Ética y antiética en la investigación científica

...

Día mundial de la Bioética

26 de noviembre de 2018

Dr. Ricardo R. Contreras

Departamento de Química - Facultad de Ciencias - ULA

Comisión Especial de Bioética de la Academia de Mérida

ricardo@ula.ve

Sócrates y Erasmo

Pietro PERUGINO. SÓCRATES. 1497-1500, Carboncillo. 337 x 101 mm. Galería Uffizi, Florencia

Albrecht DÜRER. ERASMO DE ROTTERDAM. 1526. Grabado. 249 x 193 mm. Galería Nacional de Arte, Washington

Jacques-Louis DAVID. Muerte de Sócrates. 1787. Óleo, 130 x 196 cm. Museo Metropolitano de Arte de Nueva York.

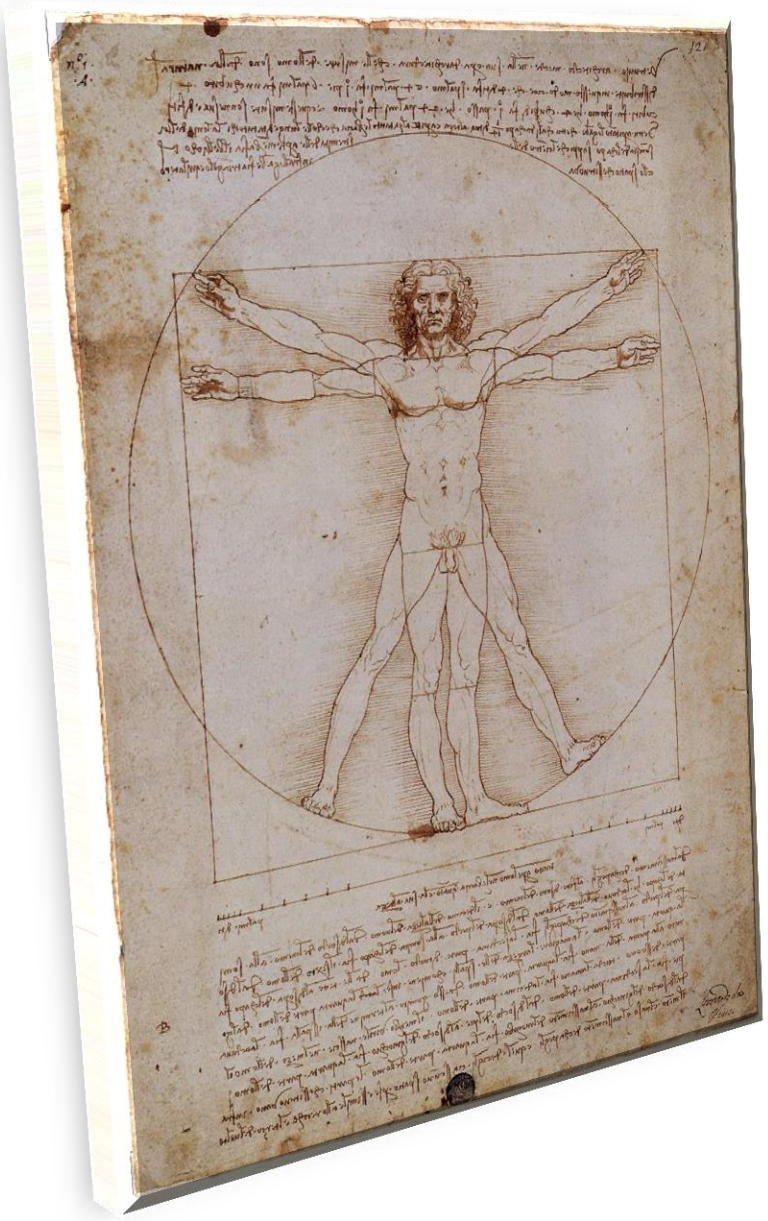
Eugenio Trías

Una ética que no se atenga a las condiciones (humanas) de su posible realización a través de la acción no puede legitimarse como tal; pero una ética que degrade al ser humano a condiciones inhumanas, infrahumanas, tampoco puede justificarse como ética genuina …

Fernando Savater

Si hoy todavía leemos con provecho la Ética a Nicómaco, que lleva por el mundo más de veinte siglos, es porque sigue tratando cuestiones que todavía son útiles.

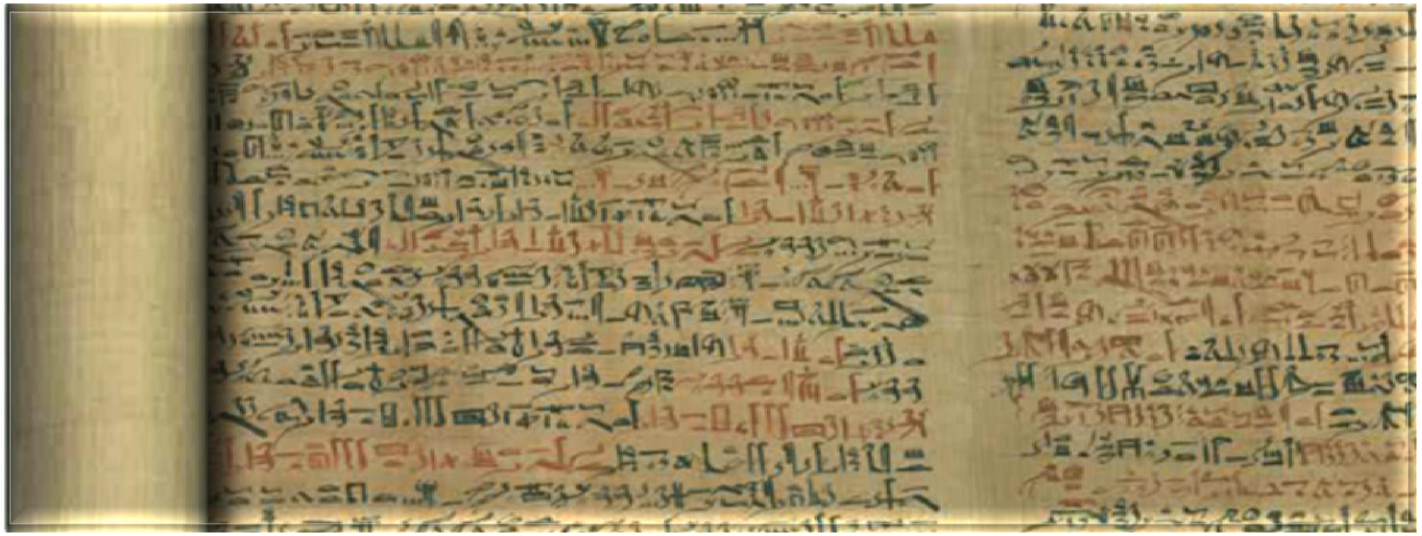
Si ese libro sigue interpelándonos es porque el fundamento y el sentido de la pregunta ética no ha variado …



La ciencia es una actividad humana por excelencia, es una empresa colectiva, que se extiende por todas las culturas y abarca a todas las generaciones, pues responde a una necesidad humana, un deseo ferviente de comprender el mundo que nos rodea, y tratar de construir certezas sobre ello …

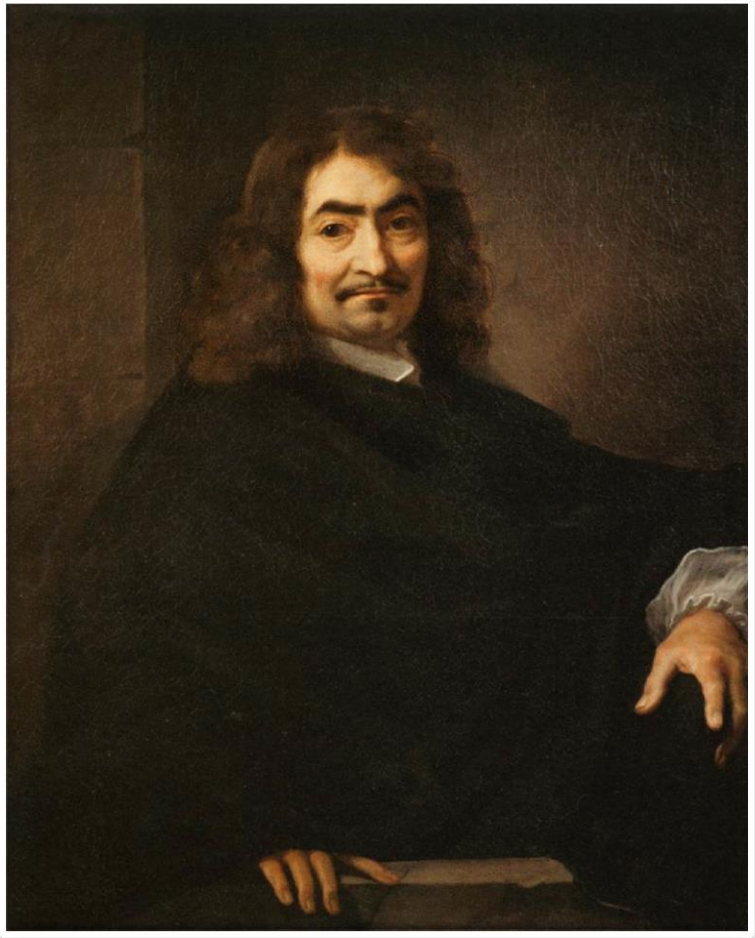
Leonardo DA VINCI. El hombre de vitruvio. 1492. Lápiz/tinta. 343 x 245 mm. Galería de la Academia de Venecia

Código de Hamurabi, ca. 1700 a.C., cilindro de diorita de 2 m x 0, 50 m. Museo del Louvre

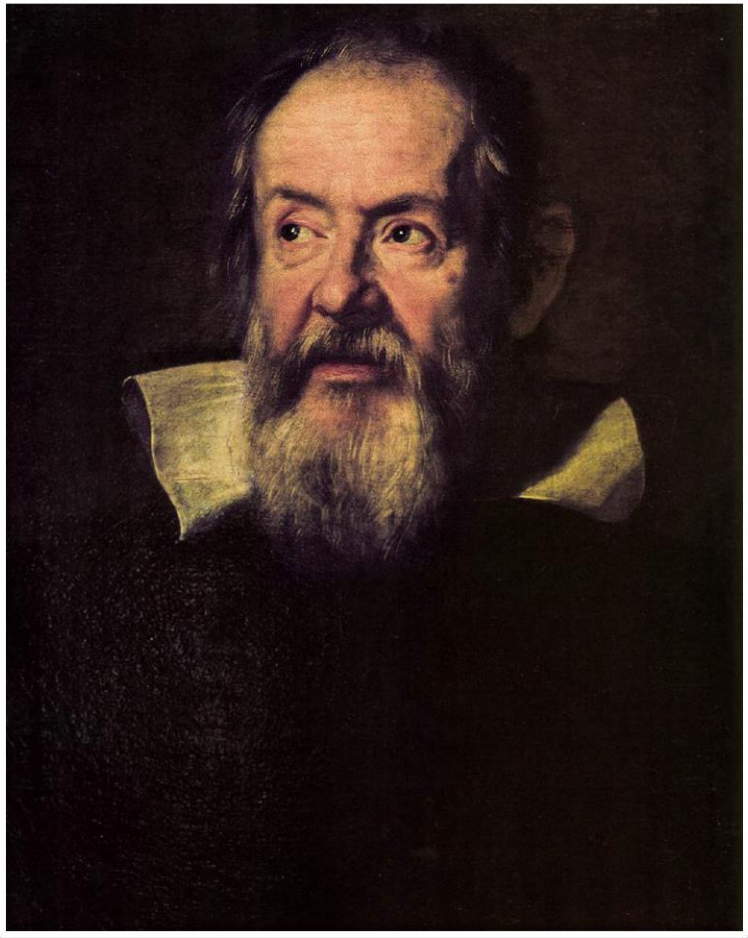


Papiro de Edwin Smith XVII a.C., adquirido en Tebas en 1862. Academia de Medicina de Nueva York

GALILEO Y DESCARTES

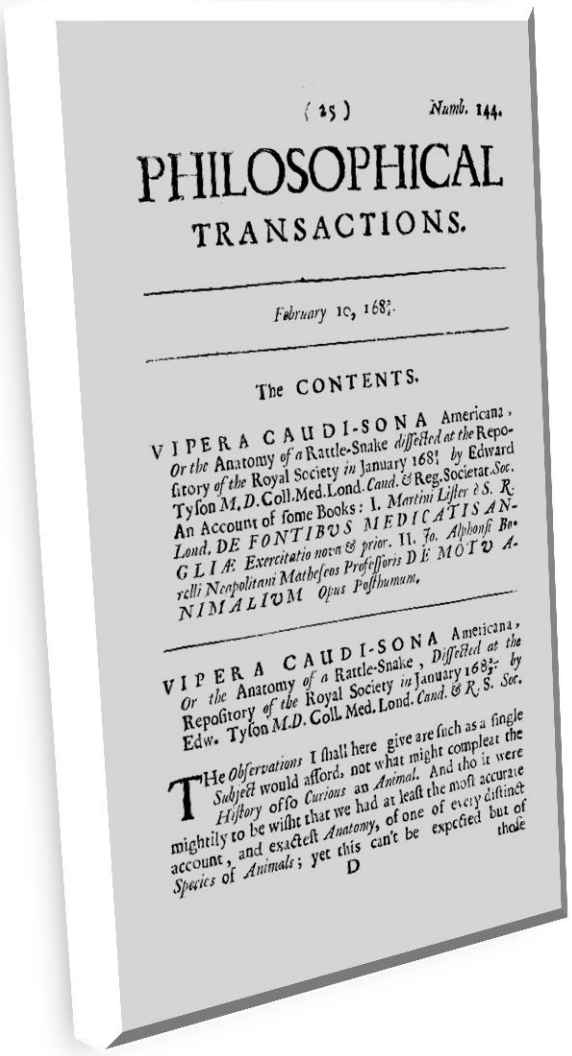


Sébastien BOURDON. Portarretrato de René Descartes. Óleo, 88 x 71 cm. Museo de Louvre, Paris



Justus SUSTERMANS. Portarretrato de Galileo Galilei. 1636. Óleo, 66 x 56 cm. Galería Uffizi, Florencia

PHILOSOPHICAL TRANSACTIONS



(25) Numb. 144.

PHILOSOPHICAL
TRANSACTIONS.

February 10, 168⅔.

The CONTENTS.

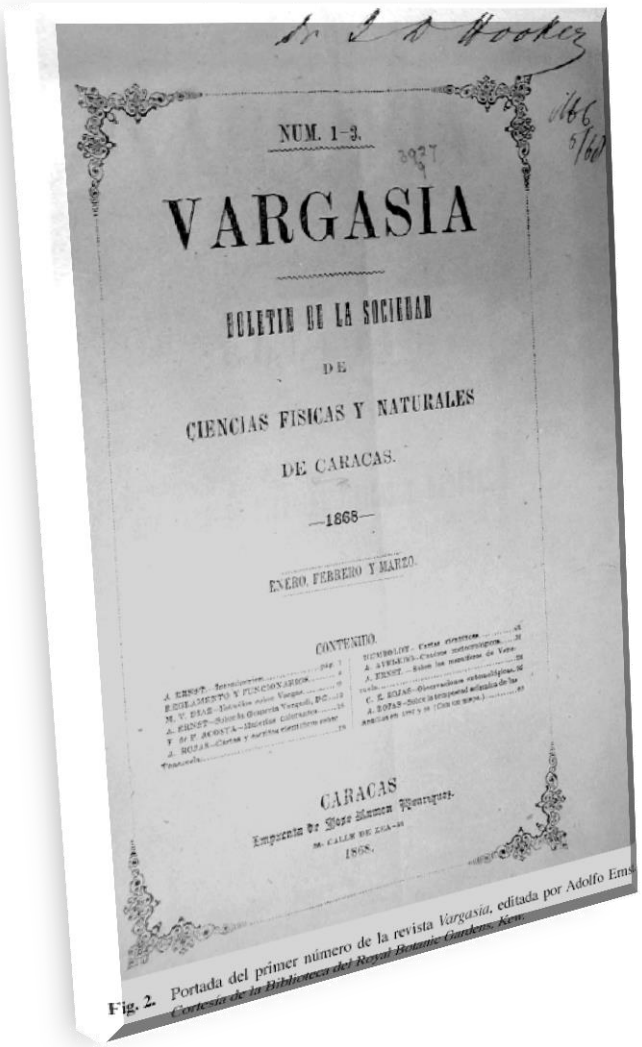
VIPERA CAUDI-SONA Americana, Or the Anatomy of a Rattle-Snake dissected at the Repository of the Royal Society in January 168⅔ by Edward Tyson M.D. Coll. Med. Lond. Cand. & Reg. Societat. Soc. An Account of some Books: I. Martini Lister ad S. R. Lond. DE FONTIBUS MEDICATIS ANGLIÆ Exercitatio nova & prior. II. Jo. Alphonsi Borelli Neapolitani Matheseos Professoris DE MOTU ANIMALIUM Opus Posthumum.

VIPERA CAUDI-SONA Americana, Or the Anatomy of a Rattle-Snake, Dissected at the Repository of the Royal Society in January 168⅔ by Edw. Tyson M.D. Coll. Med. Lond. Cand. & R. S. Soc.

THE Observations I shall here give are such as a single Subject would afford, not what might compleat the History of so Curious an Animal. And tho it were mightily to be wisht that we had at least the most accurate account, and exactest Anatomy, of one of every distinct Species of Animals; yet this can't be expected but of those

D

CIENCIA VENEZOLANA



NUM. 1-3.

VARGASIA

BOLETIN DE LA SOCIEDAD

DE

CIENCIAS FISICAS Y NATURALES

DE CARACAS.

—1868—

ENERO, FEBRERO Y MARZO.

CONTENIDO.

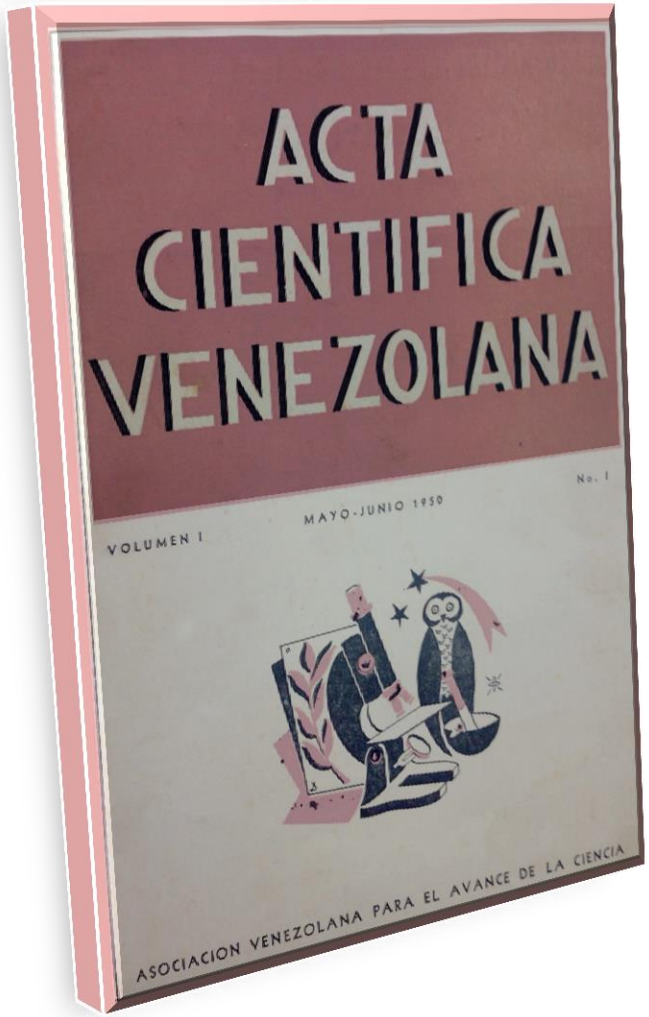
CARACAS

Imprenta de José Manuel Rodriguez.

1868.

Fig. 2. Portada del primer número de la revista *Vargasia*, editada por Adolfo Ems

Cortesía de la Biblioteca del Royal Botanic Gardens, Kew.



ACTA CIENTIFICA VENEZOLANA

VOLUMEN I

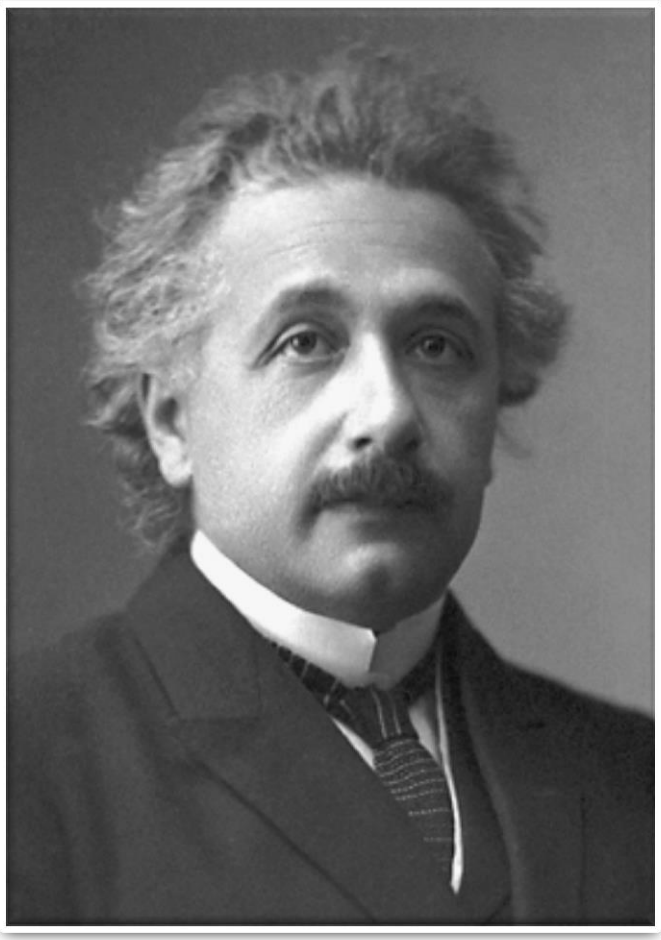
MAYO-JUNIO 1950

No. 1

ASOCIACION VENEZOLANA PARA EL AVANCE DE LA CIENCIA

Pelagio ALAGI. Newton descubriendo la refracción de la luz. 1827.Óleo, 167 x 216 cm Pinacoteca Tosio Martinengo, Brescia

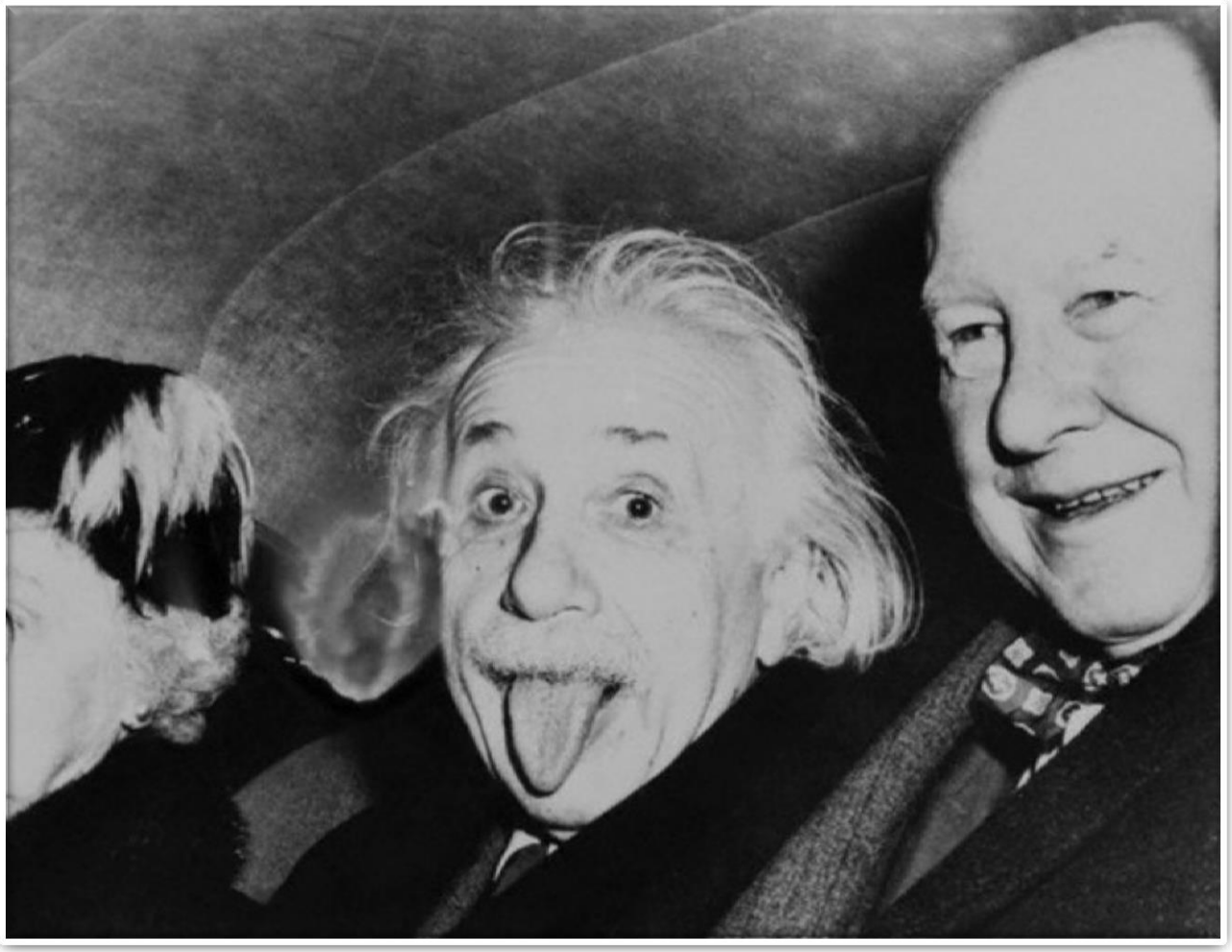
Albert Einstein



Albert Einstein. Fotografía de la Fundación Premio Nobel

Albert Einstein junto a su esposa y su amigo Aydelotte Frank. Foto: Arthur Sasse

Albert irreverente!



Albert Einstein a los 72 años, junto a su esposa y su amigo Aydelotte Frank. Foto: Arthur Sasse

LA INSULINA

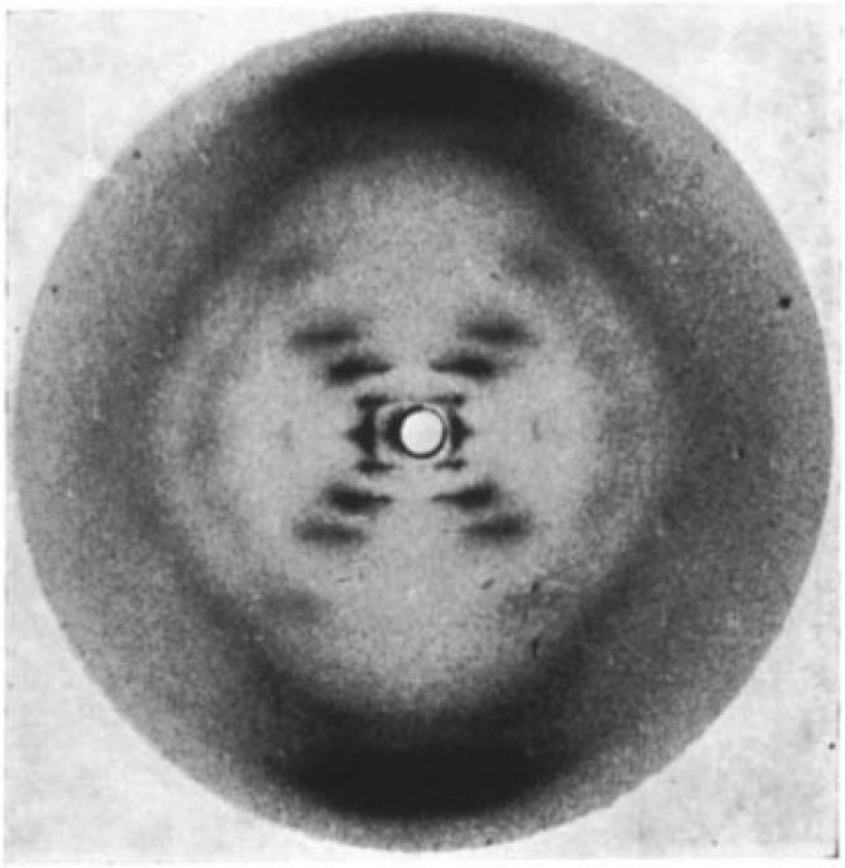
Frederick Grant Banting

John James Rickard Macleod

LA MOLÉCULA DE ADN

Foto-ilustración de los ganadores del Premio Nobel de medicina 1962 James Watson (izquierda) y Francis Crick, en medio la científica Rosalind Franklin, que casi venció a Watson y Crick en la determinación de la estructura del ADN. Foto: SMH

FOTOGRAFÍA 51



Sodium deoxyribose nucleate from calf thymus. Structure *B*

We wish to thank Prof. J. T. Randall for encouragement; Profs. E. Chargaff, R. Signer, J. A. V. Butler and Drs. J. D. Watson, J. D. Smith, L. Hamilton, J. C. White and G. R. Wyatt for supplying material without which this work would have been impossible; also Drs. J. D. Watson and Mr. F. H. C. Crick for stimulation, and our colleagues R. E. Franklin, R. G. Gosling, G. L. Brown and W. E. Seeds for discussion. One of us (H. R. W.) wishes to acknowledge the award of a University of Wales Fellowship.

M. H. F. Wilkins
Medical Research Council Biophysics Research Unit,

A. R. Stokes
H. R. Wilson
Wheatstone Physics Laboratory, King's College, London.
April 2.

[1] Astbury, W. T., Symp. Soc. Exp. Biol., 1, Nucleic Acid (Cambridge Univ. Press, 1947).
[2] Riley, D. P., and Oster, G., *Biochim. et Biophys. Acta*, **7**, 526 (1951).
[3] Wilkins, M. H. F., Gosling, R. G., and Seeds, W. E., *Nature*, **167**, 759 (1951).
[4] Astbury, W. T., and Bell, F. O., Cold Spring Harb. Symp. Quant. Biol., **6**, 109 (1938).
[5] Cochran, W., Crick, F. H. C., and Vand, V., *Acta Cryst.*, **5**, 581 (1952).
[6] Wilkins, M. H. F., and Randall, J. T., *Biochim. et Biophys. Acta*, **10**, 192 (1953).

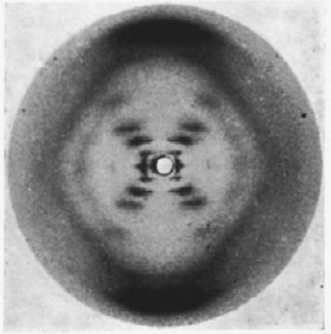
Molecular Configuration in Sodium Thymonucleate

Sodium thymonucleate fibres give two distinct types of X-ray diagram. The first corresponds to a crystalline form, structure *A*, obtained at about 75 per cent relative humidity; a study of this is described in detail elsewhere[1]. At higher humidities a different structure, structure *B*, showing a lower degree of order, appears and persists over a wide range of ambient humidity. The change from *A* to *B* is reversible. The water content of structure *B* fibres which undergo this reversible change may vary from 40–50 per cent to several hundred per cent of the dry weight. Moreover, some fibres never show structure *A*, and in these structure *B* can be obtained with an even lower water content.

The X-ray diagram of structure *B* (see photograph) shows in striking manner the features characteristic of helical structures, first worked out in this laboratory by Stokes (unpublished) and by Crick, Cochran and Vand[5]. Stokes and Wilkins were the first to propose such structures for nucleic acid as a result of direct studies of nucleic acid fibres, although a helical structure had been previously suggested by Furberg (thesis, London, 1949) on the basis of X-ray studies of nucleosides and nucleotides.

While the X-ray evidence cannot, at present, be taken as direct proof that the structure is helical, other considerations discussed below make the existence of a helical structure highly probable.

Structure *B* is derived from the crystalline structure *A* when the sodium thymonucleate fibres take up quantities of water in excess of about 40 per cent of their weight. The change is accompanied by an increase of about 30 per cent in the length of the fibre, and by a substantial re-arrangement of the molecule. It therefore seems reasonable to suppose that in structure *B* the structural units of sodium thymonucleate (molecules or groups of molecules) are relatively free from the influence of neighbouring



Sodium deoxyribose nucleate from calf thymus. Structure *B*

molecules, each unit being shielded by a sheath of water. Each unit is then free to take up its least-energy configuration independently of its neighbours and, in view of the nature of the long-chain molecules involved, it is highly likely that the general form will be helical[2]. If we adopt the hypothesis of a helical structure, it is immediately possible, from the X-ray diagram of structure *B*, to make certain deductions as to the nature and dimensions of the helix.

The innermost maxima on the first, second, third and fifth layer lines lie approximately on straight lines radiating from the origin. For a smooth single-strand helix the structure factor on the nth layer line is given by:

$$F_n = J_n(2\pi rR) \exp i\, n(\psi + \tfrac{1}{2}\pi),$$

where $J_n(u)$ is the nth-order Bessel function of u, r is the radius of the helix, and R and ψ are the radial and azimuthal co-ordinates in reciprocal space[2]; this expression leads to an approximately linear array of intensity maxima of the type observed, corresponding to the first maxima in the functions J_1, J_2, J_3, etc.

If, instead of a smooth helix, we consider a series of residues equally spaced along the helix, the transform in the general case treated by Crick, Cochran and Vand is more complicated. But if there is a whole number, m, of residues per turn, the form of the transform is as for a smooth helix with the addition, only, of the same pattern repeated with its origin at heights mc^*, $2mc^*$ . . . etc. (c is the fibre-axis period).

In the present case the fibre-axis period is 34 A. and the very strong reflexion at 3·4 A. lies on the tenth layer line. Moreover, lines of maxima radiating from the 3·4-A. reflexion as from the origin are visible on the fifth and lower layer lines, having a J_5 maximum coincident with that of the origin series on the fifth layer line. (The strong outer streaks which apparently radiate from the 3·4-A. maximum are not, however, so easily explained.) This suggests strongly that there are exactly 10 residues per turn of the helix. If this is so, then from a measurement of R_n the position of the first maximum on the nth layer line (for n 5–7), the radius of the helix, can be obtained. In the present instance, measurements of R_1, R_2, R_3 and R_5 all lead to values of r of about 10 A.

NATURE: 1953
ANNUS MIRABILIS

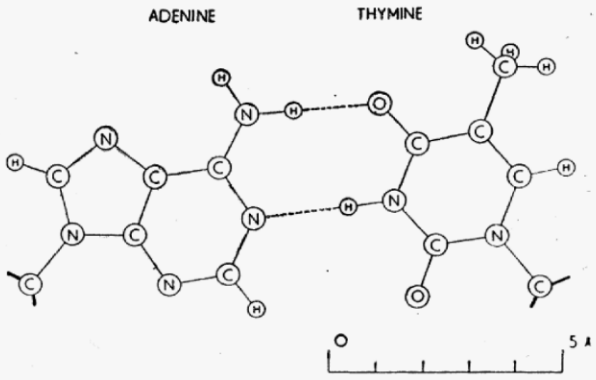


Fig. 4. Pairing of adenine and thymine. Hydrogen bonds are shown dotted. One carbon atom of each sugar is shown

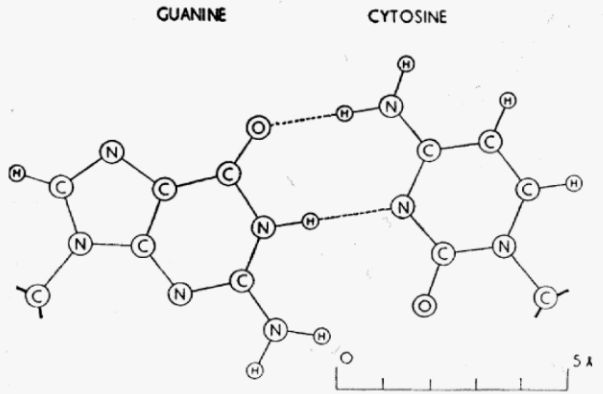


Fig. 5. Pairing of guanine and cytosine. Hydrogen bonds are shown dotted. One carbon atom of each sugar is shown

equipment, and to Dr. G. E. R. Deacon and the captain and officers of R.R.S. *Discovery II* for their part in making the observations.

[1] Young, F. B., Gerrard, H., and Jevons, W., *Phil. Mag.*, **40**, 149 (1920).
[2] Longuet-Higgins, M. S., *Mon. Not. Roy. Astro. Soc., Geophys. Supp.*, **5**, 285 (1949).
[3] Von Arx, W. S., Woods Hole Papers in Phys. Oceanog. Meteor., **11** (3) (1950).
[4] Ekman, V. W., *Arkiv. Mat. Astron. Fysik. (Stockholm)*, **2** (11) (1905).

MOLECULAR STRUCTURE OF NUCLEIC ACIDS

A Structure for Deoxyribose Nucleic Acid

WE wish to suggest a structure for the salt of deoxyribose nucleic acid (D.N.A.). This structure has novel features which are of considerable biological interest.

A structure for nucleic acid has already been proposed by Pauling and Corey[1]. They kindly made their manuscript available to us in advance of publication. Their model consists of three intertwined chains, with the phosphates near the fibre axis, and the bases on the outside. In our opinion, this structure is unsatisfactory for two reasons: (1) We believe that the material which gives the X-ray diagrams is the salt, not the free acid. Without the acidic hydrogen atoms it is not clear what forces would hold the structure together, especially as the negatively charged phosphates near the axis will repel each other. (2) Some of the van der Waals distances appear to be too small.

Another three-chain structure has also been suggested by Fraser (in the press). In his model the phosphates are on the outside and the bases on the inside, linked together by hydrogen bonds. This structure as described is rather ill-defined, and for this reason we shall not comment on it.

This figure is purely diagrammatic. The two ribbons symbolize the two phosphate–sugar chains, and the horizontal rods the pairs of bases holding the chains together. The vertical line marks the fibre axis

We wish to put forward a radically different structure for the salt of deoxyribose nucleic acid. This structure has two helical chains each coiled round the same axis (see diagram). We have made the usual chemical assumptions, namely, that each chain consists of phosphate diester groups joining β-D-deoxyribofuranose residues with 3′,5′ linkages. The two chains (but not their bases) are related by a dyad perpendicular to the fibre axis. Both chains follow right-handed helices, but owing to the dyad the sequences of the atoms in the two chains run in opposite directions. Each chain loosely resembles Furberg's[2] model No. 1; that is, the bases are on the inside of the helix and the phosphates on the outside. The configuration of the sugar and the atoms near it is close to Furberg's 'standard configuration', the sugar being roughly perpendicular to the attached base. There is a residue on each chain every 3·4 A. in the z-direction. We have assumed an angle of 36° between adjacent residues in the same chain, so that the structure repeats after 10 residues on each chain, that is, after 34 A. The distance of a phosphorus atom from the fibre axis is 10 A. As the phosphates are on the outside, cations have easy access to them.

The structure is an open one, and its water content is rather high. At lower water contents we would expect the bases to tilt so that the structure could become more compact.

The novel feature of the structure is the manner in which the two chains are held together by the purine and pyrimidine bases. The planes of the bases are perpendicular to the fibre axis. They are joined together in pairs, a single base from one chain being hydrogen-bonded to a single base from the other chain, so that the two lie side by side with identical z-co-ordinates. One of the pair must be a purine and the other a pyrimidine for bonding to occur. The hydrogen bonds are made as follows: purine position 1 to pyrimidine position 1; purine position 6 to pyrimidine position 6.

If it is assumed that the bases only occur in the structure in the most plausible tautomeric forms (that is, with the keto rather than the enol configurations) it is found that only specific pairs of bases can bond together. These pairs are: adenine (purine) with thymine (pyrimidine), and guanine (purine) with cytosine (pyrimidine).

In other words, if an adenine forms one member of a pair, on either chain, then on these assumptions the other member must be thymine; similarly for guanine and cytosine. The sequence of bases on a single chain does not appear to be restricted in any way. However, if only specific pairs of bases can be formed, it follows that if the sequence of bases on one chain is given, then the sequence on the other chain is automatically determined.

It has been found experimentally[3,4] that the ratio of the amounts of adenine to thymine, and the ratio of guanine to cytosine, are always very close to unity for deoxyribose nucleic acid.

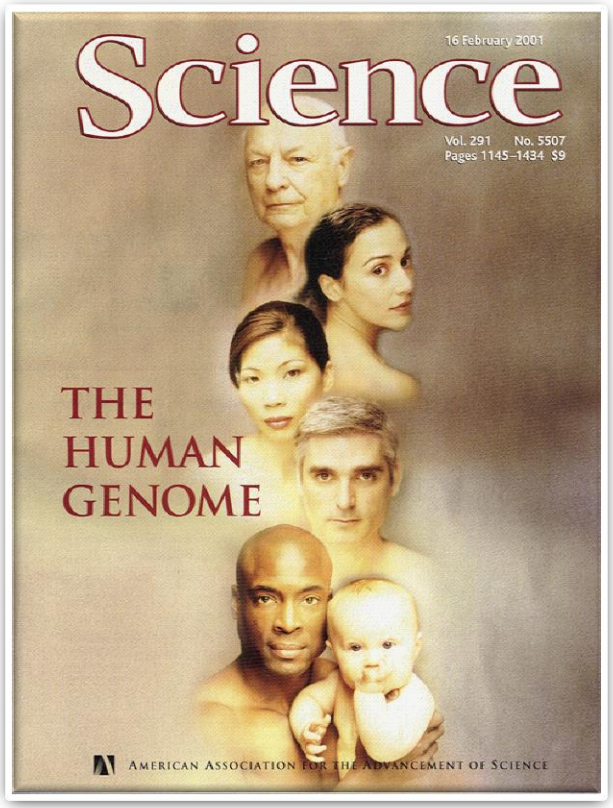
It is probably impossible to build this structure with a ribose sugar in place of the deoxyribose, as the extra oxygen atom would make too close a van der Waals contact.

The previously published X-ray data[5,6] on deoxyribose nucleic acid are insufficient for a rigorous test of our structure. So far as we can tell, it is roughly compatible with the experimental data, but it must be regarded as unproved until it has been checked against more exact results. Some of these are given in the following communications. We were not aware of the details of the results presented there when we devised our structure, which rests mainly though not entirely on published experimental data and stereochemical arguments.

It has not escaped our notice that the specific pairing we have postulated immediately suggests a possible copying mechanism for the genetic material.

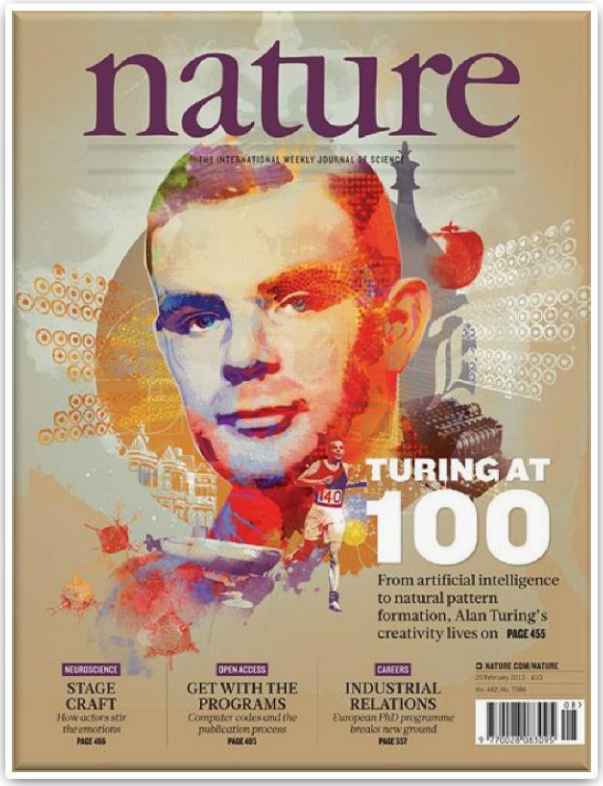
Full details of the structure, including the conditions assumed in building it, together with a set of co-ordinates for the atoms, will be published elsewhere.

We are much indebted to Dr. Jerry Donohue for constant advice and criticism, especially on interatomic distances. We have also been stimulated by a knowledge of the general nature of the unpublished experimental results and ideas of Dr. M. H. F. Wilkins, Dr. R. E. Franklin and their co-workers at

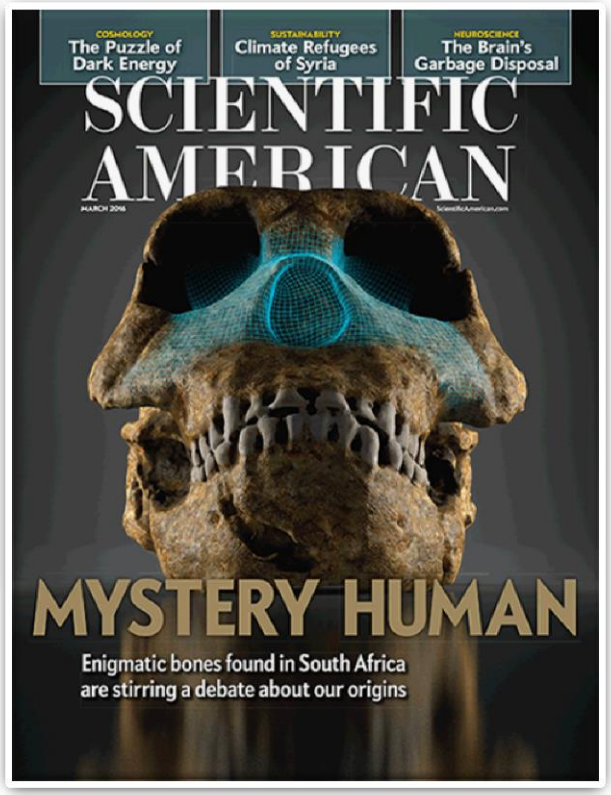

Science
16 February 2001
Vol. 291 No. 5507
Pages 1145–1434 $9
THE HUMAN GENOME
American Association for the Advancement of Science

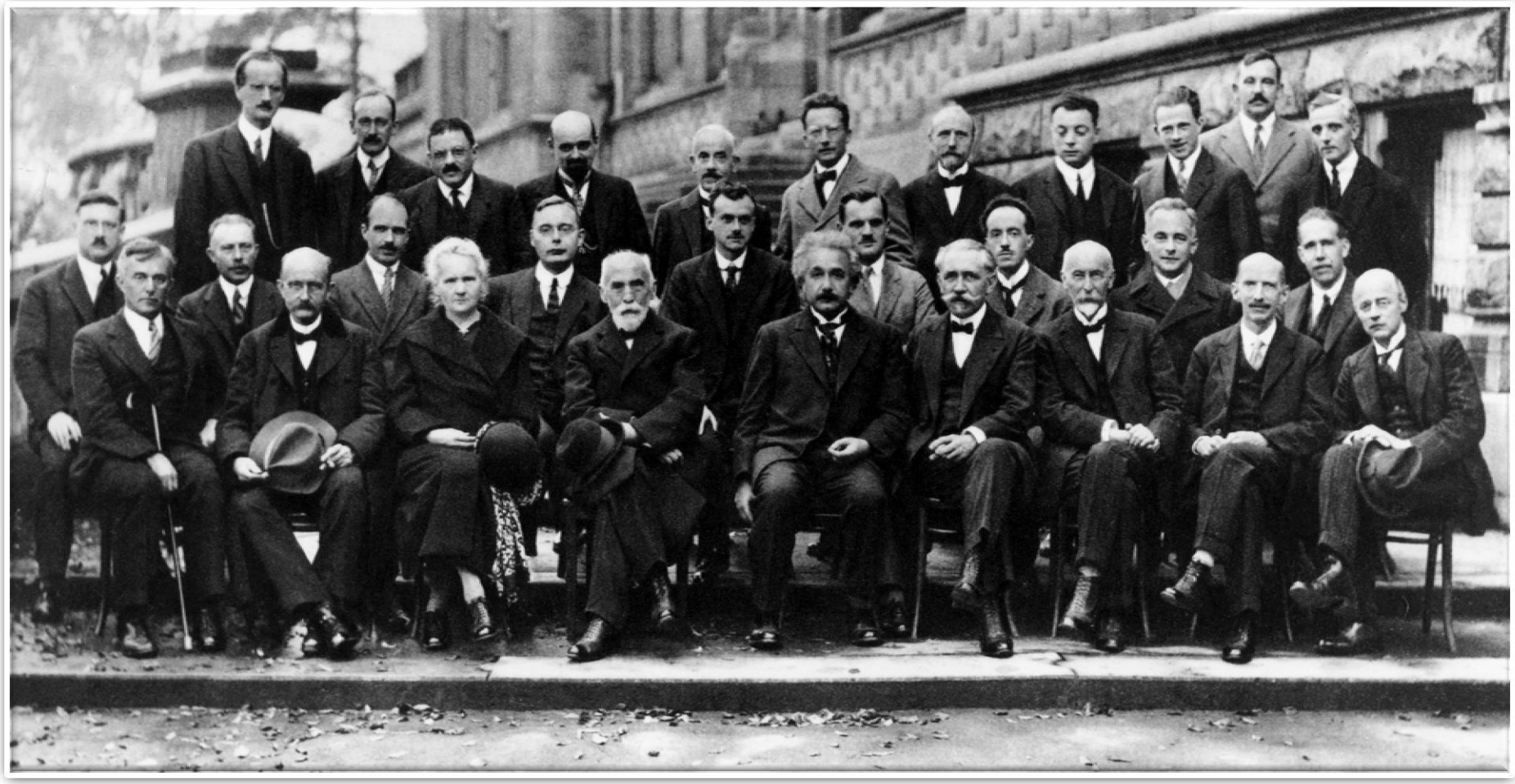

Science
BREAKTHROUGH of the YEAR
The HIGGS BOSON
AAAS


Brain institute bets big on open science p. 329
Regulating genome editing p. 337
Consoling prairie voles p. 373
Science
$15
22 JANUARY 2016
sciencemag.org
AAAS
Molecular weaving
A route to flexible framework materials
pp. 336 & 365


nature
THE INTERNATIONAL WEEKLY JOURNAL OF SCIENCE
TURING AT 100
From artificial intelligence to natural pattern formation, Alan Turing's creativity lives on PAGE 455
NEUROSCIENCE
STAGE CRAFT
How actors stir the emotions
PAGE 466
OPEN ACCESS
GET WITH THE PROGRAMS
Computer codes and the publication process
PAGE 485
CAREERS
INDUSTRIAL RELATIONS
European PhD programme breaks new ground
PAGE 557
NATURE.COM/NATURE


nature
THE INTERNATIONAL WEEKLY JOURNAL OF SCIENCE
WOMEN'S WORK
Why is science still institutionally sexist? PAGE 21
HISTORY
RENAISSANCE THINKING
Science and culture in Medici Florence
PAGE 46
GEOPHYSICS
ICE, ICE EVERYWHERE
How the oceans would fare in a Snowball Earth
PAGE 90
CAREERS
COMMUNITY SPIRIT
The rewards of teaching in US community colleges
PAGE 129
NATURE.COM/NATURE

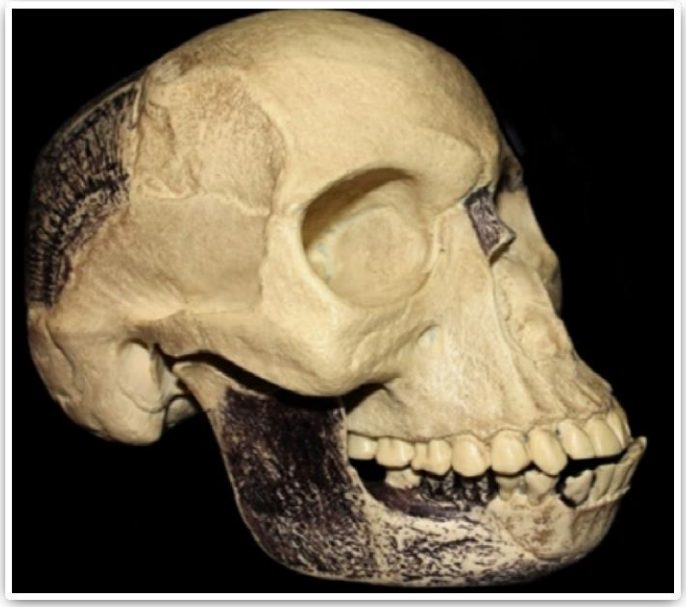

COSMOLOGY
The Puzzle of Dark Energy
SUSTAINABILITY
Climate Refugees of Syria
NEUROSCIENCE
The Brain's Garbage Disposal
SCIENTIFIC AMERICAN
MARCH 2016
MYSTERY HUMAN
Enigmatic bones found in South Africa are stirring a debate about our origins

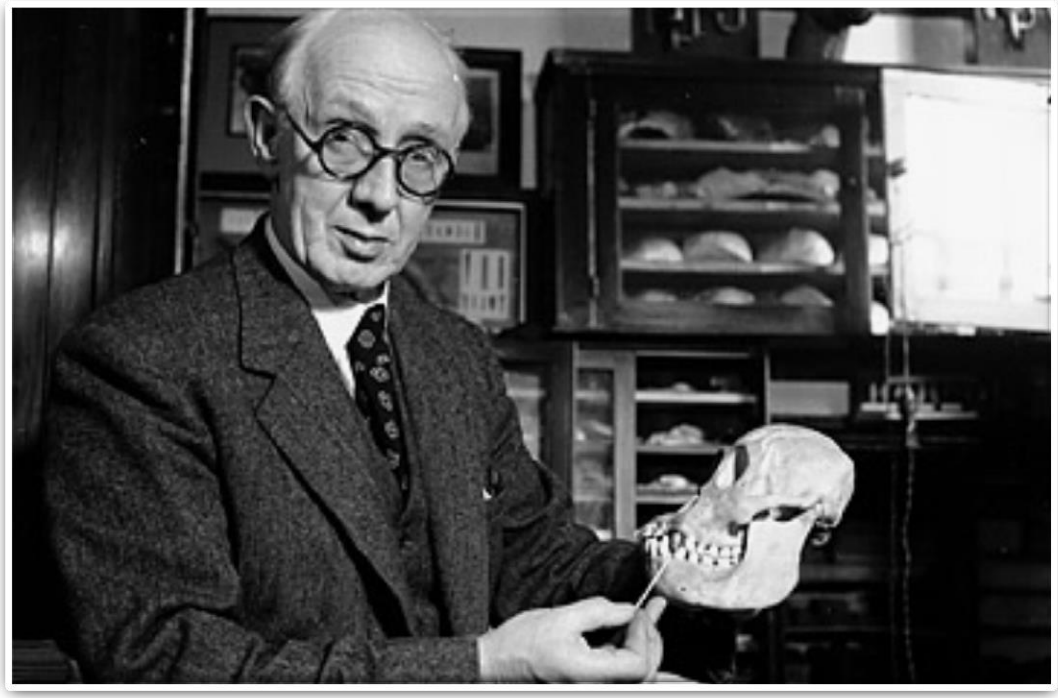


Quinta Conferencia Solvay sobre Electrones y Fotones, 1927

F1. A. Piccard, E. Henriot, P. Ehrenfest, E. Herzen, Th. de Donder, E. Schrödinger, J.E. Verschaffelt, W. Pauli, W. Heisenberg, R.H. Fowler, L. Brillouin;
F2. P. Debye, M. Knudsen, W.L. Bragg, H.A. Kramers, P.A.M. Dirac, A.H. Compton, L. de Broglie, M. Born, N. Bohr;
F3. I. Langmuir, M. Planck, M. Skłodowska-Curie, H.A. Lorentz, A. Einstein, P. Langevin, Ch.-E. Guye, C.T.R. Wilson, O.W. Richardson

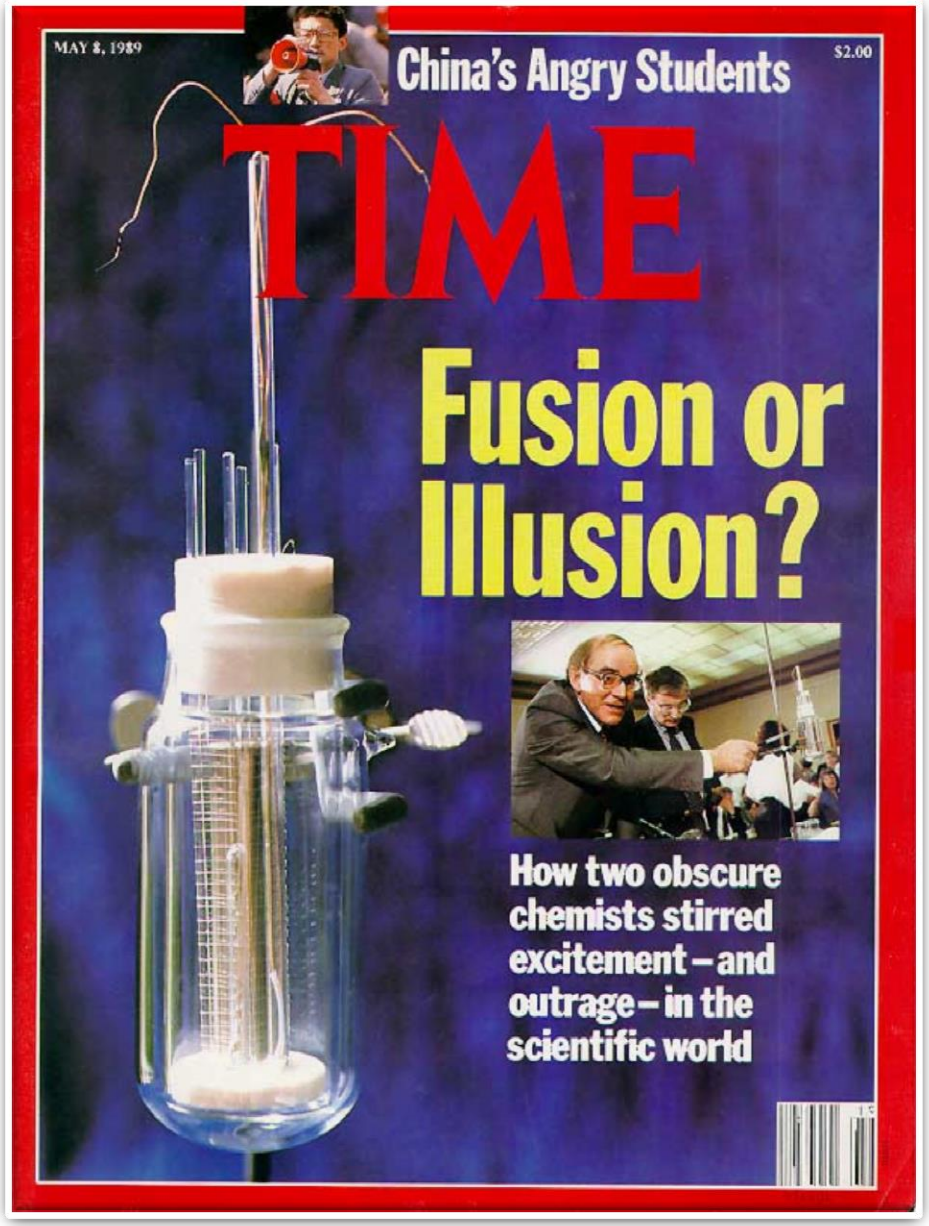
CHARLES DAWSON
CON EL FRAUDULENTO
"CRÁNEO DEL HOMBRE DE PILTDOWN"





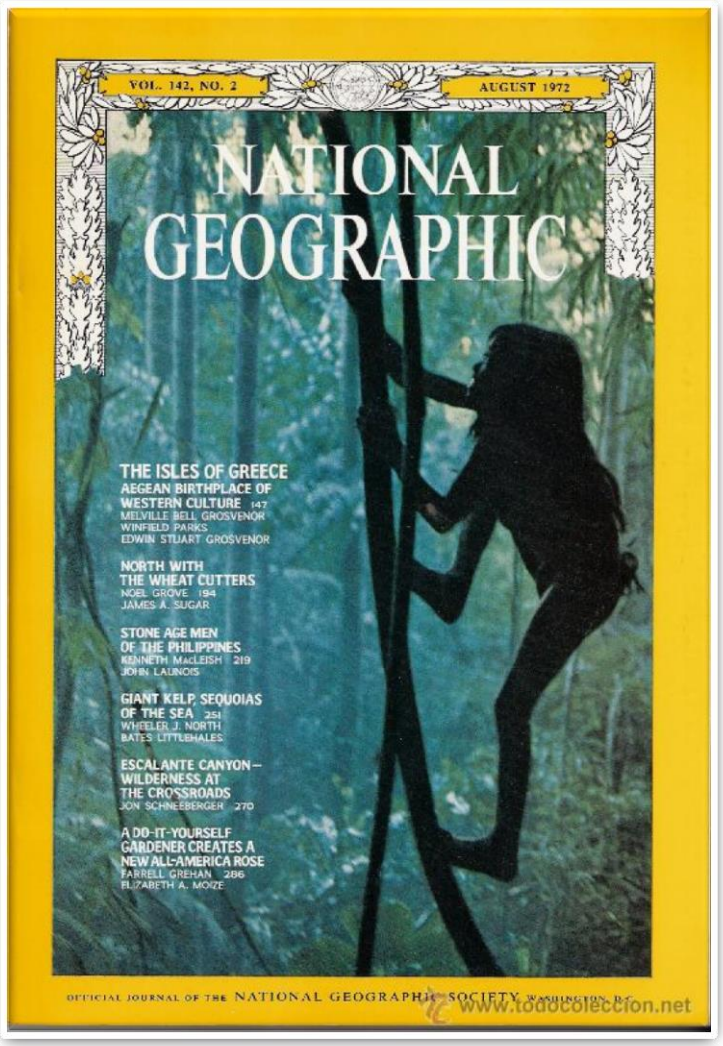
FUSIÓN FRÍA?

Martin Fleischmann, a la derecha, con su asociado, B. Stanley Pons, en 1989, anunciando que habían alcanzado la fusión nuclear. New York Times



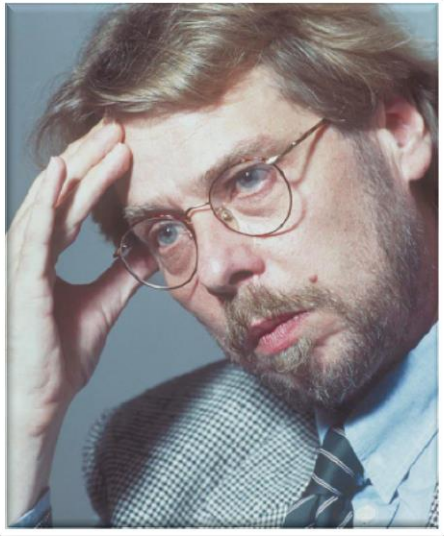
FRAUDE HISTÓRICO!
LA TRIBU TASADAY

Manuel Elizalde abrazando a Kuletaw durante una visita en julio de 1971 al borde del bosque, acompañan Bilangan, Balayam y Mahayag Fotografía: John Nance

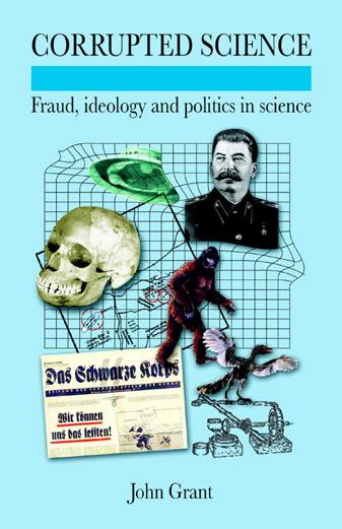


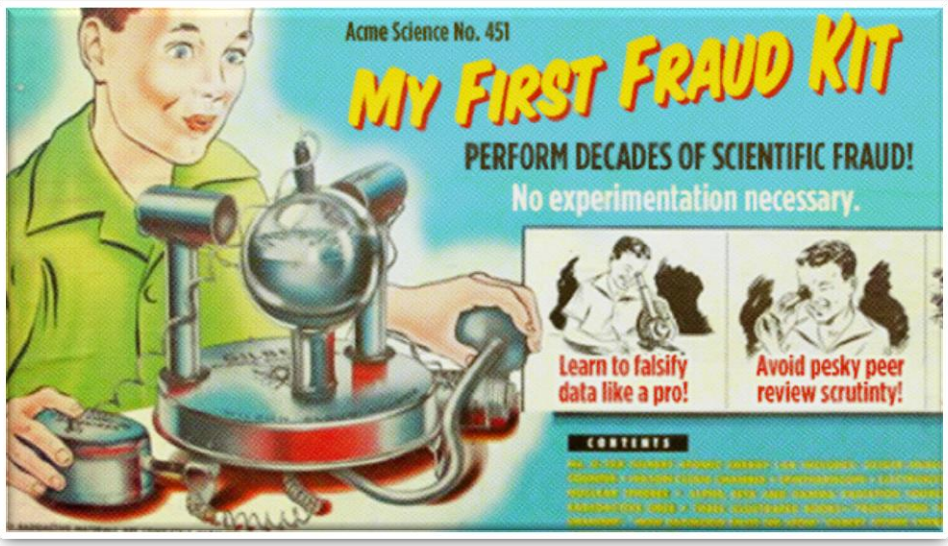
MANIPULANDO DATOS

Friedhelm Herrmann



Marion Brach





TESIS Y PLAGIO

Karl-Theodor zu Guttenberg, ministro alemán de Defensa, 2009 -2011

Annette Schavan, ministra alemana para Educación e Investigación 2005 - 2007

Enrique Peña Nieto, presidente de México, 2012-2018

PLAGIOS Y TESIS

Pedro Sánchez,
presidente del gobierno Español,
2018 - ?

Carmen Montón, ex ministra de sanidad del gobierno socialista de Pedro Sánchez

Cristina Cifuentes, ex presidenta de la Comunidad de Madrid

FRAUDE:
CLONES HUMANOS EN COREA DE SUR

Hwang Woo-suk y su perro clonado(?) Snuppy

DATOS CONCRETOS

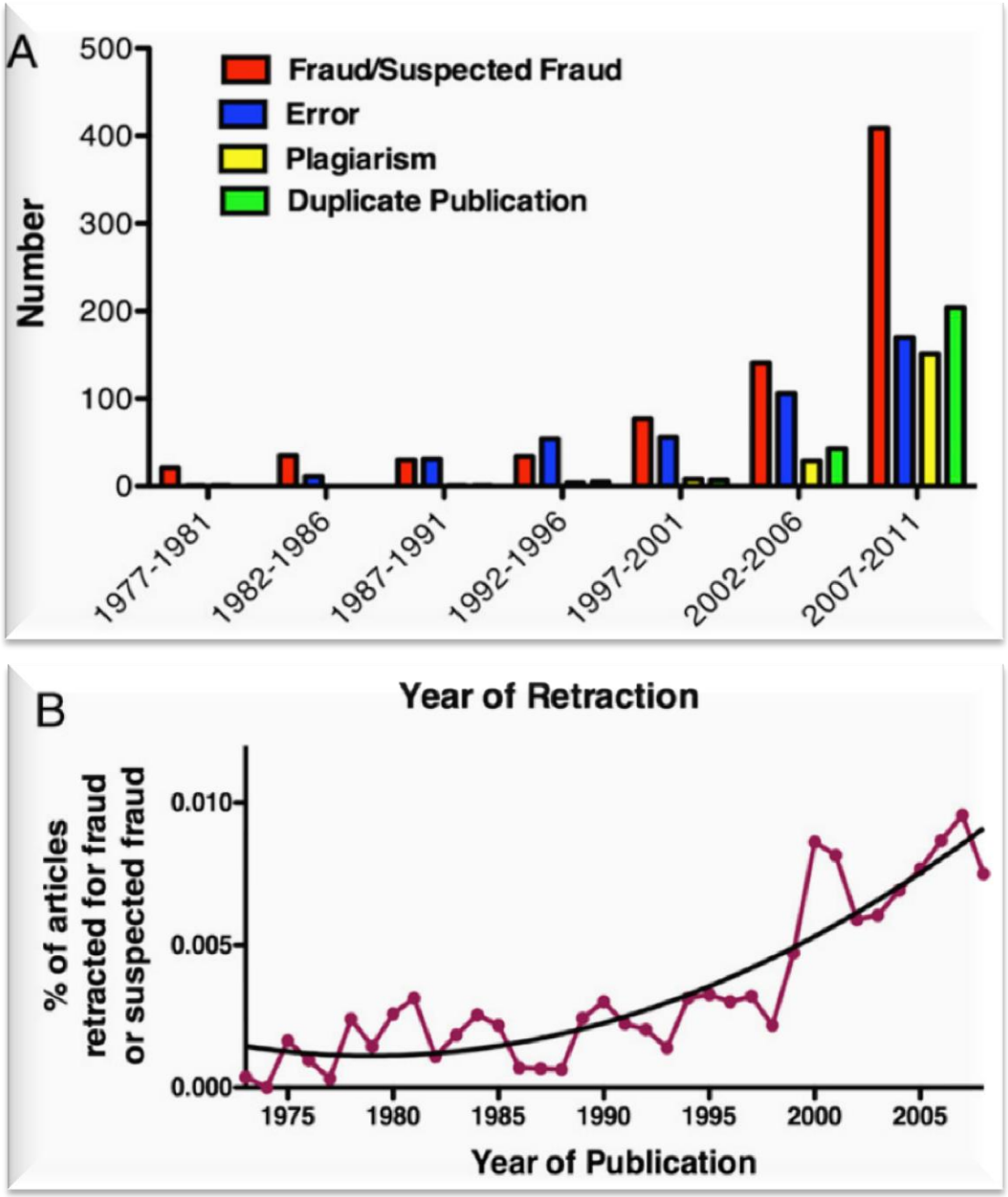


Fig. 1.

(A) Number of retracted articles for specific causes by year of retraction. (B) Percentage of published articles retracted for fraud or suspected fraud by year of publication.

Fang CF, Steen RG, Casadevall A. 2012. Misconduct accounts for the majority of retracted scientific publications. Proc Natl Acad Sci USA 109, 17028–17033.

DATOS CONCRETOS

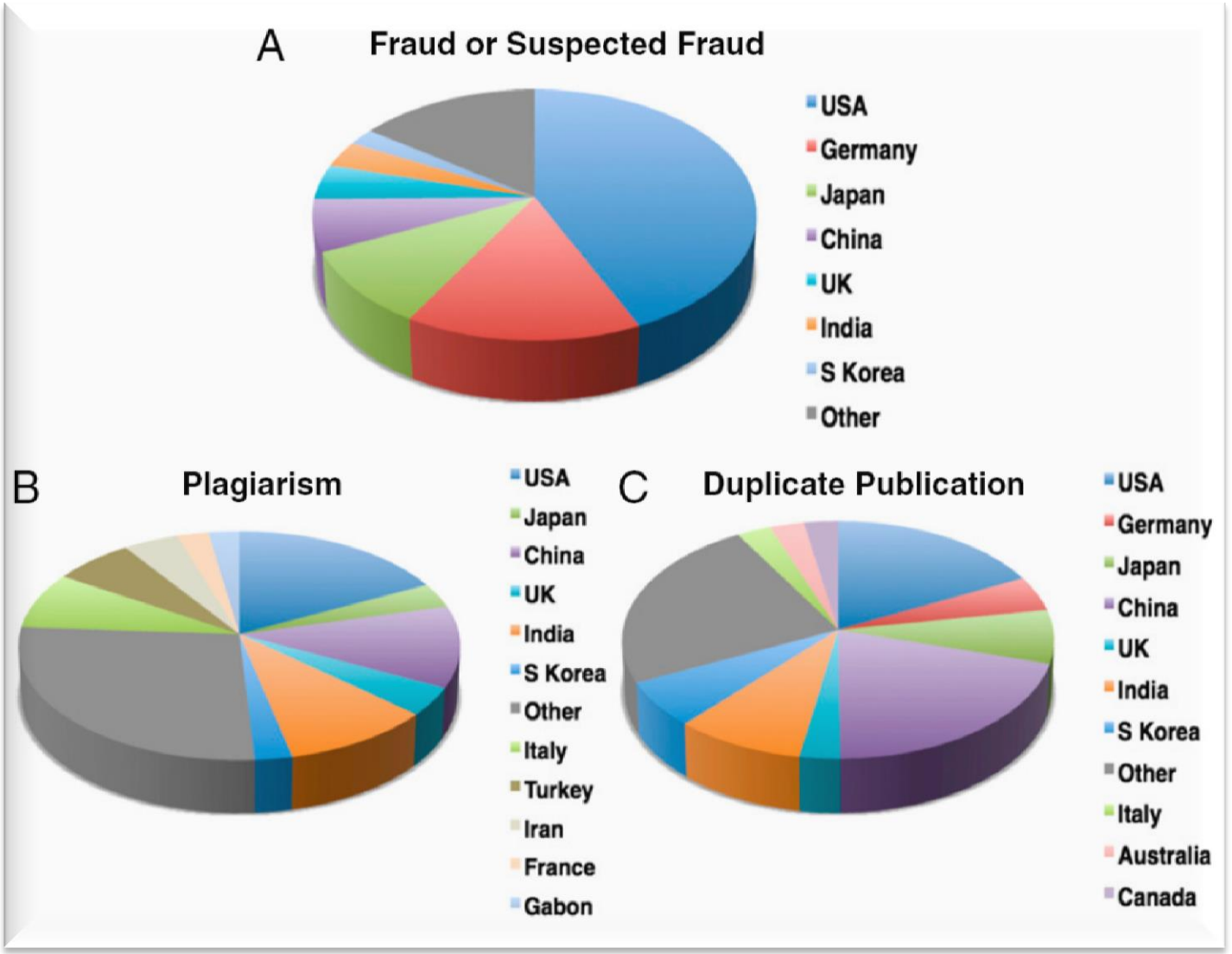


Fig. 2.
Country of origin of publications retracted for fraud or suspected fraud (A), plagiarism (B), or duplicate publication (C).

Fang CF, Steen RG, Casadevall A. 2012. Misconduct accounts for the majority of retracted scientific publications. Proc Natl Acad Sci USA 109, 17028–17033.

BIOÉTICA

¡Uno de los mayores enemigos de la ciencia en el tercer milenio es el

PLAGIO!

CÓDIGO DE ÉTICA DEL INVESTIGADOR

I. **Promoverá** y realizará investigaciones que lleven a aumentar el bienestar de la población. Hará buen uso de los fondos otorgados para realizar su investigación.

II. **Cumplirá** las normas institucionales y gubernamentales que regulan la investigación, como las que velan por la protección de los sujetos humanos, el confort y tratamiento humano de los sujetos animales y la protección del ambiente.

III. **Reportará** los hallazgos de su investigación de manera abierta, completa y oportuna a la comunidad científica y compartirá razonablemente sus resultados con otros investigadores.

IV. **Describirá** sus experimentos tal como los realizó. Mostrará su trabajo, metodología y análisis de la forma más precisa posible.

V. **Nunca usará** el trabajo de otros como que fuera el suyo propio. Citará adecuadamente las investigaciones relevantes que se hayan publicado previamente.

VI. **Tratará** los manuscritos y las solicitudes de financiamiento con confidencialidad y evitará su uso inapropiado cuando actúe como evaluador.

VII. **Revelará** los conflictos de intereses que puedan presentarse en sus distintos roles como autor, evaluador y tutor.

/III. **Dará** entrenamiento y experiencia a sus aprendices cuando sirva de tutor para aumentar sus habilidades y conocimiento en la práctica ética de la investigación. Reconocerá apropiadamente las contribuciones de ellos a la investigación.

IX. **Incentivará** y apoyará la publicación oportuna de resultados de sus aprendices sin imponer restricciones que no se hayan mencionado con anticipación.

X. **Creará** y mantendrá un ambiente de trabajo que propicie la diversidad cultural sin discriminación de ninguna naturaleza.


ULA
CIENCIAS
FIN .../