Relevancia de la historia de la ciencia en el quehacer del investigador: implicancias para la publicación

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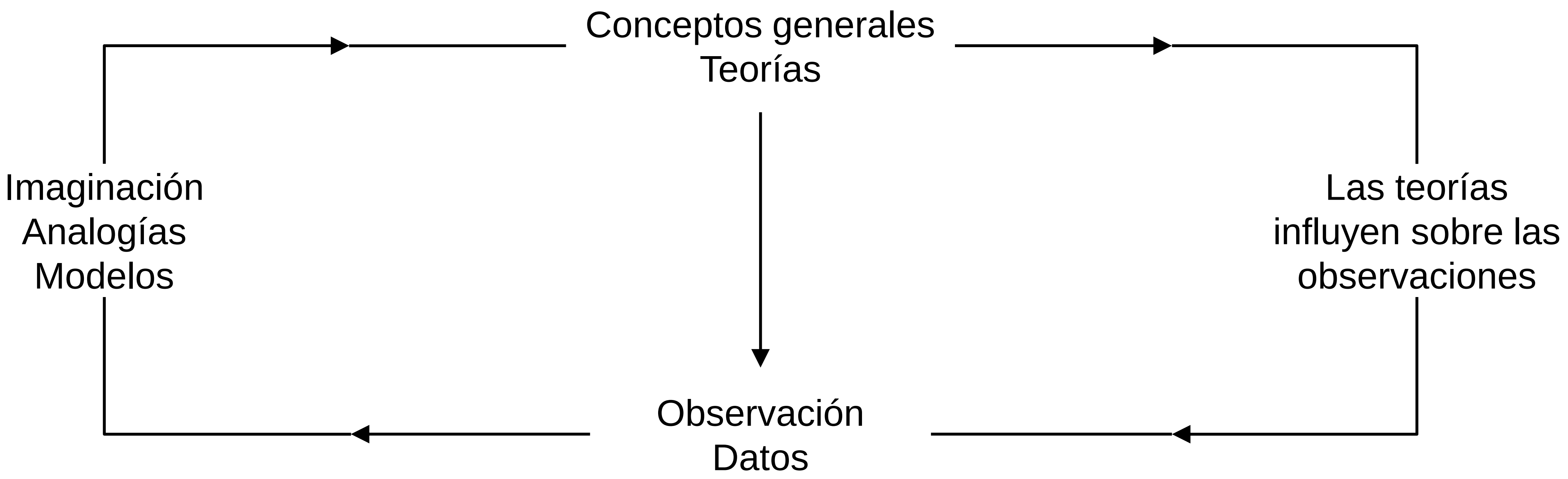
Temas a desarrollar

- El proceso de investigación científica
- Percepción general sobre la historia
- Importancia de la historia de la ciencia
- Aspectos históricos y la redacción de artículos

Estructura de la ciencia



Barbour IG. Religion and Science. New York: Harper One; 1997.

Reglas metodológicas en ciencias

1. El juego de la ciencia es, en principio, inacabable.

Quien afirma que los conceptos científicos no requieren evaluación posterior y que pueden ser considerados como plenamente verificados, se retira del juego.

2. Una vez que una hipótesis ha sido propuesta y probada, y ha demostrado su valía, no se debería permitir abandonarla sin una buena razón.

Una buena razón puede ser, por ejemplo: reemplazo de una hipótesis por otra que ha sido mejor verificada, o la refutación de alguna de las consecuencias de a hipótesis.

Popper K. The Logic of Scientific Discovery. London: Routledge; 2002.

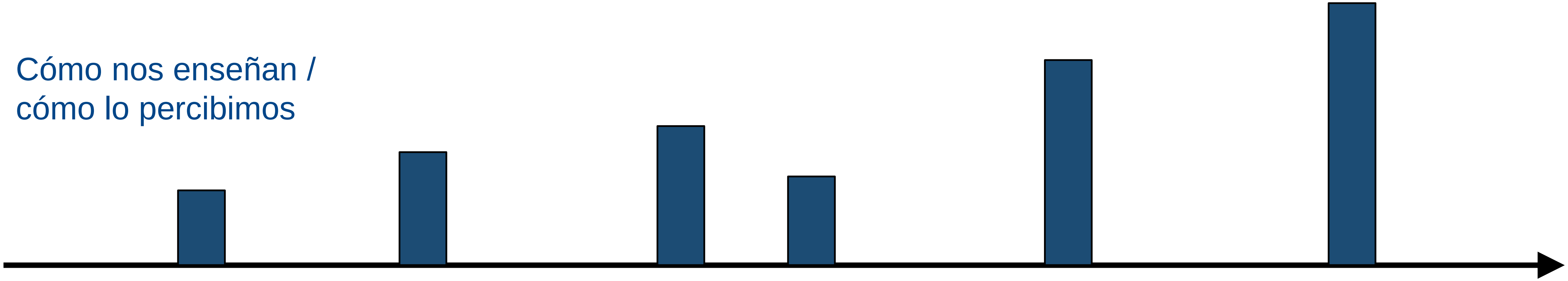
Hitos históricos en la microbiología

1676 - Antonie van Leeuwenhoek emplea su microscopio para observar microorganismos.

1796 – Edward Jenner prepara la primera vacuna contra la viruela.

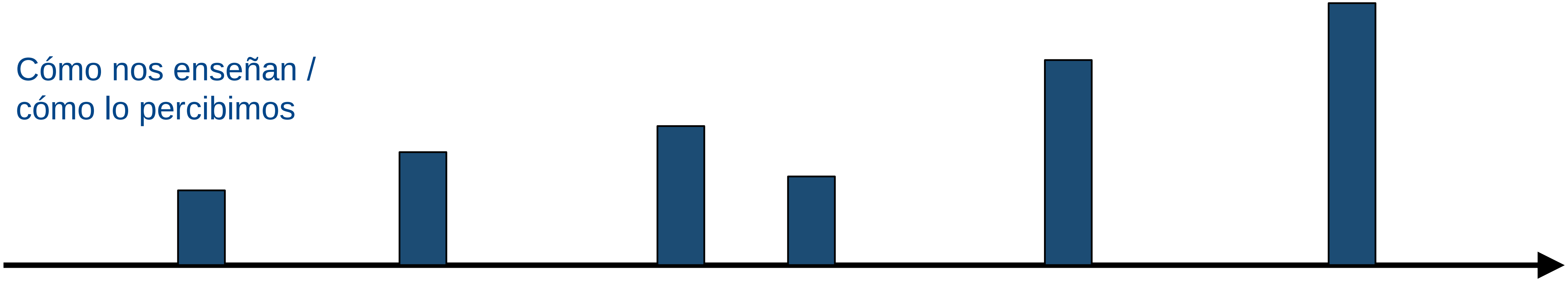
1857 – Louis Pasteur publica su tratado sobre la fermentación por levaduras.

Percepción sobre la historia

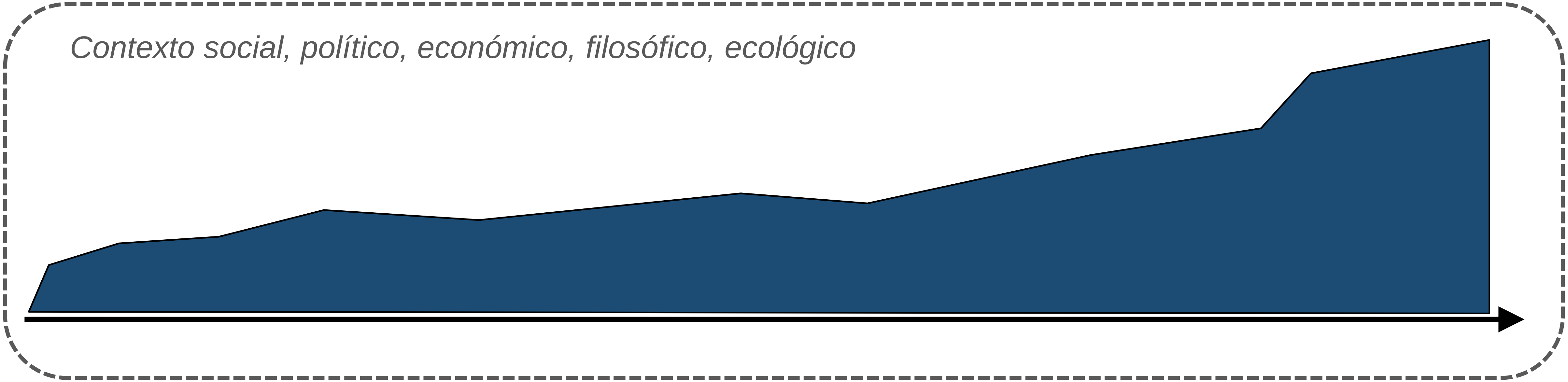


Percepción sobre la historia

Cómo nos enseñan /
cómo lo percibimos



Cómo evolucionan los
conocimientos



¿Por qué el investigador debe preocuparse por la historia de la ciencia?

1. La ciencia es influida por factores históricos y sociales
2. La historia permite aprender de errores previos
3. Una perspectiva histórica provee una mayor apreciación de cómo ocurrieron los descubrimientos
4. La historia puede dar un reconocimiento cuando se está en deuda
5. La historia revela la evolución de los estándares éticos en ciencia

Casadevall A, Fang FC. (A)Historical science. Infect Immun. 2015; 83(12): 4460-4.

La ciencia es influida por factores históricos y sociales

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June 24, 2014

Epidemiology in History

The Thompson-McFadden Commission and Joseph Goldberger: Contrasting 2 Historical Investigations of Pellagra in Cotton Mill Villages in South Carolina

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As pellagra reached epidemic proportions in the United States in the early 20th century, 2 teams of investigators assessed its incidence in cotton mill villages in South Carolina. The first, the Thompson-McFadden Commission, concluded that pellagra was likely infectious. The second, a Public Health Service investigation led by Joseph Goldberger, concluded that pellagra was caused by a dietary deficiency. In this paper, we recount the history of the 2 investigations and consider how the differences between the 2 studies' designs, measurements, analyses, and interpretations led to different conclusions. Because the novel dietary assessment strategy was a key feature of the Public Health Service's study design, we incorporated simulated measurement error in a reanalysis of the Public Health Service's data to assess whether this specific difference affected the divergent conclusions.

epidemiology in history; measurement; multilevel epidemiology; nutrition

La historia permite aprender de errores previos

630 THE NEW ENGLAND JOURNAL OF MEDICINE March 12, 1981

COFFEE AND CANCER OF THE PANCREAS

BRIAN MACMAHON, M.D., STELLA YEN, M.D., DIMITRIOS TRICHOPOULOS, M.D., KENNETH WARREN, M.D., AND GEORGE NARDI, M.D.

Abstract We questioned 369 patients with histologically proved cancer of the pancreas and 644 control patients about their use of tobacco, alcohol, tea, and coffee. There was a weak positive association between pancreatic cancer and cigarette smoking, but we found no association with use of cigars, pipe tobacco, alcoholic beverages, or tea. A strong association between coffee consumption and pancreatic cancer was evident in both sexes. The association was not affected by controlling for cigarette use. For the sexes combined, there was a significant dose-response relation (P ~ 0.001); after adjustment for cigarette smoking, the relative risk associated with drinking up to two cups of coffee per day was 1.8 (95 per cent confidence limits, 1.0 to 3.0), and that with three or more cups per day was 2.7 (1.6 to 4.7). This association should be evaluated with other data; if it reflects a causal relation between coffee drinking and pancreatic cancer, coffee use might account for a substantial proportion of the cases of this disease in the United States. (N Engl J Med. 1981; 304:630-3.)

OVER the past few decades, cancer of the pancreas has emerged as one of the most important neoplasias in human beings. It now accounts for approximately 20,000 deaths annually in the United States. Causative factors have been sought in several previous studies, but only cigarette smoking has emerged as a consistent, though relatively weak, exogenous risk factor. We report the results of a study that

whose interviews were judged to be unreliable, the control series used for the analysis consisted of 644 patients. Minor differences between tables in the stated numbers of cases and controls resulted from absence of specific items being analyzed in a few questionnaires.

The control series was composed of two principal diagnostic groups: 273 patients with cancer other than cancers of the pancreas and biliary tract, respiratory tract, or bladder and 371 patients with other disorders. Of the control patients with cancer, the tumor was in the breast in 65 patients, colon in 60, rectum in 25, stomach

Una perspectiva histórica provee una mayor apreciación de cómo ocurrieron los descubrimientos

Found Sci (2014) 19:387–401
DOI 10.1007/s10699-014-9348-0

Serendipity and the Discovery of DNA

Áurea Anguera de Sojo · Juan Ares · María Aurora Martínez · Juan Pazos · Santiago Rodríguez · José Gabriel Zato

Published online: 19 March 2014

Abstract This paper presents the manner in which the DNA, the molecule of life, was discovered. Unlike what many people, even biologists, believe, it was Johannes Friedrich Miescher who originally discovered and isolated nuclein, currently known as DNA, in 1869, 75 years before Watson and Crick unveiled its structure. Also, in this paper we show, and above all demonstrate, the serendipity of this major discovery. Like many of his contempo-

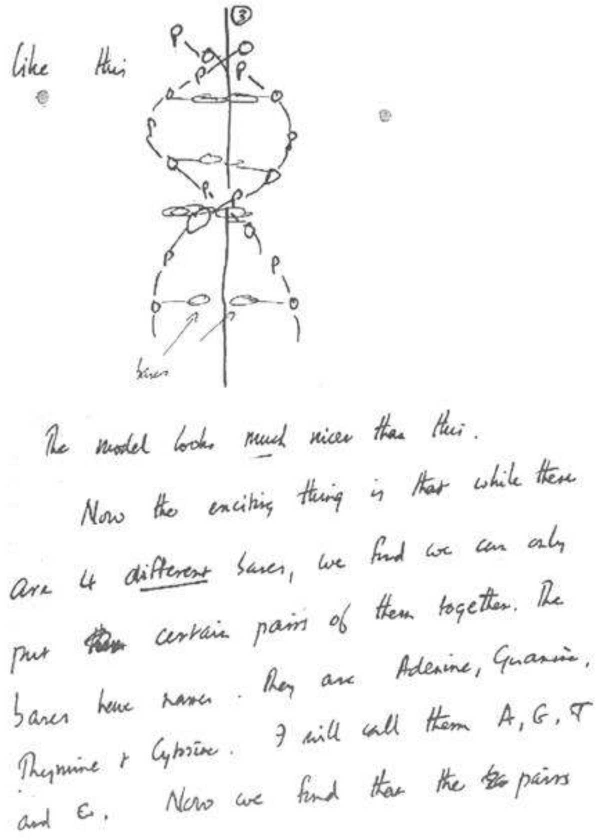

Fig. 1 Extract from Crick's letter to his son with a drawing of the DNA spiral model

La historia puede dar un reconocimiento cuando se está en deuda

Hist. Phil. Life Sci., 13 (1991), 97-124

Streptomycin: Discovery and Resultant Controversy

Milton Wainwright

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and Biotechnology, University of Sheffield,
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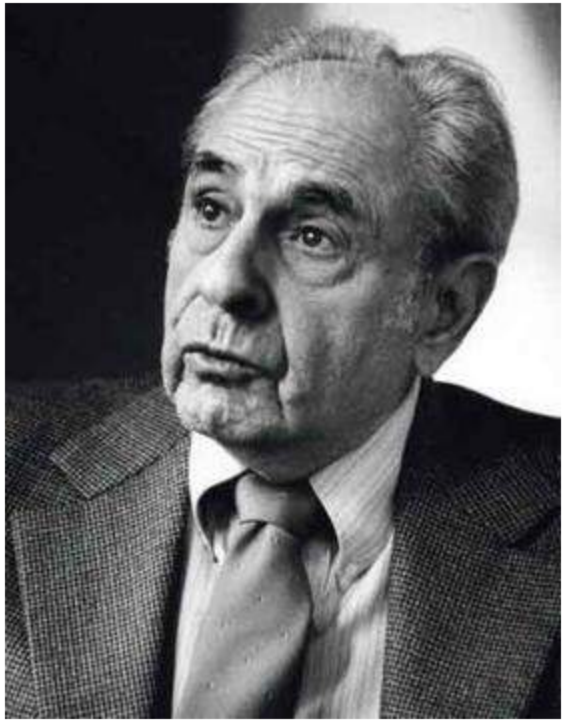
ABSTRACT – The antibiotic streptomycin was discovered soon after penicillin was introduced into medicine. Selman Waksman, who was awarded the Nobel Prize for the discovery, has since generally been credited as streptomycin's sole discoverer. However, one of Waksman's graduate students, Albert Schatz, was legally recognized as streptomycin's co-discoverer and received a share of the royalties from the drug. The aim of this essay is to discuss the streptomycin story, largely using previously unquoted archival material, and in particular to provide further evidence for the important role which Schatz played in the discovery.

Introduction

Streptomycin was discovered soon after penicillin was introduced into medicine, being the second major therapeutically useful antibiotic to enter medicine. It provided the first effective cure for tuberculosis, tuberculous meningitis, and a range of other infections caused by pathogenic Gram negative bacteria.[1] The impact of streptomycin on medicine in the early 1940's can be summed up by the following comment by L.P.



Albert Schatz

La historia revela la evolución de los estándares éticos en ciencia

436 April 15, 1985 Vol. 142 THE MEDICAL JOURNAL OF AUSTRALIA

ORIGINAL ARTICLES

Attempt to fulfil Koch's postulates for pyloric campylobacter

(see also page 431)

Barry J. Marshall, John A. Armstrong, David B. McGechie and Ross J. Glancy

ABSTRACT: A volunteer with histologically normal gastric mucosa received pyloric campylobacter by mouth. A mild illness developed, which lasted 14 days. Histologically proven gastritis was present on the tenth day after the ingestion of bacteria, but this had largely resolved by the fourteenth day. The syndrome of acute pyloric campylobacter gastritis is described. It is proposed that this disorder may progress to a chronic infection which predisposes to peptic ulceration.

(Med J Aust 1985; 142: 436-439)

The association between the newly

Second postulate. "The germ should be obtained from the diseased animal and grown outside the body." PC was first isolated in 1982 from a patient with gastritis.[11] Since January 1983 PC has been cultured from over 150 patients in our hospital. In almost all patients, an infiltration of polymorphonuclear cells has been found in the specimens of antral mucosa on the initial or a subsequent biopsy.

The experiment described in this paper was undertaken in order to fulfil Koch's third and fourth postulates; that is, to demonstrate that PC could colonize

with gastritis in the same gastroscopy session. The test isolate was taken from the latter patient, a 66-year-old man with non-ulcer dyspepsia. Before the human experiment was conducted, a portion of this isolate was inoculated intraperitoneally into two rats which suffered no ill effects after the inoculation. The isolate was sensitive to ampicillin, erythromycin, tinidazole, doxycycline and rifampicin. It was freeze-dried, then revived for the experiment.

One month later, when electron microscopic results were available and any lesion which resulted from the initial biopsies

Literatura científica – deliberadamente ahistórica

SCIENCE IN BOOKS

IS THE SCIENTIFIC PAPER FRAUDULENT?

Yes; It Misrepresents Scientific Thought

I HAVE chosen for my title a question: Is the scientific paper a fraud?

I ought to explain that a scientific "paper" is a printed communication to a learned journal, and scientists make their work known almost wholly through papers and not through books, so papers are very important in scientific communication. As to what I mean by asking "is the scientific paper a fraud?" —I do not, of course, mean "Does the scientific paper misrepresent facts?" and I do not mean that the interpretations you find in a scientific paper are wrong or deliberately mistaken. I mean the scientific paper may be a fraud because it misrepresents the processes of thought that accompanied or gave rise to the work that is described in the paper.

That is the question, and I will say right away that my answer to it is "yes." The scientific paper in its orthodox form does embody a totally mistaken conception, even a travesty, of the nature of scientific thought.

Just consider for a moment the traditional form of a scientific paper (in-

evidence until the "discussion" section, and in the discussion you adopt the ludicrous pretense of asking yourself if the information you have collected actually means anything.

Of course, what I am saying is rather an exaggeration, but there is more than a mere element of truth in it.

The conception underlying this style of scientific writing is that scientific discovery is an inductive process. What induction implies in its cruder form is roughly speaking this: Scientific discovery, or the formulation of scientific theory, starts in with the unvarnished and unembroidered evidence of the senses. It starts with simple observation —simple, unbiased, unprejudiced, naïve, or innocent observation—and out of this sensory evidence, embodied in the form of simple propositions or declarations of fact, generalizations will grow up and take shape, almost as if some process of crystalization or condensation were taking place. Out of a disorderly array of facts, an orderly theory, an orderly general statement, will somehow emerge.

THIS conception of scientific discov-

Now, John Stuart Mill's deeper motive in working out what he conceived to be the essential method of science was to apply that method to the solution of sociological problems: He wanted to apply to sociology the methods which the practice of science had shown to be immensely powerful and exact. It is ironical that the application to sociology of the inductive method, more or less in the form in which Mill himself conceived it, should have been an almost entirely fruitless one.

The simplest application of the Millsian process of induction to sociology came in a rather strange movement called Mass Observation. The belief underlying Mass Observation was apparently this: that if one could only record and set down the actual raw facts about what people do and what people say in pubs, in trains, when they make love to each other, when they are playing games, and so on, then somehow, from this wealth of information, a great generalization would inevitably emerge.

Well, in point of fact, nothing important emerged from this approach.

THE theory underlying the inductive method cannot be sustained. Let me give three good reasons why not.

In the first place, the starting point of induction is philosophic fiction. There is no such thing as unprejudiced observation. Every act of observation we make is biased. What we see or otherwise sense is a function of what we have seen or sensed in the past.

The second point is this: Scientific discovery or the formulation of the scientific idea on the one hand, and demonstration or proof on the other hand,

EMBO reports

Science & Society

Revisiting "Is the scientific paper a fraud?"

The way textbooks and scientific research articles are being used to teach undergraduate students could convey a misleading image of scientific research

Susan M Howitt[1] & Anna N Wilson[2]

In 1963, Peter Medawar gave a talk, *Is the scientific paper a fraud?*, in which he argued that scientific journal articles give a false impression of the real process of scientific discovery [1]. In answering his question, he argued that, "The scientific paper in its orthodox form does embody a totally mistaken conception, even a travesty, of the nature of scientific thought." His main concern was that the highly formalized structure gives only a sanitized version of how scientists come to a conclusion and that it leaves no room for authors to discuss the thought processes that led to the experiments.

Medawar explained that papers were presented to appear as if the scientists had no pre-conceived expectations about the outcome and that they followed an inductive process in a logical fashion. In fact, scientists do have expectations and their observa- actual process of discovery had been messy, a good paper presents a logical argument, provides supporting evidence, and comes to a conclusion. The reader usually does not need or want to know about false starts, failed experiments, and changes of direction.

This approach to scientific communication has implications for teaching undergraduates the nature and practice of science as it creates a completely wrong impression of how science actually works and perpetuates a stereotype of scientists as logical and rational beings, doggedly adhering to the scientific method. Students may confuse the presentation of a logical argument with an accurate representation of what was actually done. This leads to a view of science that is unrealistic and may even be damaging as it implies that failure, serendipity, and unexpected results are not a normal part of both the process of discovery and the thought that preceded it.

A case in point is the discovery of the double helical structure of DNA by James Watson and Francis Crick. Their *Nature* paper reporting the discovery is famous for its elegance and brevity [2]. A typical textbook account mentions that Watson and Crick used models to generate the double helix structure accommodating complementary base pairs. It usually also mentions the X-ray data of Rosalind Franklin and Maurice Wilkins but says little beyond this. As with a scientific paper, this is a question of purpose; students read textbooks to "learn facts," rather than to learn about scientific discovery.

As Watson's book, *The Double Helix* [3], makes clear, the actual process of discovery was anything but straightforward. In fact,

Literatura científica – deliberadamente ahistórica

AMERICAN DOCUMENTATION Vol. XI, 1960

THE "HALF-LIFE" OF SOME SCIENTIFIC AND TECHNICAL LITERATURES

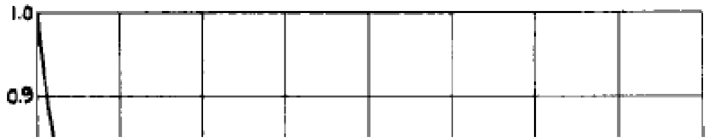
R. E. BURTON and R. W. KEBLER***

ABSTRACT

A consideration of the analogy between the *half-life* of radioactive substances and the rate of obsolescence of scientific literature. The validity of this analogy suggests the possibility of more accurate prognostications concerning the period of time during which scientific literature may be used and hence might help to guide the planning of library collections and technical information services.

The concept of *half-life* is most familiar to the physicist and nuclear engineer who employ it to describe the decay of radioactive substances. Recently, however, the expression has been used by documentalists, some librarians, and other information "officers" to describe a totally different measure in a manner which

remaining material is the same as the half-life of the original mass.



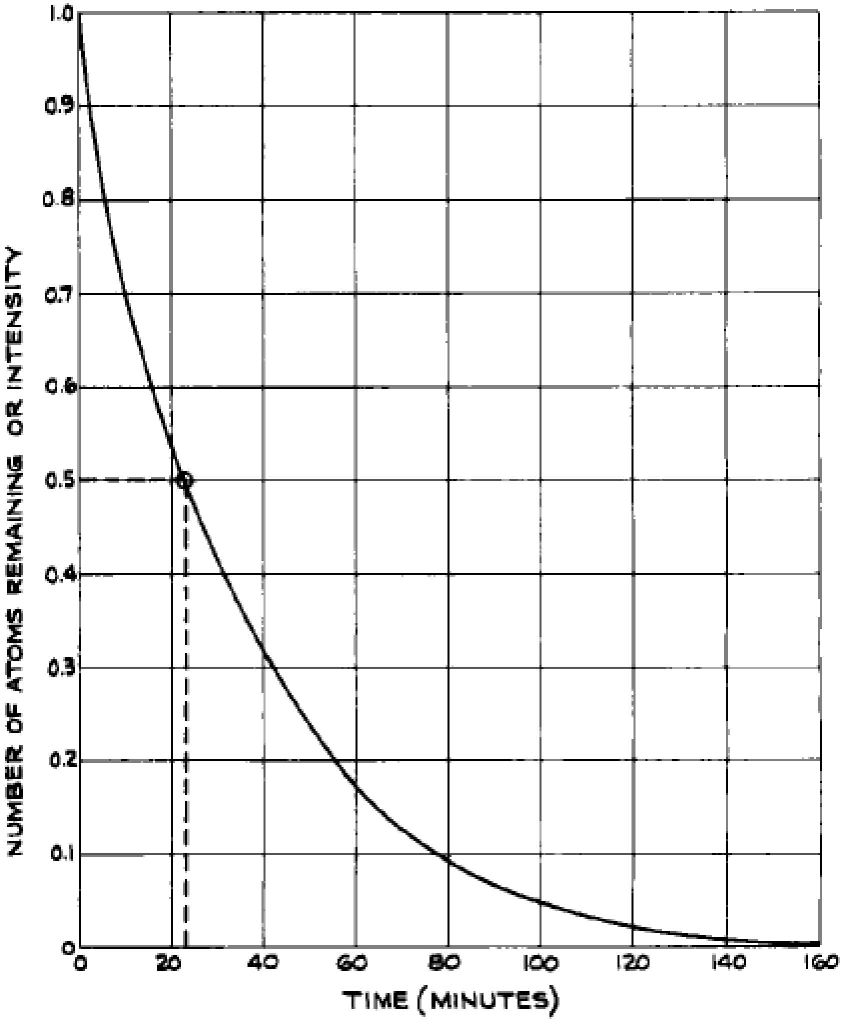


Fig. 1. Decay Curve for Uranium 239

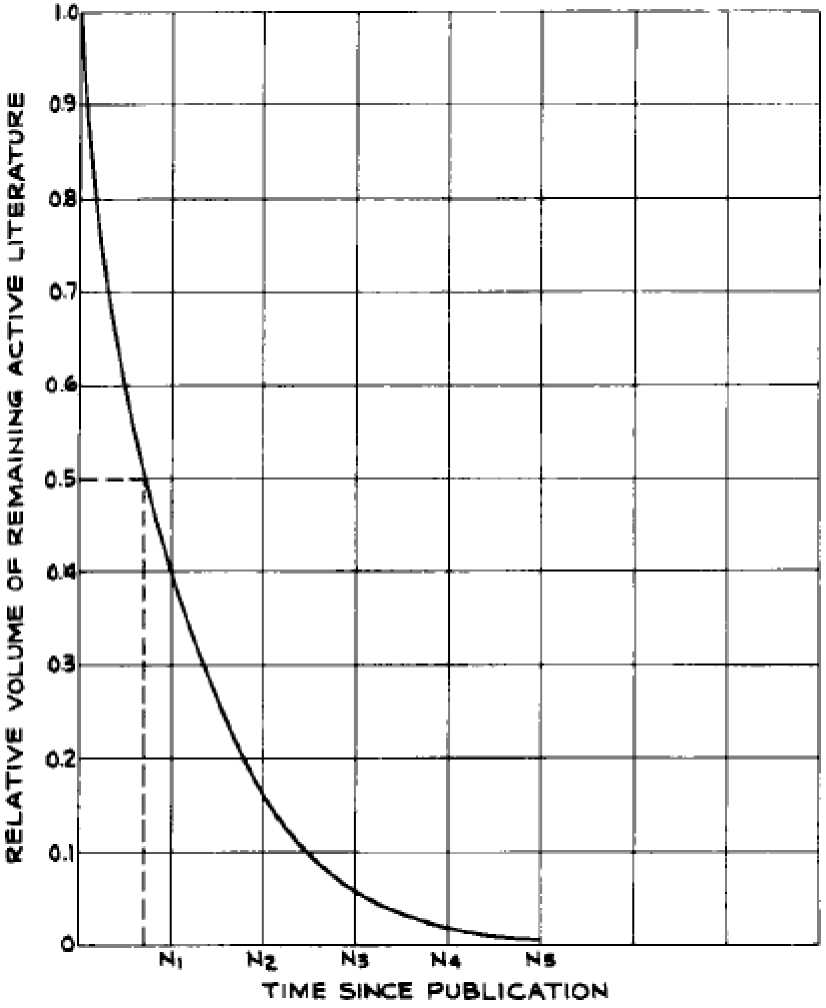


Fig. 2. Generalized Active Literature Curve

Table II

Literature Half-Lives

Chemical Engineering	4.8 years
Mechanical Engineering	5.2
Metallurgical Engineering	3.9
Mathematics	10.5
Physics	4.6
Chemistry	8.1
Geology	11.8
Physiology	7.2
Botany	10.0

Oral communication

500 BC

Scrolls or ancient texts

500 AD

Letter writing

1000 AD

Published books

1250 AD

1500 AD

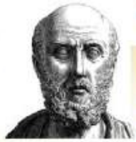
1750 AD

Scientific journals

2000 AD

Ancient World

Philosophers teach at their own schools and their students carry the knowledge far and wide, spreading it orally, or writing it down in Greek. Later, the Roman Empire spreads this knowledge further, often translating Greek texts into Latin.

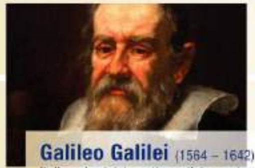


Hippocrates of Kos (c. 460 – c. 370 BC)
Greek physician with revolutionary ideas about disease and medicine. Hippocrates passed on his teachings orally and in written treatises. His students added to and spread his ideas far and wide after training at his school.

Early Middle Ages

Most teaching is done at religious schools. Knowledge is passed on orally and books are hand-written, copied by monks. Science is not high on the agenda, except where needed to determine the exact date of Easter or the time of day for prayer. Education is limited to the wealthy.

Alcuin of York (c. 735 – 804 AD)
English, Roman Catholic scholar at the Carolingian court of Charlemagne. Alcuin taught in Catholic schools and at court, where he ensured that books and manuscripts were copied in an accurate and legible fashion. He also wrote letters to friends and peers to explain his theological and philosophical ideas.



Galileo Galilei (1564 – 1642)
Italian physicist, mathematician, astronomer and philosopher. Originally studied medicine at the University of Pisa, Italy, but did not graduate. Galileo championed the heliocentric view of the Solar System against the opinion of his peers and the Roman Catholic Church. He wrote books, essays and letters putting forward his views and presented them at royal courts and scientific societies.

The Renaissance

The first universities are founded to provide an infrastructure for teaching and research. Scientific advances are made, building on the work of Byzantine and Islamic scholars. Education is still limited to the wealthy. Scientific societies begin to form for intellectuals to present and discuss their ideas.

Isaac Newton (1642 – 1727)
English physicist and mathematician; widely regarded as one of the most influential scientists of all time. Attended and then taught at Cambridge University, UK. He published books and manuscripts explaining his ideas, wrote letters commenting on the ideas of others and exploring his own, and presented his research at meetings of the Royal Society in London.

The Enlightenment

The first scientific journals are founded by scientific societies to formally publish the presentations made by their members. Ancient Greek texts are rediscovered and spark new advances that often overthrow the knowledge of the time. Important scientific ideas are still mainly communicated verbally, or in letters and books, but the invention of the printing press has made books more widely available.

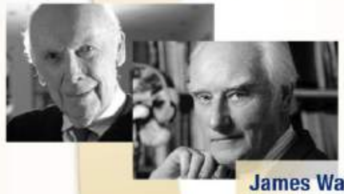
Gregor Mendel (1822 – 1884)
German-speaking Silesian scientist who demonstrated genetic inheritance in peas. Studied at the University of Olomouc, Czech Republic, before training as a priest and later studying at the University of Vienna, Austria. Mendel presented his ideas at meetings of scientific societies and published them in German-language scientific journals.

The 19th Century

Scientific journals are becoming the main method of communicating new knowledge to the scientific community. Although scientists still correspond in letters and present ideas at scientific meetings, more and more are beginning to then publish their major ideas formally in journals rather than books or self-published manuscripts.

The 20th Century

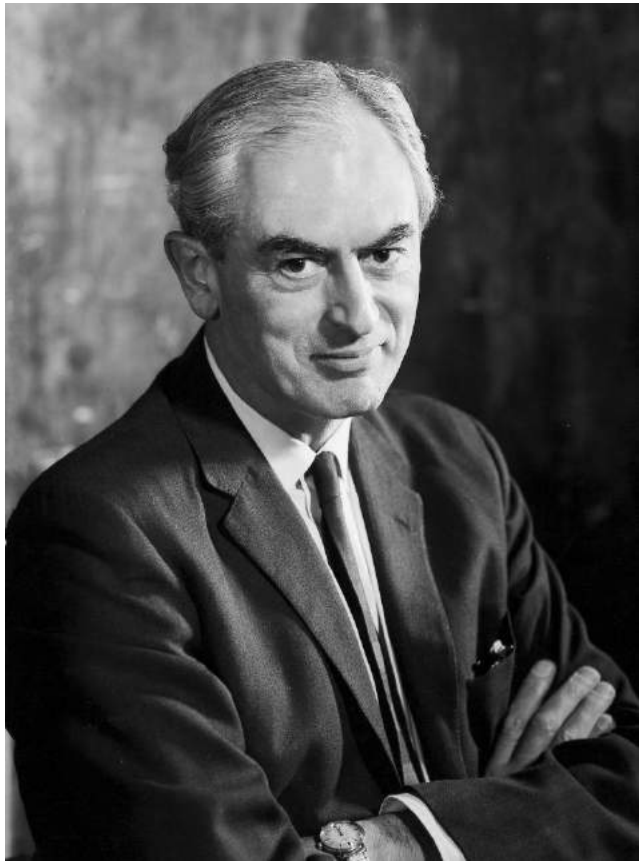
All scientific discoveries are now published in scientific journals. Formalized peer-review is established and publication in journals has become the measure of a scientist's work. The scientific paper has become a highly stylized document. The invention of the Internet in the late 20th century now allows journal articles to be instantly available to scientists and students worldwide. The Internet also facilitates informal sharing of data and ideas between scientists.



James Watson & Francis Crick (1953)
English biologists who discovered the double-helix structure of DNA. Both worked and taught at Cambridge University, UK. They presented their work at scientific meetings and published their research in scientific journals and would continue to do so throughout their careers. However, they have both written books to tell the full stories of their discoveries that cannot be captured in scientific journals.

Sobre la escritura de un artículo científico:

"El debido homenaje y justicia a los propios predecesores son normas que se deben tomar en cuenta…"



Medawar PB. Consejos a un joven científico. México, DF: Fondo de Cultura Económica; 1996.

Relevancia de la historia de la ciencia en el quehacer del investigador: implicancias para la publicación

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