way, to the still weak social forces proposing resolved social and political changes. In this context, the reception of darwinism –as a paradigmatic example of how the scientific thinking was a jolt to the traditional Western foundations during the second half of XIX century– was at first impeded.

The new ideas, and darwinism ahead, penetrated however through the split opened by the Revolution of 1868 (*La Gloriosa*). This revolutionary triumph was quite ephemeral if one consider that Monarchic Restoration was effective by 1874, but perdurable after all given that many of the revolutionary changes were irreversible. Many other developments occurred albeit the evolutionist doctrines were the flag of the ideological renovation with a scientifc substrate (for review see **Núñez** 1977, **Glick** 1982 and **Sala Catalá** 1987).

The aim of this work is to review the discussion on the origin of life in the Spanish context, always as an ancillary question of the problem of the species transmutation but, at any rate, sharing with it the vehemence –specially on discussing the possibility of spontaneous generation–, the confrontation of opinions and, in general, the notably scarcity of original results.

2. The task initiated in the 1860s

The references to scientific studies on the origin of life were limited to reports on the activity done in other countries –mainly France, Germany and Great Britain– due to the absence of a possibility to develop an original experimental work. During a long period of time those reports were published in popularized miscellanies aimed to inform the readers of some journals about the more recent scientific advances. On the issue of our interest was specially active the journal *Revista de los Progresos de las Ciencias Exactas, Físicas y Naturales* (*Real Academia de Ciencias Exactas, Físicas y Naturales*, Madrid 1850-1904), that regularly published news and translations of papers appeared in *Comptes Rendues de l'Académie des Sciences* (Paris, France). Thus, *Revista de los Progresos…* allowed the Spanish readers to know about **Félix Pouchet** research as early as in 1859. **Pouchet** work on the experimental possibility of heterogenesis –translated as *heterogenia*, a term that will be very popular in Spain– have been published only months before in the French journal aforementioned. As a measure of how timely and convinient was the news selection made by *Revista de los Progresos…* we mark that in 1859 –the publication year of **Charles Darwin** *On the Origin of Species…*– **Pouchet** publishes *Hétérogenie ou traité de la génération spontanée* (**Farley** 1977 : 96), a work that will start the famous **Pasteur-Pouchet** debate (see Timeline). In 1863 this journal publishes a less relevant paper by the German anthropologist **Hermann Schaaffhausen**, a follower of the spontaneous generation doctrine. The Spanish translation reveales how faltering the scientific terminology is at this moment in using, e.g., *metamórfoses* instead of *metamorfosis*. Later will be published a paper by the French botanist **Charles Lemaire** on the presence of microorganisms in air samples from different French locations. Lemaire attacks the heterogenist position that negates the existence of germs in the atmosphere (**Lemaire** 1865). A few later the journal –in the section *Variedades*, a kind of review of current scientific news in short– will show the interest on the controversy in France and the *Académie* resolution to create a informative comission (**Ruiz** 1865). The editorial board of *Revista de los Progresos…* will heat the discussion publishing a note by the French naturalist **Gourdan de Fromentel** and, in 1866, the translation –incidentally, using now the term *metamórfosis*– of a paper by the French botanist **Auguste Trécul** –originally published in *L'Institut*– on the transformation in spores of the starch granules of plant parenchyma.

Other Spanish journals, besides *Revista de los Progresos…*, were sensitive to the spontaneous generation controversy. Thus, in 1864 *El Museo Universal* publishes a documented paper by **Ignacio Oliver de Brichfeus** that reviews accurately the history of the problem since the classical epoch, the philosophical implications –without forgetting, after **Pierre Flourens**, the current and dangerous linking

between transformism and spontaneous generation– and ending with a description of Pasteur experiments and his opponent criticisms. The author, albeit adversary of spontaneous generation, will use a measured tone, one that increasingly became strange in the scientific debates by Spanish authors.

Spain, therefore, was a passive receptor of the ideas and experimental results on spontaneous generation during the sixth decade of XIX century. Both journals and authors undertook a modest popularization of the debate in France but with complete absence of an original work.

3. The 1870s eclosion

The convulsed and encouraging period, initiated by the Revolution of 1868 and closed with the Monarchic Restoration in 1874, although intellectually renovating was not particularly prolific on the topic studied here if one considers just the printed production. Nevertheless, as we will see later, it is the moment of the author that will become the main reference in the origin-of-life problem in the Spanish context, **Enrique Serrano Fatigati**. But now we will focus on other authors who also pay attention to that question, albeit their results, purposes, and presuppositions were quite different.

The popularization task went on, but now from different journals. It is remarkable *Revista Europea*, one of the public platforms of the Krausist group, that published in 1876 the translation of a long paper by **Wilhelm Preyer**, professor at the University of Jena, where he expounded the origin-of-life question in crude mechanistic terms, with ideas related with the thought of **Haeckel**, also professor at Jena University. The line of thinking of **Preyer**'s paper dismantled the possibility of spontaneous generation because if it occurred in a particular moment of the past, what would impede its manifestation today as indicated by numerous and compelling experimental evidences? If in fact it have occurred under very different circumstances, how life could bear so wide change in environmental conditions? The dilemma is evaded by **Preyer** invoking the eternity of life and accepting that terrestrial life is the result of the arrival of life forms from outer space. Many of these ideas will be presented by the author in his more extended work *Die Hypothesen über den Ursprung des Lebens* –a title almost identical to the one in translated paper– published in Berlin in 1880 (see **Farley** 1977: 152).

The same journal reported the new experiments of **Pasteur** answering the objections to his fermentation theory, a question related to the spontaneous generation debate (Teoria 1875). It is noticeable that any of the French scientist public activities attracted the attention. Thus, *Anales de Ciencias Médicas*, a journal with a different scope, beyond the popularization of science –the Spanish medical class demanded already professional journals with a certain level– enthusiastically covered the frustrated confrontation between **Pasteur** and **Henry Bastian** (**Tolosa Latour** 1877). The contributions of **Pasteur** also appeared in the newspaper pages. As an example we refer to a feature by **Emilio Ribera** –a natural history teacher in a secondary school– in *El Imparcial* (1877). With ponderous rethoric the author, with references to the scientific triumphs in the XIX century, described the experiments of **Pasteur** and **Tyndall** on fermentation, stressing the fact that fermentative fungi always proceed from another identical one travelling in the air.

The prevailing panorama in the Spanish XIX-century scientific world about the origin-of-life problem, according to the already exposed, was both the effort to keep the knowledge up to date and the lack of originality. But in the seventh decade something is going to change. Some personages try hard to do better and be something else than a mere echo of foreign advances but still enthusiastically estimulated by the scientific progress in other countries. They lived the typical contradictions and limitations of the Spanish scientist of the time, immersed in the "anxious effort" of connecting with European science but after all isolated from a society completely indifferent to his intellectual work (**López Piñero** 1979: 77-78). Thus, we refer to a human anatomy professor at the University of València, **Peregrin Casanova**, one of the most resolute bastion in the introduction of the evolutionist doctrines in Spain (**López Piñero** 1989). In a provocative address to the *Instituto Médico Valenciano* -an active professional corporation- just before becoming university professor, **Casanova** expressed an advanced concept of cell, discussed the artificial separation between inorganic and organic things, and proclaimed the essential continuity in matter, form, and force in everything that surround us (**Casanova** 1875). Therefore **Casanova** exhibited a radical mechanism (**López Piñero** 1988: 122) directly connected to **Haeckel** proposals. **Casanova** interest on the work of the polemical German naturalist was so great that there was an epistolar exchange between 1876 and 1883 and he payed a visit to Jena to personally meet to whom he considered his master (**Glick** 1982: 18).

The Haeckelian works were truly fundamental to the evolutionary diffusion, in particular among positivist circles, logically impregnating their ideas on the subject of life beginnings. As a good example we introduce the social theorist **Pedro Estasén**, the author of outstanding articles trying to show the evolutionary condition of social development (**Glick** 1982: 26-28). **Estasén** wrote the foreword to the Spanish version of **Haeckel**'s *Natürliche Schöpfungsgeschichte*, previously appeared in *Revista Contemporánea,* a remarkable positivist journal. In this article the author reviews the ideas of the scientist from Jena on the progressive aggregation of material manifestations, a basic principle to explain the origin of life, and that covered all the forms of matter, from ether atoms, through atoms of ponderable matter, molecules, cells –huge molecular aggregates–, tissues, organs, and living beings (**Estasén** 1878).

The ambients not so open to radical materialism were permeated also by **Haeckel** ideas, as was the case of the Krausist groups –assimilators of the doctrines of the German philosopher **Karl Christian Friedrich Krause**, whose ideas found an unusual resonance in Spain during the second half of XIX century. We point out, as a significant contribution, the course on Haeckelian morphology by the naturalist **Augusto González de Linares** delivered at *Institución Libre de Enseñanza* (*ILE*, institution committed in a radical pedagogical renovation, affecting both methodology and contents). He explained **Haeckel** criticisms to the traditional conceptions on spontaneous generation and then expounded the proposal on autogony by means of aggregation nuclei formed in albuminoid-like solutions, as a base of *monera –moneros* in the author's version–, "homogeneous and indifferent" organisms (**González de Linares** 1877: 58).

We now return to **Casanova** since his compromise with the Haeckelian cause was the stimulus to publish in 1877 the book *La biología general*, a synthesis of basic biological questions, always explained in the light of **Haeckel** views, but incorporating also references to the more prominent European evolutionists, including British authors that in general were less known in Spain. The book had to be the first in a series, *Estudios biológicos*, that finally did not continue (**López Piñero** 1988: 126-129). The chapter 18 of **Casanova**'s book is devoted, in part, to life beginnings on Earth. The author declares initially that he does not wish to express his support to **Pasteur** or **Bastian**, so he neither admits nor refuses spontaneous generation. He thought rather to remark the great errors committed by ones and others. In the Spanish context this is a new approach clearly derivated from **Haeckel** thoughts. The restraint to the laboratory of the research on the "heterogenic generation" was considered by **Casanova** as chimerical and crude, basically due to the necessity for long periods of time. Instead he suggested to look at the ocean bottom, where we must find the proper conditions and even evidences of the phenomena related to life origins, the transition from inorganic to organic matter (**Casanova** 1877: 398-403). In his book, **Casanova** quotes nine times **Huxley**'s *Bathybius,* as a direct proof of those transitions.

4. Enrique Serrano Fatigati

Enrique Serrano Fatigati can be adscribed (according to **Sala Català** 1987: 31) to the Krausist group, together with **Francisco Giner** (founder of the *ILE*), **Salvador** and **Alfredo Calderón** and **A. G. de Linares**. All of them will publish their works in *Boletín-Revista de la Universidad de Madrid, Revista de España, Boletín de la ILE* and *Revista Europea.* This group of thinkers and scientists accepted the new ideas of evolutionism and assumed as a main intellectual goal its general diffusion. **Serrano** represents for us a qualitative change in the way a Spanish scientist confronted the origin-of-life question, as he became engaged both in theoretical and experimental approaches.

In the paper of 1873 (a revised version of the work of 1870, and a previous version of the booklet of 1874, see list below) **Serrano** considers that all material forms, from stars to man, are organized and based on the same chemical and dynamical grounds. There is a "unity of constitution", "unity of phenomena" and a "common origin" in the general "progress of matter". More than simple "analogy", among the species there is a "necessity law" that orders the series from the simplest to the more complicated forms. After admitting the difficulty to define those simplest forms he establishes a relationship between the transformism of species and spontaneous generation, a possibility "rebutted by those who believed that [those proposals] would bring the collapse of spiritualism whereas actually they are one among other proofs of incompleteness of the materialistic system" (1873: 85), and he adds an epistemological criticism to **Pasteur**'s approach to the question. The author then cites the original works by **Carpenter**, **Thomson**, **Ehremberg**, **Sars**, **Agassiz**, **Haeckel**, and **Huxley** to review afterwards the astonishing diversity of life forms and their adaptations to very different –and extreme– physicochemical conditions, and presents the discovery of *Bathybius* and *cocolites* as the more advanced proofs of his views.

All those arguments will be the starting point of **Serrano Fatigati**'s experimental efforts in the following years. In the period 1874-1881 he performed experiments on the influence of several conditions –e.g. light colours, temperature, or composition of culture media– on the growth of microorganisms –i.e. "infusoria"– including yeasts, and published five papers –two in Spanish, two in French, and one in English. It is more explicit the paper published in 1877a in the *Bibliothèque Universelle- Archives of Sciences Physiques et Naturelles* (Généve). In this work the author recognizes the observation of *archibiosis* [sic] whereas the journal acknowledges the interest of the paper and the convenience to publish it. In several Spanish scientific journals (*Anales de Ciencias Médicas, Crónica Científica*) will appear a report on **Serrano**'s paper. Even in one of them (**Tolosa Latour** 1877) there is the new on the **Bastian** and **Pasteur** frustrated debate before the commission of the *Académie* in the same miscellaneous report. Curiously enough this is the year of publication of **Tyndall**'s major technical paper on spontaneous generation (see Timeline).

Serrano Fatigati probably was the only Spanish scientist that performed experiments in the field of the spontaneous generation in an advanced situation of the debate in Europe –the period of demise, after **Farley** (1977). In 1881b **Serrano** will publish, as far as we know, a final paper more reflexive on the origin of life problem and where he expresses his confidence in the *heterogenist*'s approach: "If the heterogenists could do one experiment, *only one experiment* without any serious objection, the controversy would finish because the appearance of beings in that conditions would demonstrate that it was possible to engender them" (his italics, 1881b: 209).

List of some Serrano Fatigati's works related to evolution, spontaneous generation, and the origin of life

1870 *Estudios de filosofía natural. Total organización de la materia*. Madrid, M. Tello. 70 p. (co-authored with S. Calderón)

1873 "El progreso de la materia" *Revista de la Universidad de Madrid* **2**, 69-98

1874 *La evolución en la Naturaleza.* Madrid, Aribau y Cia. 46 p.

1876 "On Saccharomyces cerevisiae" *Annals and Magazine of Natural History* (London) **18**, 187-189 (co-authored with Francisco Quiroga Rodríguez)

1877 "Note sur les bactéries et les générations spontanées" *Archives of Sciences Physiques et Naturelles* (Géneve) **59**, 383-384

1879a "Influence des diverses couleurs sur le développement et la respiration des infusoires" *Comtes Rendues de l'Académie des Sciences* (Paris) **89**, 959-960

1879b "Influencia de los distintos colores del espectro solar sobre la nutrición y desarrollo de los infusorios" *Anales de la Sociedad Española de Historia Natural* **8** (Actas de la sesión de 2 de julio), 42-43

1881a "Influencias físicas en el desarrollo de los seres inferiores" *Boletín de la Institución Libre de Enseñanza* (Madrid) **5**, 135

1881b "Orígenes de la vida: último aspecto del problema experimental" *Revista Ilustrada*, no. 18, 207-209

5. Into the XX Century

At the turn of the Century there is a new generation of scientists in a better position to do original experimental work, establishing scientific relationships with colleagues abroad, and taking advantage of the timid starting of new laboratories in some universities and research centers. We will focus our presentation on three characters: **Jaume Pujiula**, SJ, **Antonio de Gregorio Rocasolano** and **José Rodríguez Carracido**.

The position of **Pujiula**, as a Jesuit, was clearly against any materialistic approach to the origin-of-life problem. Thus, his criticism to plasmogenists was especially forceful. In this sense, **Pujiula** belongs to an intellectual tradition linked to the Catholic circles, with vociferous opponents to evolutionism like **Salvador Castellote** (see his lecture given in Madrid Cathedral in 1892), but now the criticisms came from a priest and professional biologist. Both in his lectures on evolution (1915) and his article "plasmogenia" in the major Spanish encyclopaedia at that time (Espasa, 1921), **Pujiula** analyzes and censures authors like **Stephan Leduc** or **Alfonso Herrera**, following mainly the arguments and bibliographic sources of **Agostino Gemelli**, OM (1910). Therefore **Pujiula**, an eminent embryologist, follows the official position of the Catholic Church and recognizes "the two ends of the chain", i.e. the origin of life and the origin of mind, as the result of Divine intervention. Thus both problems are more in the realm of philosophy than science.

On the other hand, two of the pioneers of biochemical sciences in Spain, **Rocasolano** and **Carracido**, will adopt similar materialistic positions. **Rocasolano** textbook on the physical and chemical bases of life (1917) has, as a first chapter, a nice review on the scientific approach to the origin of life. He quotes accurately the work of **Leduc**, **Loeb** and **Herrera**, and, in despite of his conspicuous Catholicism, accepts a materialistic emergence of life –but still keeps the Creator's hand only on the origin of the human soul (1917: 21). A more radical and reductionist opinion was expressed by **Carracido**. We consider this author a true advanced scientist in his view of biochemical evolution. In 1910, adapting **Haeckel**'s biogenetic law at the molecular level, **Carracido** proposes a phylogenetic classification of "albuminoids". In the paper of 1917 –and the textbook on biological chemistry (1917, 1924)–, he adopted **Pflüger** (1875) ideas on the origin of proteins from cyanogen in the primitive Earth (see **Oparin** 1938: 47-51) and found them compatible with his phylogenetic order of "albuminoids". After adhering to **Loeb**'s criticism to plasmogeny, he compares the XIX-century evolution of organic chemistry with the future development of biochemistry. He ends by expressing his belief that "will be possible, albeit limited, the synthesis of the more rudimentary expression of living matter" (1917: 166). In his paper of 1927, although starting with a crude criticism to plasmogenists, he adopted the position of trying at least to understand, if not explain, the origin of the different chemical components of living matter.

Cast of characters

CASANOVA CIURANA, Peregrín (1849-1919) was professor of human anatomy at the University of València and one of the main introducer of evolutionism. In 1876 initiated his relation with Haeckel. He was the author of *La biología general* (1877), a Haeckelian vision of life, translated several works by Haeckel and wrote the foreword of the Spanish version of *Die Perigenesis der Plastidule…* (1882). He also was the organizer of the homage to Darwin at the University of València (1909).

PUJIULA I DILMÉ, Jaume, S.J. (1869-1958) was an embriologist, founder of the Sarrià Biological Institute. He published many papers on animal morphological microscopy. He published different papers on the ethics of medical practices and a number of textbooks on general biology, embryology, and histology. He belonged to the Catalan Society of Biology, the Catalan Institution of Natural History, the Royal Academy of Medicine (Barcelona), and the Royal Academy of Exact, Physical, and Natural Sciences (Madrid).

DE GREGORIO ROCASOLANO, Antonio (1873-1941) was a biochemist interested in topics like colloidal chemistry, and medical and agronomical biochemistry. He was the author also of several textbooks and was the founder of the Laboratory of Biochemical Research at the University of Zaragoza in 1918. In 1921 helped decisively in the beginning of activities of the first Biological Chemistry Laboratory at the University of València by Luis Bermejo.

RODRÍGUEZ CARRACIDO, José (1856-1928) was professor of organic chemistry (1881) and biological chemistry (1898) at the University of Madrid. He collaborated with M. Berthelot, S. Arrhenius, M. Verworn and C. von Noorden. He was the author of the first textbook on biological chemistry in Spanish (1903) and of several other books and more than 180 papers. He belonged to the Academy of Sciences, of Medecine and the Royal Spanish Academy, as well as he was named Rector of his University (1916-1927).

SERRANO FATIGATI, Enrique (1845-1918) was a secondary school teacher on mathematics, physics, and chemistry in several Spanish cities. He was interested, besides the question of spontaneous generation and the origin of life, in many different topics as geology, fine arts, archaeology, and medieval studies. He published several books and papers on those topics. He belonged to the Spanish Society of Natural History (1879-1891) and to the Academy of Fine Arts.

Sources

You may find some of the following texts (*) in our web site:

http://www.valencia.edu/~orilife/biblorigen.htm

Casanova, P. (1875) "Historia natural de la célula: su estudio especial en el organismo humano" *Boletín del Instituto Médico Valenciano* **XIV**, 131-135.

*Casanova, P. (1877) *La biología general.* València, Ferrer de Orga, 415 p.

*Castellote y Pinazo, S. (1892) "El origen de la vida", segunda conferencia. In: *Conferencias científico-religiosas pronunciadas en la Catedral de Madrid.* Madrid, Imp. Católica de Adolfo Ruiz de Castroviejo.

*De Gregorio Rocasolano, A. (1917) *Estudios químico físicos sobre la materia viva.* Zaragoza, chapter 1.

Estasén, P. (1878) "La Creación, según Haeckel". *La Revista Contemporánea* **17**, 148-166 [foreword of the first Spanish translation of Haeckel 1868 work *Natürliche Schöpfungs-Geschichte*]

Gemelli, A. (1910) *L'enigma de la vitta e i nuovi orizzonti della biologia.* Firenze, Libreria Editrice Fiorentina.

González de Linares, A. (1877) "La morfología de Haeckel: antecedentes y crítica". *Boletín de la Institución Libre de Enseñanza* **1**, 58 and 78.

Gourdan de Fromentel, L. E. (1865) "Investigaciones experimentales acerca de la cuestión de las generaciones espontáneas. Tomado de una nota de Mr. Fromentel". *Revista de los Progresos de las Ciencias Exactas Físicas y Naturales* **XV**, 245-246 [from *Compt. Rend. Acad. Sci. Paris,* 1-8-1864]

Lemaire, C. (1865) "Investigaciones sobre los microfitos y los microzoarios" *Revista de los Progresos de las Ciencias Exactas Físicas y Naturales* **XV**, 105-110 [from *Compt. Rend. Acad. Sci. Paris,* 17-8-1864]

Oliver de Brichfeus, I. (1864) "La generación espontánea". *El Museo Universal* **VIII/6, 7-II**, p. 42-43.

Pouchet, F. (1859) "Nota sobre proto-organismos vegetales y animales nacidos espontáneamente en aire artificial y en gas oxígeno" *Revista de los Progresos de las Ciencias Exactas Físicas y Naturales* **IX**, 179-185 [from *Compt. Rend. Acad. Sci. Paris,* 20-12-1858]

Preyer, W. (1876) "Las hipótesis sobre el origen de la vida". *Revista Europea* **7**, 241-252.

Pujiula, J. (1915) *La vida y su evolución filogenética.* Barcelona, Tip. Casals. 208 p.

*Pujiula, J. (1921) "Plasmogenia". *Enciclopedia Universal Ilustrada Europeo-Americana*, **45**, 454-463. Barcelona, Espasa.

*Ribera, E. (1877) "El origen de los fermentos". *El Imparcial*, Madrid, July 27.

*Ribera, E. (1882) *Elementos de historia natural,* 2nd ed. València, Imp. Manuel Alufre

Rodríguez Carracido, J. (1910) "Classification biochemique des matières albuminoïdes". *Revue Scient.* July 23, 114.

Rodríguez Carracido, J. (1917) "Los fundamentos de la bioquímica" *Bol. R. Soc. Esp. Hist. Nat.* **17**, 154-166.

Rodríguez Carracido, J. (1924) *Tratado de química biológica.* 3rd edition. Madrid, Sucesores de Hernando, 834 p. [1st edition, 1903. 2nd edition, 1917].

*Rodríguez Carracido, J. (1927) *La formación de la materia viva.* Madrid, Blass. 15 p.

Ruiz, R. (1865) "Sobre las generaciones espontáneas". *Revista de los Progresos de las Ciencias Exactas Físicas y Naturales* **XV**, 124-125 [on Pasteur report to the *Académie*]

Schaaffhausen, H. (1863) "Del origen de las algas y de las metamorfoses [sic] de las mónadas". *Revista de los Progresos de las Ciencias Exactas Físicas y Naturales* **XIII**, 175-176 [from *Compt. Rend. Acad. Sci. Paris,* 12-5-1862]

Teoría (1875) "La teoría de la fermentación". *Revista Europea* **57**, 156-157 [new on Pasteur report before *l'Académie*, 22-2-1875]

Tolosa Latour, M. (1877) "Revista de ciencias auxiliares". *An.Cien. Méd.* **4**, 239-248.

Trécul, A. (1866) "Sobre la transformación de los granos de almidón en esporas, dentro de las celdillas parenquimatosas durante la putrefacción y sobre la germinación de estas esporas. Nota leída por Mr. Trécul". *Revista de los Progresos de las Ciencias Exactas Físicas y Naturales* **XVI**, 243-247) [from *L'Institut,* 1-10-1865]

References

Farley, J. (1977) *The Spontaneous Generation Controversy from Descartes to Oparin.* Baltimore, The Johns Hopkins University Press.

Geison, G.L. (1995) *The Private Science of Louis Pasteur.* Princeton, Princeton University Press.

Glick, T.F. (1982) *Darwin en España*. Barcelona, Península.

López Piñero, J.M. (1979) "Introducción histórica". *In:* P. González Blasco, J. Jiménez Blanco, J.M. López Piñero, *Historia y sociología de la ciencia en España*. Madrid, Alianza, p. 11-93.

López Piñero, J.M. (1988) "Las ciencias morfológicas". *In:* J.M. López Piñero (dir.) *Las ciencias médicas básicas en la Valencia del siglo XIX.* València, Alfons el Magnànim-IVEI-Institut d'Estudis Juan Gil-Albert, p. 65-162.

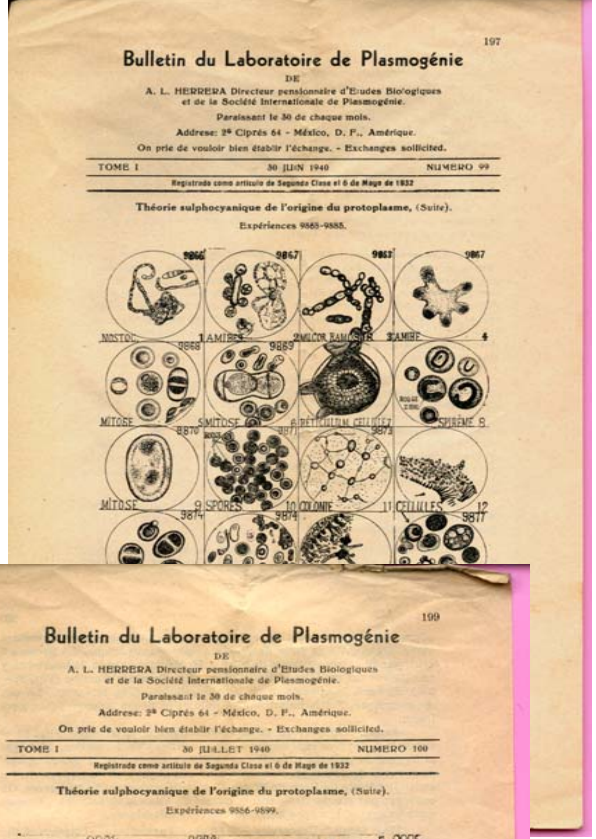
López Piñero, J.M. (1989) "Peregrín Casanova (1849-1919) y la morfología darwinista". *Medicina e Historia* **29**, 5-28.

Núñez, D. (1977) *El darwinismo en España.* Madrid, Castalia.

Oparin, A. I. (1938) *The Origin of Life*. New York, Macmillan.

Sala Catalá, J. (1987) *Ideología y ciencia biológica en España entre 1860 y 1881. La difusión de un paradigma.* Madrid, Centro de Estudios Históricos del CSIC.

Strick, J.E. (2000) *Sparks of Life. Darwinism and the Victorian Debates over Spontaneous Generation.* Cambridge MA, Harvard University Press.



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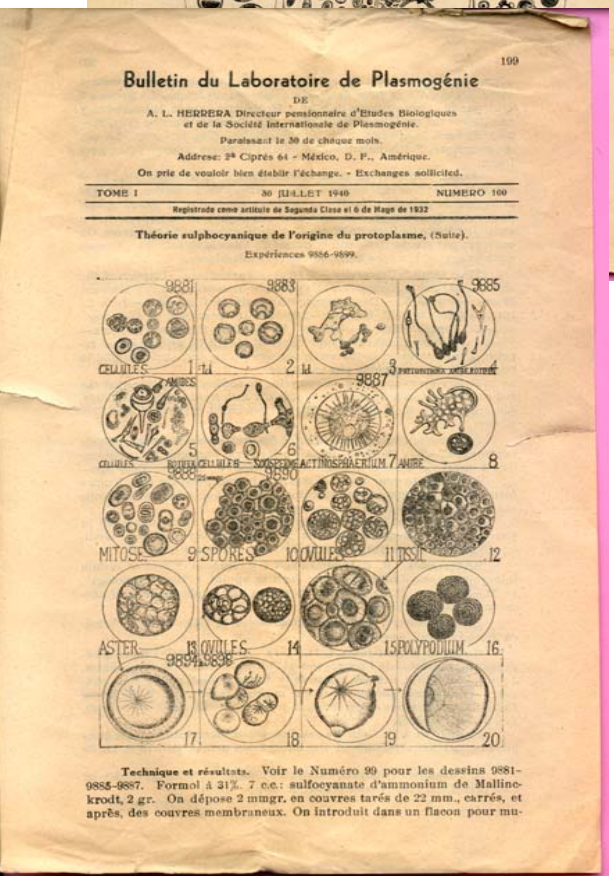
Théorie sulphocyanique de l'origine du protoplasme, (Suite).

Expériences 9868-9885.



199

Bulletin du Laboratoire de Plasmogénie

DE

A. L. HERRERA Directeur pensionnaire d'Etudes Biologiques et de la Société Internationale de Plasmogénie.

Paraissant le 30 de chaque mois.

Addresse: 2ª Ciprés 64 - México, D. F., Amérique.

On prie de vouloir bien établir l'échange. - Exchanges sollicited.

TOME I | 30 JUILLET 1940 | NUMERO 100

Registrado como artículo de Segunda Clase el 6 de Mayo de 1932

Théorie sulphocyanique de l'origine du protoplasme, (Suite).

Expériences 9886-9899.

Technique et résultats. Voir le Numéro 99 pour les dessins 9881-9885-9887. Formol à 31%. 7 c.c.: sulfocyanate d'ammonium de Mallinckrodt, 2 gr. On dépose 2 mmgr. en couvres tarés de 22 mm., carrés, et après, des couvres membraneux. On introduit dans un flacon pour mu-

Alfonso L. Herrera and the Spanish readers

The Mexican plasmogenist **Alfonso L. Herrera** had many readers, not only among Spanish scientists who criticized his work –as was the case of **Pujiula**, **Rocasolano**, and **Carracido**, based on different theoretical grounds– but also people belonging to freethinker groups, including anarchists.

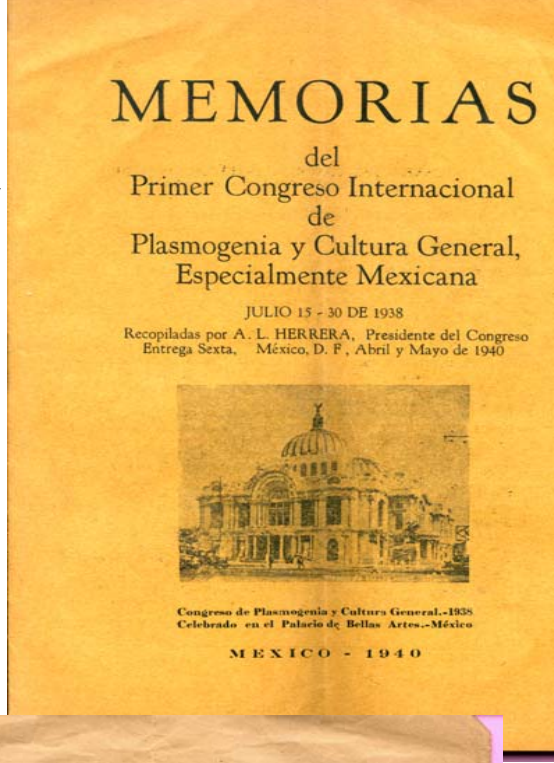
We have found several issues of the *Bulletin du Laboratiore de Plasmogénie, Memorias del Primer Congreso Internacional de Plasmogenia y Cultura General, Especialmente Mexicana,* and *Gaceta de Plasmogenia,* at the Historical Library of the *Institut d'Ensenyament Secundari "Lluís Vives"* (València), the old *Instituto General y Técnico de València*. We have no idea of the person or persons that, in the period immediately before the Civil War (1936-1939), were the receptors of those publications.

A measure of the interest on Herrera's work in Spain are the two books he published:

Plasmogenia. Una nueva ciencia, Barcelona, Maucci (1929). A volume of 420 pages and more than 100 figures.

La plasmogenia. Nueva ciencia del origen de la vida. València, Cuadernos de Cultura (1932). A 45-pages booklet addressed to the general public and published by a republican group. The foreword by Herrera is ardently anti-Catholic. You will find a pdf version of this text in our web site.

ACKNOWLEDGEMENTS. We wish to thank Soledad Rubio for her help in both the documentalist task and the construction of the web page.



MEMORIAS

del

Primer Congreso Internacional

de

Plasmogenia y Cultura General, Especialmente Mexicana

JULIO 15 - 30 DE 1938

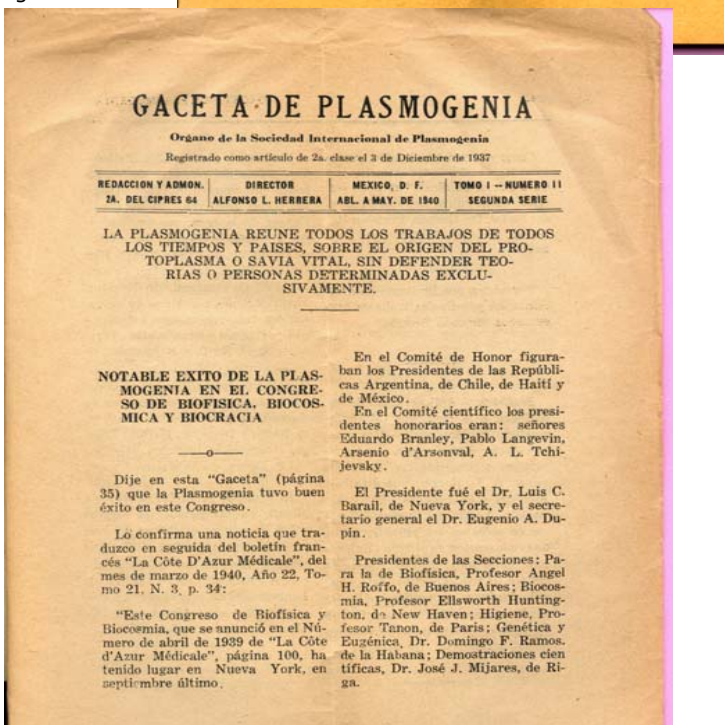
Recopiladas por A. L. HERRERA, Presidente del Congreso

Entrega Sexta, México, D. F., Abril y Mayo de 1940

Congreso de Plasmogenia y Cultura General.-1938

Celebrado en el Palacio de Bellas Artes.-México

MEXICO - 1940



GACETA DE PLASMOGENIA

Organo de la Sociedad Internacional de Plasmogenia

Registrado como artículo de 2a. clase el 3 de Diciembre de 1937

REDACCION Y ADMON.	DIRECTOR	MEXICO, D. F.	TOMO I -- NUMERO 11
2A. DEL CIPRES 64	ALFONSO L. HERRERA	ABL. A MAY. DE 1940	SEGUNDA SERIE

LA PLASMOGENIA REUNE TODOS LOS TRABAJOS DE TODOS LOS TIEMPOS Y PAISES, SOBRE EL ORIGEN DEL PROTOPLASMA O SAVIA VITAL, SIN DEFENDER TEORIAS O PERSONAS DETERMINADAS EXCLUSIVAMENTE.

NOTABLE EXITO DE LA PLASMOGENIA EN EL CONGRESO DE BIOFISICA, BIOCOSMICA Y BIOCRACIA

—o—

Dije en esta "Gaceta" (página 35) que la Plasmogenia tuvo buen éxito en este Congreso.

Lo confirma una noticia que traduzco en seguida del boletín francés "La Côte D'Azur Médicale", del mes de marzo de 1940, Año 22, Tomo 21, N. 3, p. 34:

"Este Congreso de Biofísica y Biocosmia, que se anunció en el Número de abril de 1939 de "La Côte d'Azur Médicale", página 100, ha tenido lugar en Nueva York, en septiembre último.

En el Comité de Honor figuraban los Presidentes de las Repúblicas Argentina, de Chile, de Haití y de México.

En el Comité científico los presidentes honorarios eran: señores Eduardo Branley, Pablo Langevin, Arsenio d'Arsonval, A. L. Tchijevsky.

El Presidente fué el Dr. Luis C. Barail, de Nueva York, y el secretario general el Dr. Eugenio A. Dupin.

Presidentes de las Secciones: Para la de Biofísica, Profesor Angel H. Roffo, de Buenos Aires; Biocosmia, Profesor Ellsworth Huntington, de New Haven; Higiene, Profesor Tanon, de Paris; Genética y Eugénica, Dr. Domingo F. Ramos, de la Habana; Demostraciones científicas, Dr. José J. Mijares, de Riga.

General Timeline

France, Germany, Great Britain,...(*)	Spain (this work)
1859 Darwin *On the Origin of Species…* **Pouchet** *Hétérogénie ou traité de la génération spontanée*	**1859 Pouchet** "Nota sobre proto-organismos vegetales y animales nacidos espontáneamente..." (*RPCEFN*)
1860 English transl. of **Pasteur** "New Experiments Relative to So-called Spontaneous Generation"	**1860**
1861 Pasteur awarded prize by French Academy for settling the question of spontaneous generation	**1861**
1862 Clémence Royer French translation of *On the Origin…* **Ernst Haeckel** monography *Die Radiolarien*	**1862**
1863 Darwin regrets the use of the "Pentateuch word"	**1863 Schaaffhausen** "Del origen de las algas y de las metamorfoses [sic] de las mónadas" (*RPCEFN*)
1864 Pasteur lecture at *La Sorbonne* (April) **Pierre Flourens** *Examen du livre de M. Darwin...* *Lancet* (December) supports heterogenesis	**1864 I. Oliver de Brichfeus** "La generación espontánea" (*El Museo Universal*)
1865	**1865 Lemaire** "Investigaciones sobre los microfitos y los microzoarios" (*RPCEFN*) "Investigaciones experimentales acerca de la cuestión de las generaciones espontáneas. Tomado de una nota de Mr. **Fromentel**" (*RPCEFN*) "Sobre el llamado Eozoon canadense" (*RPCEFN*) "Sobre las generaciones espontáneas" (*RPCEFN*) [report on **Pasteur**'s experiments]
1866 Haeckel *Generelle Morphologie der Organismen*	**1866 Trécul** "Note sobre la transformación de los granos de almidón en esporas…" (*RPCEFN*)
1868 Haeckel *Natürliche Schöpfungsgeschichte* Discovery of *Bathybius* **T. H. Huxley** lecture "The Physical Basis of Life" (November)	**1868 Revolution (*la Gloriosa*)**
1869 *Brit. Med. J.* series on the origin of life English transl. of **Haeckel** *Monographie der Moneren*	1869
1870 Tyndall "Dust and Disease" lecture (January) **Bastian** first articles in *Nature* (June, July) **Huxley**'s Liverpool BAAS address "Biogenesis and Abiogenesis" (September)	**1870 Enrique Serrano Fatigati** and **Salvador Calderón** *Estudios de filosofía natural. Total organización de la materia*
1871 Bastian *Modes of Origin of Lowest Organisms* **Darwin**'s letter to **Hooker** on the "warm little pond"	1871
1872 Bastian *Beginnings of Life* **Ferrière** *Le Darwinisme*	1872
1873	**1873 Serrano** "El progreso de la materia" (*Rev Uni Madrid*)
1874 Bastian *Evolution and the Origin of Life*	**1874 Monarchic restoration** **Serrano** *La evolución en la naturaleza*
1875 Huxley renounces *Bathybius* as artifact **Pflüger** cyanogen theory on the origin of proteins	**1875 P. Casanova** "Historia natural de la célula" (*BIMV*) [**Pasteur**] "La teoría de la fermentación" (*Rev Europea*)
1876 Cohn's *Beiträge* paper on discovery of heat-resistant spores in hay bacillus (July) English transl. of **Haeckel** *The history of creation…* **Haeckel** *Die Perigenesis der Plastidule, oder die Wellenzeugung der Lebenstheilchen*	**1876 Serrano** and **Quiroga** "On Saccharomyces cerevisiae" (*Ann. Mag. Nat. Hist.*) **W. Preyer** "Las hipótesis sobre el origen de la vida" (*Rev. Europea*)

1877 Tyndall major technical paper in *Phil Trans Royal Soc* (May). Most, including **Darwin**, conclude that the heat-resistant spores provide the final explanation for why **Bastian** must be wrong	**1877 Casanova** *La biología general*, and Spanish transl. of **Haeckel** lecture on evolution (*La Crónica Médica* **1**) **E. Ribera** "El origen de los fermentos" (*El Imparcial*) **Serrano** "Note sur les bactéries et les générations spontanées" (*Arch. Sci. Phys. Nat.*) and **Tolosa Latour** report on this work and on the Bastian-Pasteur frustrated debate (*An. Cien. Méd.*) **A. G. de Linares** "La morfología de Haeckel: antecedentes y crítica" (*BILE*)
1878 Finale exchange of articles between **Tyndall** and **Bastian** **Bastian**'s last paper on "archebiosis" (*The Nineteenth Century,* February)	**1878** Spanish transl. of **Haeckel** *Natürliche Schöpfungsgeschichte* (as 35 articles in *Revista Europea,* through 1879) **P. Estasén** "La Creación, según Heackel" (*Rev Contemp*), foreword of **Haeckel** *Historia Natural de la Creación* **Tyndall** "La generación espontánea" (*El Anfiteatro Anatómico Español, Crónica Científica* and *Rev. Europea*) **P. Colvée** "Microzoarios y micrófitos" (*BIMV*)
1879	**1879 Serrano** "Influence des diverses couleurs sur le développement et la respiration des infusoires" (*Paris Acad. Sci. Compt. Rend.*) **Ribera** *Elementos de historia natural*
1880	**1880 V. Peset Cervera** *La fermentación en fisiología y patología* **Balbino Quesada** *Tratado elemental de fisiología* **S. Calderón** "El origen de la materia orgánica" (*BILE*) **Serrano** "Constitución de la materia" (*Rev. Europea*)
1881 Bastian and **Pasteur** disagree at International Medical Congress in London	**1881 J. Úbeda y Correal** "El estudio de las fermentaciones en su relación con la heterogenia, el panspermismo y el polimorfismo" (*Rev. Contemp.*) **Serrano** "Influencias físicas en el desarrollo de los seres inferiores" (*BILE*) and "Orígenes de la vida: último aspecto del problema experimental" (*Revista Ilustrada*)
1882	**1882** Spanish transl. of **Haeckel** *Die Perigenesis der Plastidule*, foreword by **Casanova** **M. Laguna** "¿Qué son las plantas?" (*Rev. Contemp.*) **B. Lázaro** "Los microbas" [sic] (*BILE*)
1883	**1883 A. Maestre de San Juan** "Idea general de los organismos" (*Rev. Contemp.*)
1885	**1885** Spanish transl. of **Haeckel** *Generelle Morphologie der Organismen*
1886	**1886 Haeckel** *La evolución y el transformismo*
1889	**1889 Nadaillac** "Origen y desarrollo de la vida en el globo" (*Rev. Contemp.*)
1892 Huxley *Les problèmes de la biologie* (Paris)	**1892 S. Castellote** lectures at the Cathedral of Madrid
1902 Fischer and **Hofmeister** demonstrate that proteins are polypeptides	**1902 R. Carracido** first biochemical classification of albuminoids (*Rev. Ibero-Americana C. Méd.*)
1903 Bastian *Studies on Heterogenesis*	**1903 Carracido** *Tratado de química biológica*
1904 Alfonso L. Herrera *Nociones de biología* (Mexico)	1904
1906 Leduc "Culture de la cellule artificielle" (*Compt. Rend. Acad. Sci.*) **Bastian** *The Nature and Origin of Living Matter*	1906
1907 Bastian *The Evolution of Life* (New York) **Leduc** *Les bases physiques de la vie*	1907
1908 Loeb *La dynamique des phénomènes de la vie* **T.C. Chamberlin** and **R.T. Chamberlin** "Early terrestrial conditions that may have favored organic synthesis" *Science*	1908
1909	**1909 Casanova** organizes the Homage to Darwin at the Univ. of València

1910 Leduc *Théorie physico-chimique de la vie* **Gemelli** *L'enigma de la vita…* (Firenze)	**1910 Carracido** paper on biochemical classification of albuminoids
1911 Herrera *Une science nouvelle* (Mexico) **Loeb** *La fécondation chimique*	1911
1912 Loeb *The Mechanistic Conception of Life* **Leduc** *La Biologie synthétique*	1912
1913 Moore colloid theory on the origin of life (*The Origin and Nature of Life*)	
1914 L. T. Troland "The chemical origin and regulation of life" *The Monist* **Bastian**'s paper "Experimental data in evidence of the present-day occurrence of spontaneous generation" *Nature*	1914
1916 Maumus' paper on the spontaneous generation controversy after **Bastian** (*Revue Scientifique*) **Troland** "The enzyme theory of life" *Cleveland Med. J.*	1916
1915	**1915 Jaume Pujiula** *La vida y su evolución filogenética*
1917 Troland "Biological enigmas and theory of enzyme action" *Amer Nat* **Félix d'Hérelle** "Sur un microbe invisible antagoniste des bacilles dysentériques" (*Compt. Rendus Acad. Sci.*)	**1917 Carracido** "Los fundamentos de la bioquímica" (*Bol. R. Soc. Esp. Hist. Nat.*) and *Tratado Quim. Biol.* 2nd ed **A. de G. Rocasolano** *Estudios químico físicos sobre la materia viva*
1920	**1920 Loeb** *El organismo vivo en la biología moderna*
1921 d'Hérelle *Le bactériophage* (Paris)	**1921 Pujiula** "Plasmogenia" (*Enciclopedia Espasa*)
1922 d'Hérelle *The Bacteriophage* (Baltimore), *Der Bakteriophage* (Braunschweig)	
1924 Aleksandr I. Oparin *The Origin of Life* (in Russian) **R.B. Harvey** "Enzymes of thermal algae" *Science*	**1924 Carracido** *Tratado de química biológica* (3rd ed)
1925	**1925 Pujiula** *La vida y su evolución...* 2nd edition
1926 H. Muller "The gene as the basis of life" *Proc Int. Congress Plant Sci.*	1926
1927 E.C.C. Baly *et al* "Photosynthesis of naturally occurring compounds. I: Action of ultraviolet light on carbonic acid" *Proc. Roy. Soc. London*	**1927 Carracido** *La formación de la materia viva*
1928 Herrera "Plasmogeny" in **Alexander**'s *Colloid Chemistry*	1928
1929 John B. S. Haldane "The Origin of Life" *The Rationalist Annual*	**1929 Herrera** *Plasmogenia* (Barcelona)
1931	**1931 Second Republic proclamed**
1932	**1932 Herrera** *La Plamogenia* (València)
1936 Oparin *The Origin of Life* (in Russian)	**1936 Franco's coup d'état. Civil war begins**
1938 Oparin *The Origin of Life* (English translation by **Sergius Morgulis**)	1938
1939	**1939 "National-Catholicism" after war. Biological evolution censured.**

(*) The events relative to France, Germany, Great Britain…, mainly after Farley (1977), Geison (1995), and Strick (2000).