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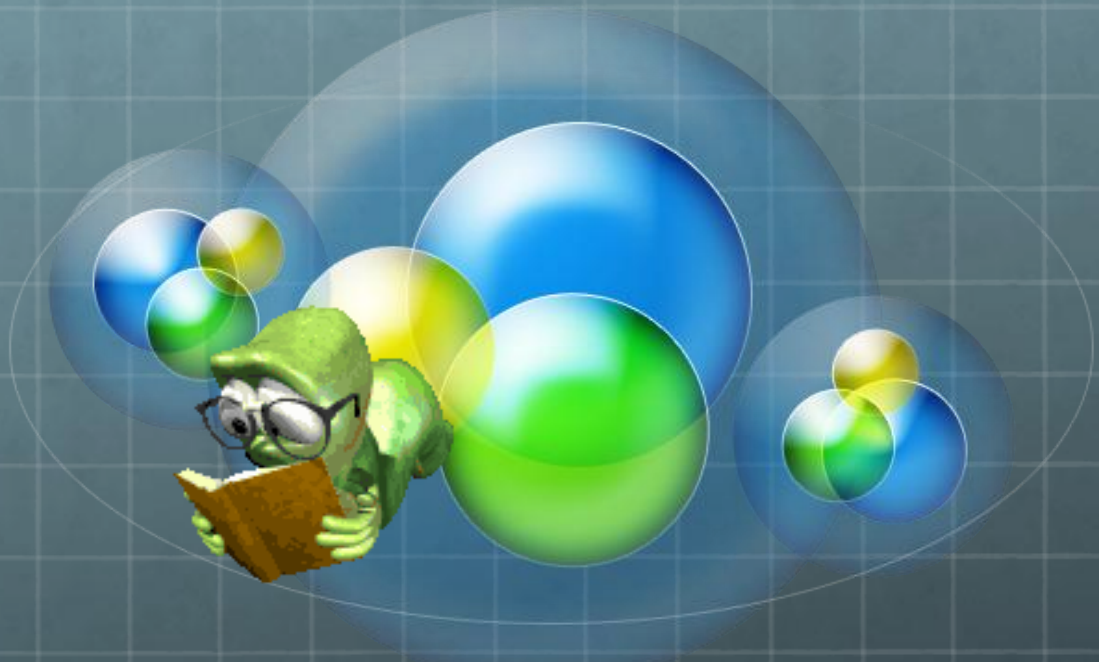
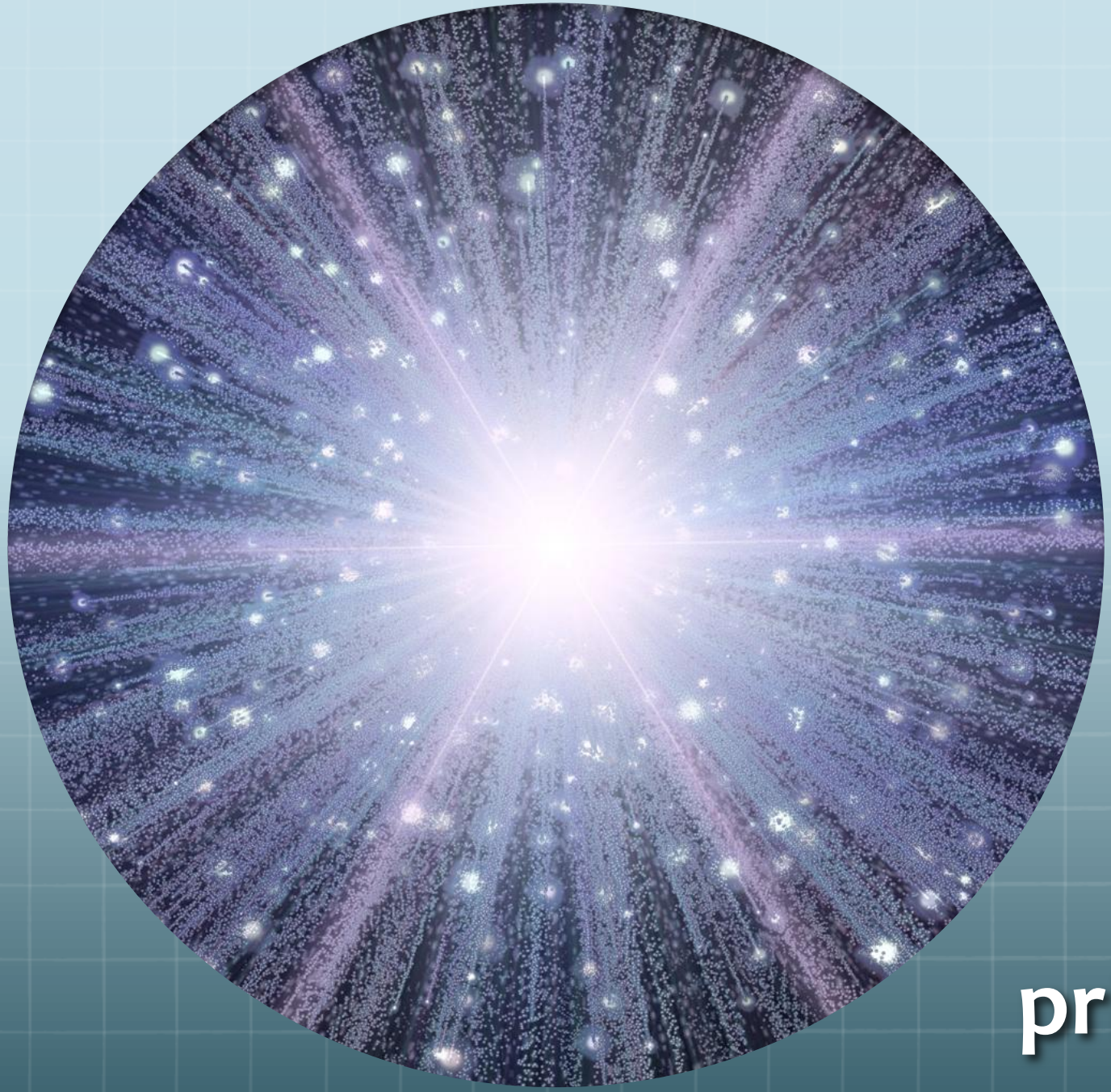


La Ciencia Ficción y yo

Una historia de colección

Claudio Olivera Fuentes
Universidad Simón Bolívar
Sartenejas, 16 de noviembre de 2012



En el principio…

ICEE 2007 (Coimbra, Portugal)

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COIMBRA • PORTUGAL
SEPTEMBER 3.7.2007

ICEE 2007
COIMBRA

THE MOVING
FRONTIERS
OF ENGINEERING

Science Fiction in Engineering Instruction: The Final Frontier?

A.E Segall
Engineering Science and Mechanics
The Pennsylvania State University
aesegall@psu.edu

Abstract – **Unfortunately, Science Fiction has not been integrated with engineering education to any appreciable extent. This is regrettable since a potent combination of theory and imagery has been shown to help students to "get it", especially in the early core courses. A fun connection between concept and application may also help avoid a "disconnect" between the ideals of engineering and the early curriculum of math, physics and chemistry. In fact, a recent poll found that most do not associate the technological gains of the last century with engineers. Hence, the absence of Science Fiction in the engineering classroom represents a significant loss of valuable resources and opportunities for enhancing engineering education, as well as attracting new students to the profession. As such, a new class has been developed that uses science and engineering (films and literature) to teach the fundamentals of engineering. Central to the course delivery is "poking fun" at the disobedience of the laws of physics and engineering and teaching the correct behaviors through example. In this fashion, students develop lasting mental pictures of the ...ings function and the complexities of design. The ...also discusses the interactions and implications of ...logy and society, as well as the ethical ...erations of engineering.**

...Terms – Dynamics, Engineering, Science Fiction,

INTRODUCTION

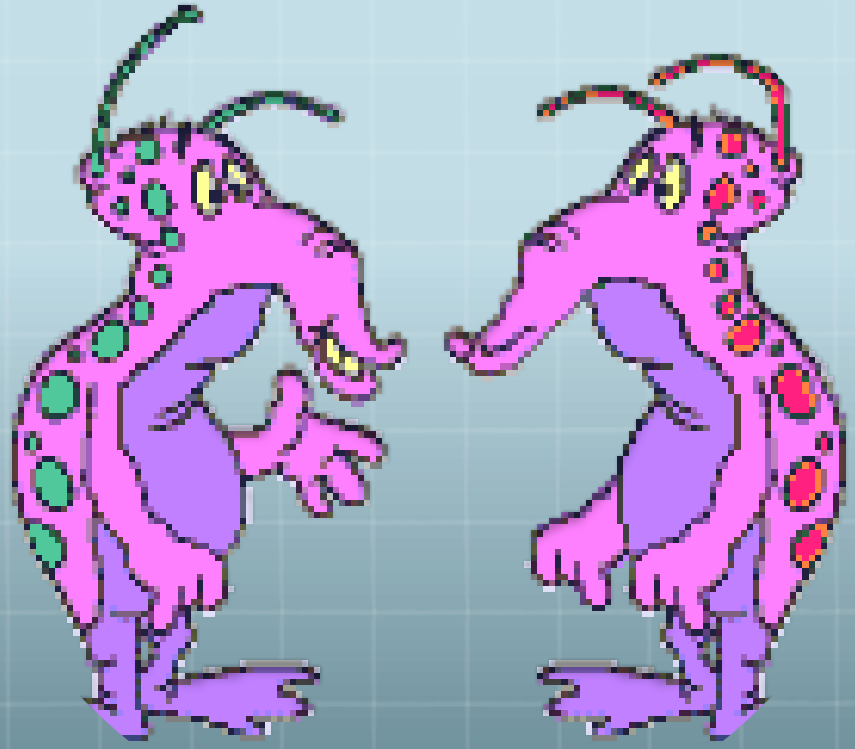
...ough it has not been used by engineering instructors, ...lication of science fiction in education is not a new ... In fact, science and physics education has long ...ized "Sci Fi's" intrinsic value for teaching basic ...ies [1]-[3] at the undergraduate level. Since physics is ...y the foundation for engineering, the obvious ...n becomes: why not use science fiction to enhance ...strate engineering as well? The answer is that "sci fi" ...d should be used to convey a wide range of concepts ...sic mechanics all the way up to advanced design and ... In fact, the importance of such usage cannot be ...ed for a number of reasons. Firstly, "Sci Fi's" ...a of lasting mental images to the underlying theory ...lp students through the seemingly abstract core ..., math, and mechanics classes. Clearly, a potent ...ation of theory and visual imagery could easily ... a critical nudge to help students to "get it [4]."

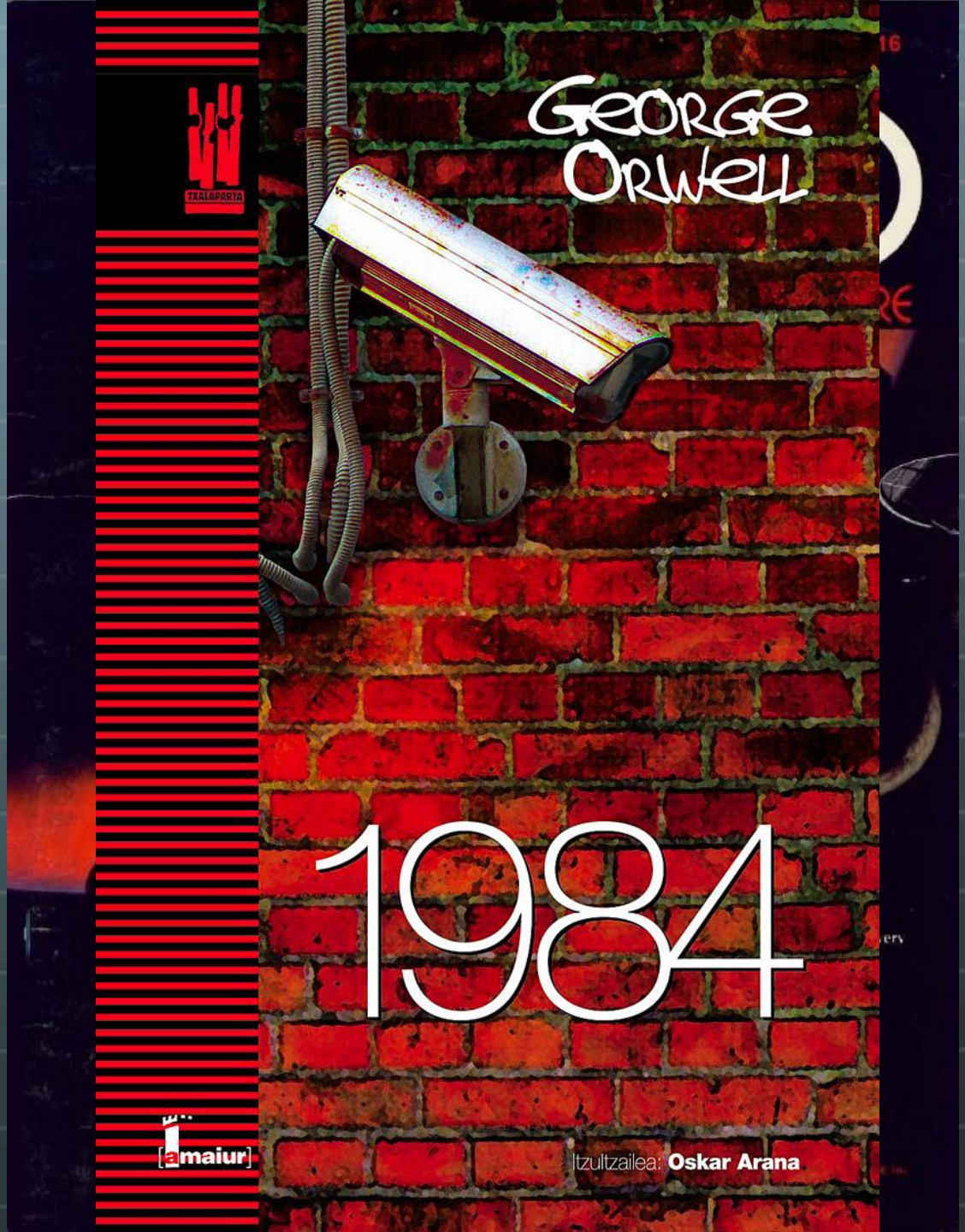
Another advantage is that a visual and fun connection between concept and application may also help avoid a "disconnect" between original (and arguably, often erroneous) idea of engineering and the freshman and sophomore curriculum that plunges into math, physics and chemistry without a clear linkage to anything related to engineering and more importantly, design.

However, it should be noted that limiting the use of science fiction to just teaching basic mechanics may be an underutilization of the medium since other equally important opportunities also exist. For instance, a recent Harris Poll [5] revealed that *"People do not think of engineers as researchers, inventors, and discoverers—they attribute these functions to scientists."* Unfortunately, this misperception is widespread as epitomized by the typical class answer of *scientist* to the age-old question: what is the professor on the campy 1960's television show, Gilligan's Island? While the professor is certainly knowledgeable in scientific theory, he is clearly able to translate this knowledge into practical solutions – the very definition of engineering! Since there appears to be many misperceptions about engineering that may reduce the number of prospective students, why not use science fiction to illustrate the many contributions of engineering and hopefully create a more positive image of the profession? Moreover, why not use the class to help recruit students to the profession by showing the many exiting aspects of the profession not usually seen in TV and movies. Finally, why not use the same techniques to teach others about the engineering concepts they unknowingly encounter every day? Regardless of the audience, the class and subject matter can and should be made fun and interesting.

Another underutilized aspect of science fiction in engineering education revolves around technology and societal issues [6]-[7] and the underlying ethical considerations that go with them. Given our limited resources and the interrelated global problems of food, water, energy, and pollution, these issues should be included in engineering education. In this regard, science fiction is a "natural" since it can easily (but not always accurately) depict a wide range of "what ifs" as already demonstrated [8]. Hopefully, the next generation of engineers will at least be able to contemplate and understand the ethical and societal implications of their actions. Given the many possibilities for topics to be taught and science fiction stories to use, virtually any combination is possible. In this paper,

¿Y eso se vale?




TXALAPARTA
GEORGE ORWELL
1984
[amaiur]
Itzultzailea: Oskar Arana

Noveli(s)tas “de a duro”

NOMBRE	SEUDÓNIMO
Jacobo Sánchez Artigao	A. S. Jacob
Ángel Torres Quesada	Alex Towers
Eduardo Rueda Segura	Edward Wheel
Carlos Gallardo Muñoz	**Johnny Garland**
Juan Cots Navarro	J. Scott Barry
Luis García Lecha	**Louis G. Milk**
Miguel Nieto Sandoval	Mike Grandson
Pedro López Gambero	Peter Logam
Arturo Rojas de la Cámara	Red Arthur

Colección Nebulae / Edhasa (1955-1966)

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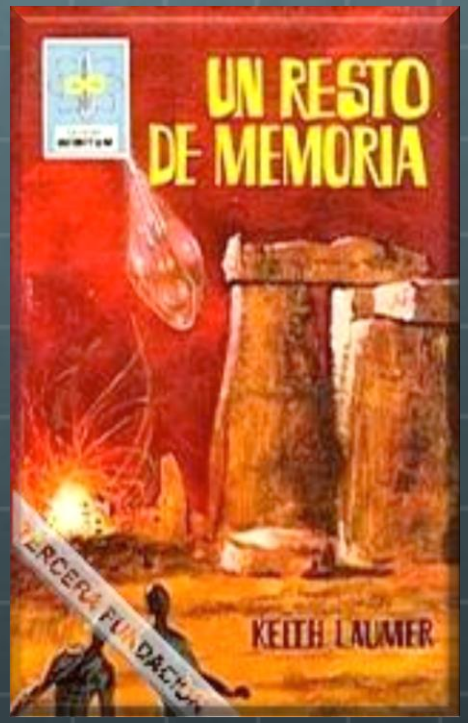
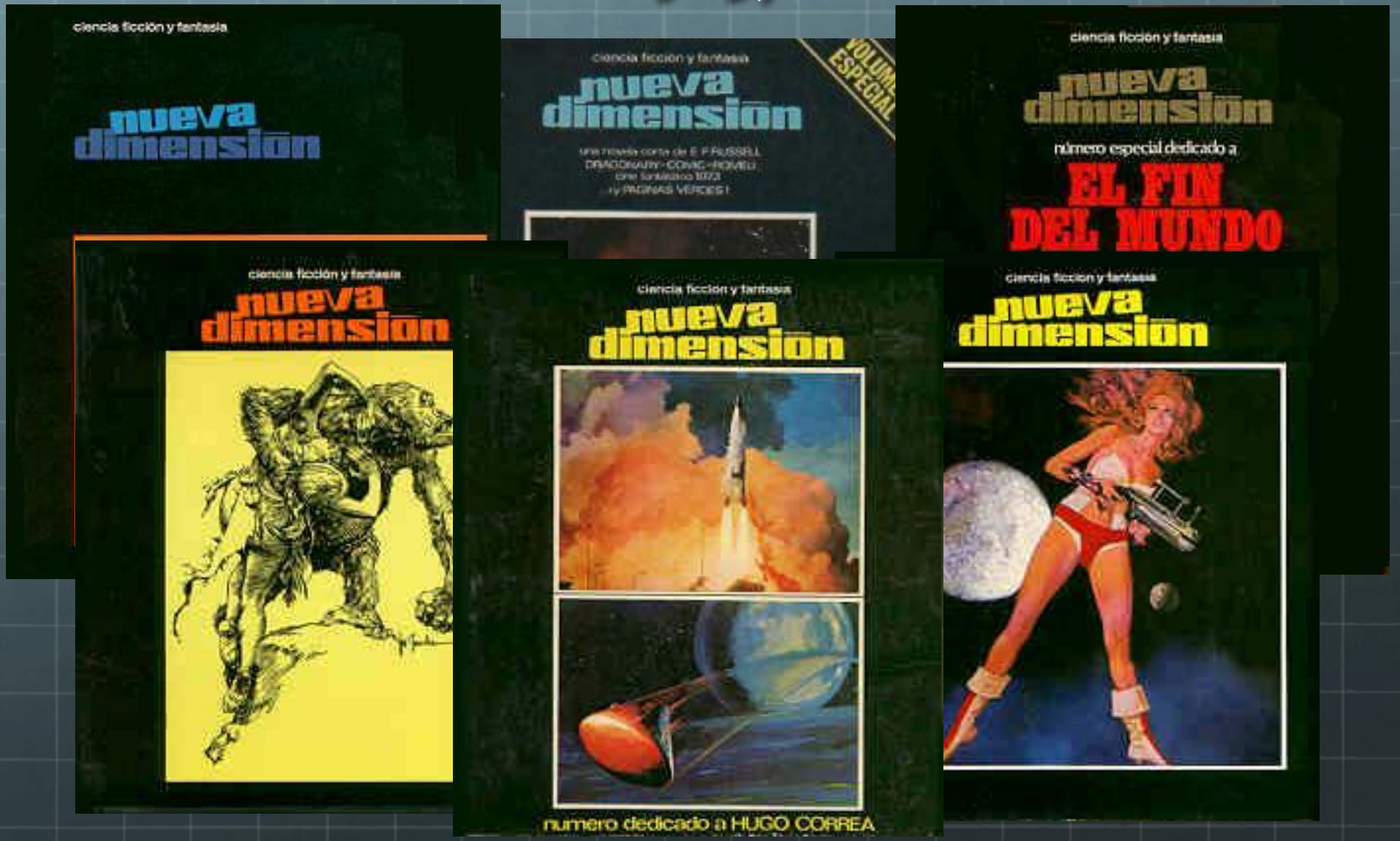


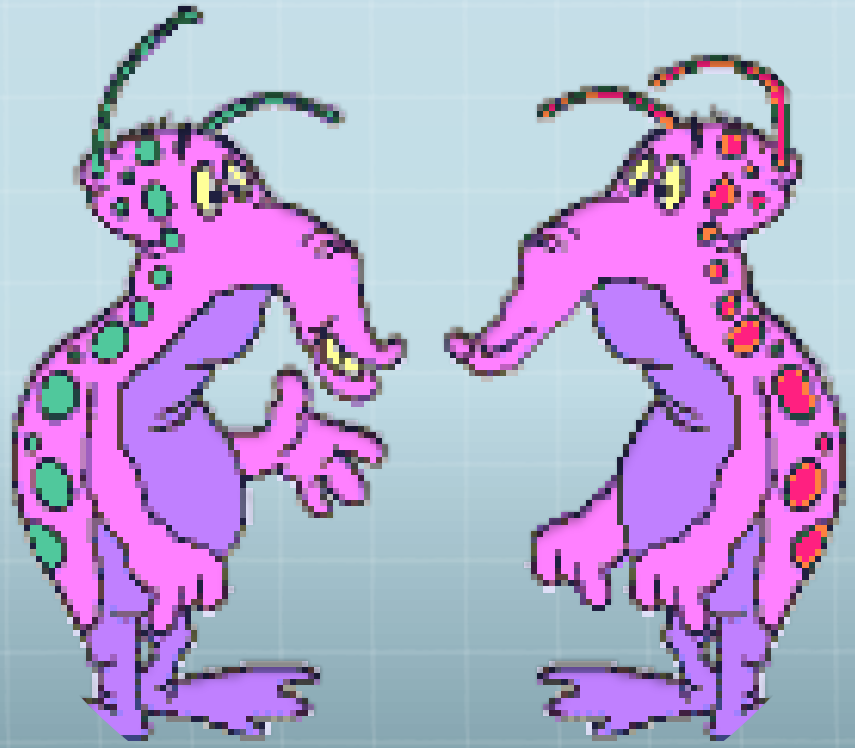
Minotauro / Planeta (1955-2001, 2001-)

Revista Nueva Dimensión / Dronte (1968-1983)



Y la galaxia…


H. Beam Piper
F. M. Busby
Frederik Pohl
Robert L. Forward
Orson Scott Card
Christopher Priest
Neil Gaiman
C. J. Cherryh
Alastair Reynolds
James Alan Gardner
Arthur C. Clarke
Bruce Sterling
Keith Roberts
David Gerrold
Hal Clement
Charles Stross
Spider Robinson
William Gibson
Michael Coney
Theodore Sturgeon
Kim Stanley Robinson
Nicola Griffith
Samuel R. Delany
Sheri S. Tepper
Joanna Russ
Joe Haldeman
Philip K. Dick
James Tiptree, Jr
Geoff Ryman
Harry Harrison
Gordon R. Dickson
Wilson Tucker
Domingo Santos
Robert A. Heinlein
Thomas M. Disch
Harry Turtkedove
Robert J. Sawyer
Frank Herbert
Philip José Farmer
Jack Vance
John Varley
James P. Hogan
S. L. Viehl
Jack Vance
Douglas Adams
Roger McBride Allen
Brian W. Aldiss
Fred Hoyle
Poul Anderson
Colin Kapp
Piers Anthony
Katharine Kerr
Catherine Asaro
J. Gregory Keyes
Isaac Asimov
C. M. Kornbluth
Kage Baker
Nancy Kress
J. G. Ballard
Keith Laumer
Iain M. Banks
Ursula K. LeGuin
Stanislaw Lem
Barry Malzberg
William Shatner
Vernor Vinge
Bob Shaw
Kurt Vonnegut, Jr
Robert Sheckley
Gregory Benford
Charles Sheffield
Richard Matheson
Robert Silverberg
Julian May
Clifford D. Simak
Anne McCaffrey
Dan Simmons
Vonda N. McIntyre
Norman Spinrad
China Miéville
Olaf Stapledon
Walter M. Miller, Jr
Allen Steele
Naomi Mitchison
Neil Stephenson
Ward Moore
Richard K. Morgan
Lois McMaster Bujold
Larry Niven
Anthony Burgess
Edgar Pangborn



¿Se te ocurre algo?

ICEE 2008 (Pécs, Hungría)

INTERNATIONAL CONFERENCE ON ENGINEERING EDUCATION

"New Challenges in Engineering Education and Research in the 21 st Century"

22 April 2008, Pécs

Dear Prof. Claudio G Olivera-Fuentes,

I am pleased to inform you that about 500 Colleagues from 50 countries have registered to ICEE-2008. 410 abstracts (337 oral and 73 poster presentations) have been accepted. The Conference organisers offered 43 topics and asked the participants to determine the topic of their presentation.

The Scientific Committee took c
which contain only 2-3, while othe
The draft of the scientific program

On behalf of the Conference Boa
we cordially invite you to act a
Tuesday,
29 July 2008.
Co-Chairman duties:

- Preliminary assessment o
- Directing the work of the s
  conducting debates, etc)
- Giving a short summary a

We hope you can accept our invi

Best regards,

Slipping on dry ice: a Martian problem in phase stability, and other science fictional chemical engineering questions

S. Derjani-Bayeh* and C. G. Olivera-Fuentes*,[1]
*TADiP Group, Department of Thermodynamics and Transport Phenomena,
Simon Bolivar University, Caracas, Venezuela

Index Terms: Thermodynamics, Chemical Engineering, Science Fiction.

Prologue

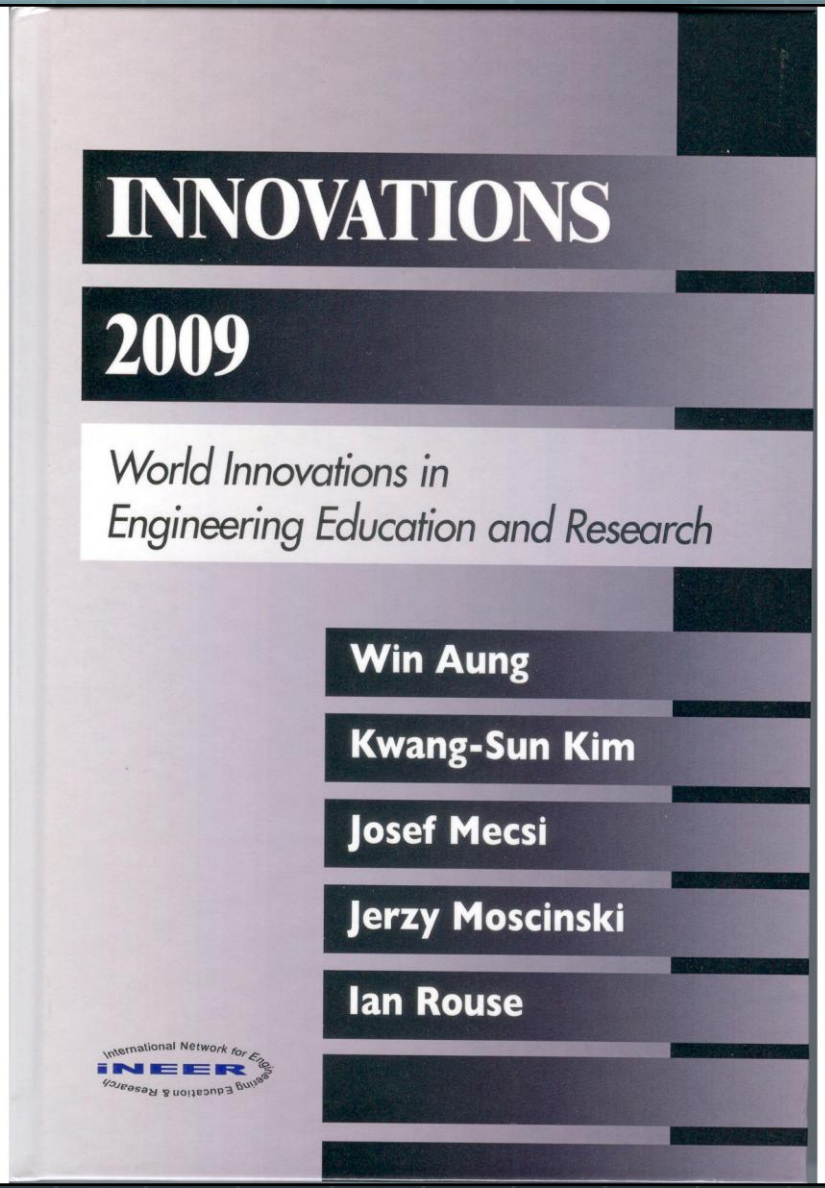
Science fiction (SF) has long been recognized as a valuable resource in teaching basic principles of science [1–4]. SF movies and TV shows in particular, with their need for visual impact through ever more spectacular
e amusing if largely unintentional examples of situations that violate the laws of
ore be used to stimulate classroom discussion and improve students' understanding
epts. Also chemistry, although much less of a protagonist [15], is featured often
the attention of the American Chemical Society in symposia [16] and a website
of SF media in engineering teaching has been discussed [18], still with a major
mechanics, but also with some valuable insights on the social and ethical

sider the use of SF-inspired settings and ideas in teaching and illustrating chemical
ocesses. We first describe three examples drawn from our experience in courses on
Phenomena, and Mass Transfer Operations at Simón Bolívar University in
Concepción in Chile. We then review a brief list of SF works that could be
earch and discussion in these and other chemical engineering subjects.

mputed the standard enthalpy, entropy and Gibbs energy of reaction for the phase
e amorphous (graphite) to the crystalline (diamond) form, and showed that
n temperature and sufficiently high pressures, where diamond becomes the more
the required pressure to be about 22,000 atm (2,230 MPa). Their analysis has
ems, some dryly factual [20, 21], others of a humorous bend, e.g. by Modell and
ea to that frequent guest in thermodynamic textbooks, the "crackpot inventor" who
wonderful process that more often than not can be shown to violate the Laws of
ein, Sandler [23] suggests that an experimental setup using the carbon reaction to
iamonds could be a way of helping students pay their tuition fees.
uperman comics knows that turning a lump of coal into a diamond is a simple task
uperhuman strength enables him to induce the phase transition just by pressing it
llowing variant of the problem appeared in one of our Thermodynamics courses at

n has the power to transform graphite into diamond by squeezing it strongly with
ransformation takes place isothermally at the superhero's body temperature (308
ure (in MPa) that Superman must apply with his superfist?
(graphite) = C (diamond), the standard Gibbs energy of reaction is $\Delta G^0_{308} = 2910$
ds at 1 bar as reference states. The density of graphite is 2260 kg/m^3*; that of*
olids are incompressible and do not form solid solutions.

E-mail: claudio@usb.ve



Chapter 16

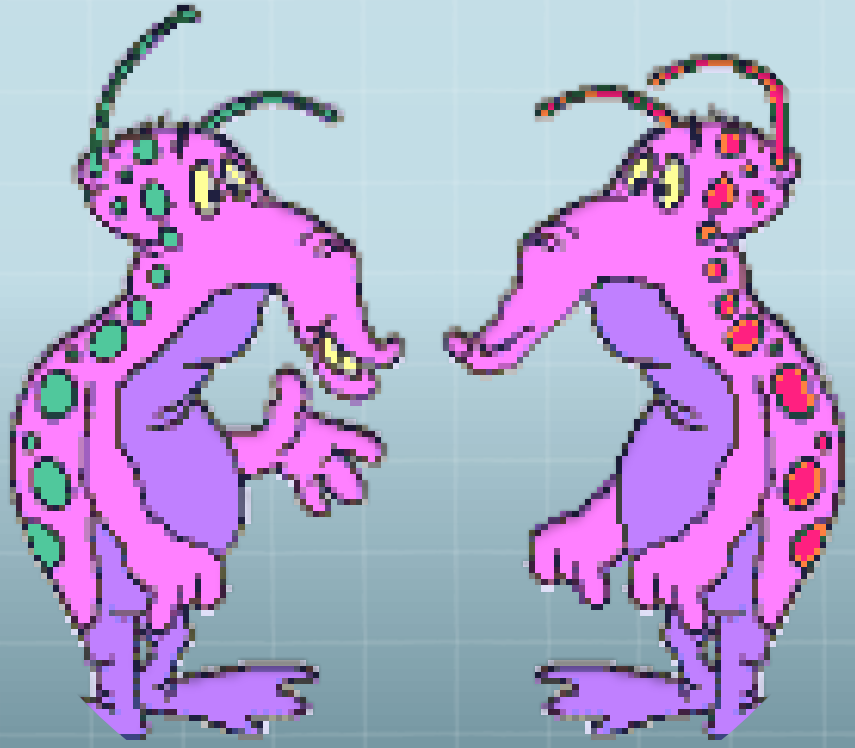
Using Science Fiction in Chemical Engineering Education

SYLVANA DERJANI-BAYEH[1] and CLAUDIO OLIVERA-FUENTES[2]
[1,2]Simón Bolívar University, TADiP Group, Department of Thermodynamics and Transport Phenomena, Caracas 1080, Venezuela. E-mail: claudio@usb.ve

In this paper, we look at how science fiction settings and ideas can be used to teach chemical engineering principles and processes. We first describe three examples drawn from our experience in teaching courses on Thermodynamics, Transport Phenomena, and Mass Transfer Operations. We then give a brief list of science fictional works and topics that might also be used in a course to stimulate discussion and research in these and other chemical engineering subjects.

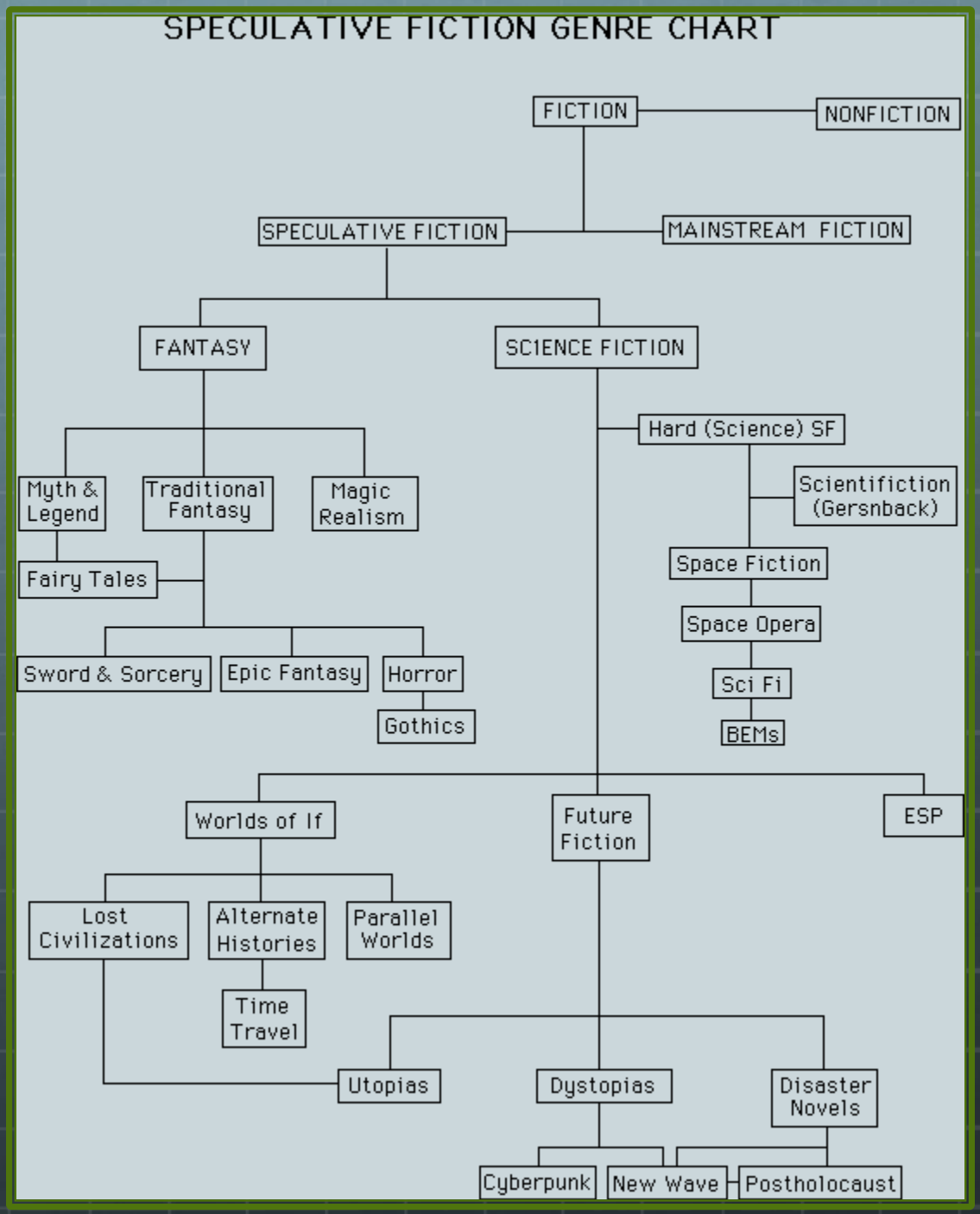
PROLOGUE

Science fiction (SF) can be hard to define. In the words of famous SF author Robert A. Heinlein, "a handy short definition of almost all science fiction might read: realistic speculation about possible future events, based solidly on adequate knowledge of the real world, past and present, and on a thorough understanding of the nature and significance of the scientific method" [1]. The respected SF critic and editor Groff Conklin added one important element when he stated that SF "consists of stories in which one or more definitely scientific notion or theory or actual discovery is carried beyond the realm of the immediately possible in an effort to see how much fun the author and reader can have exploring the imaginary outer reaches of a given idea's potentialities" [2]. Thus, good SF in book, television, film or any other form should depict imaginary but rigorously argued applications of science and technology, and should do so in an entertaining and thought-provoking way. Not surprisingly, therefore, SF has long been recognized as a valuable resource in teaching basic principles of science [3–6]. SF movies and TV shows in particular, with their use of ever more spectacular special effects, usually provide amusing if unintentional examples of situations that violate the laws of physics [7-16]



¿Qué es la CF?

- Patrick Parrinder:
  - “Las definiciones de la CF, más que una serie de acercamientos lógicos a un ideal escurridizo, son en sí mismas un pequeño subgénero parásito”.
- Kim Stanley Robinson:
  - “En toda narración de CF hay una historia de ficción, implícita o explícita, que conecta al período descrito con nuestro momento actual, o con algún momento de nuestro pasado”.
- Groff Conklin:
  - “Historias en las cuales uno o más conceptos, teorías o descubrimientos científicos son […] llevados más allá del terreno de lo inmediatamente posible, en un afán de ver cuánto se pueden **divertir** el autor y los lectores explorando las posibilidades extremas de una idea determinada”.



R. Runté, *The NCF Guide to Canadian Science Fiction*, 4ª Ed. (2000)

C. Sheffield, *Borderlands of science* (1999)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up at the stars
and wondered, don't
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Ciencia


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WITH A FOREWORD BY STEPHEN HAWKING
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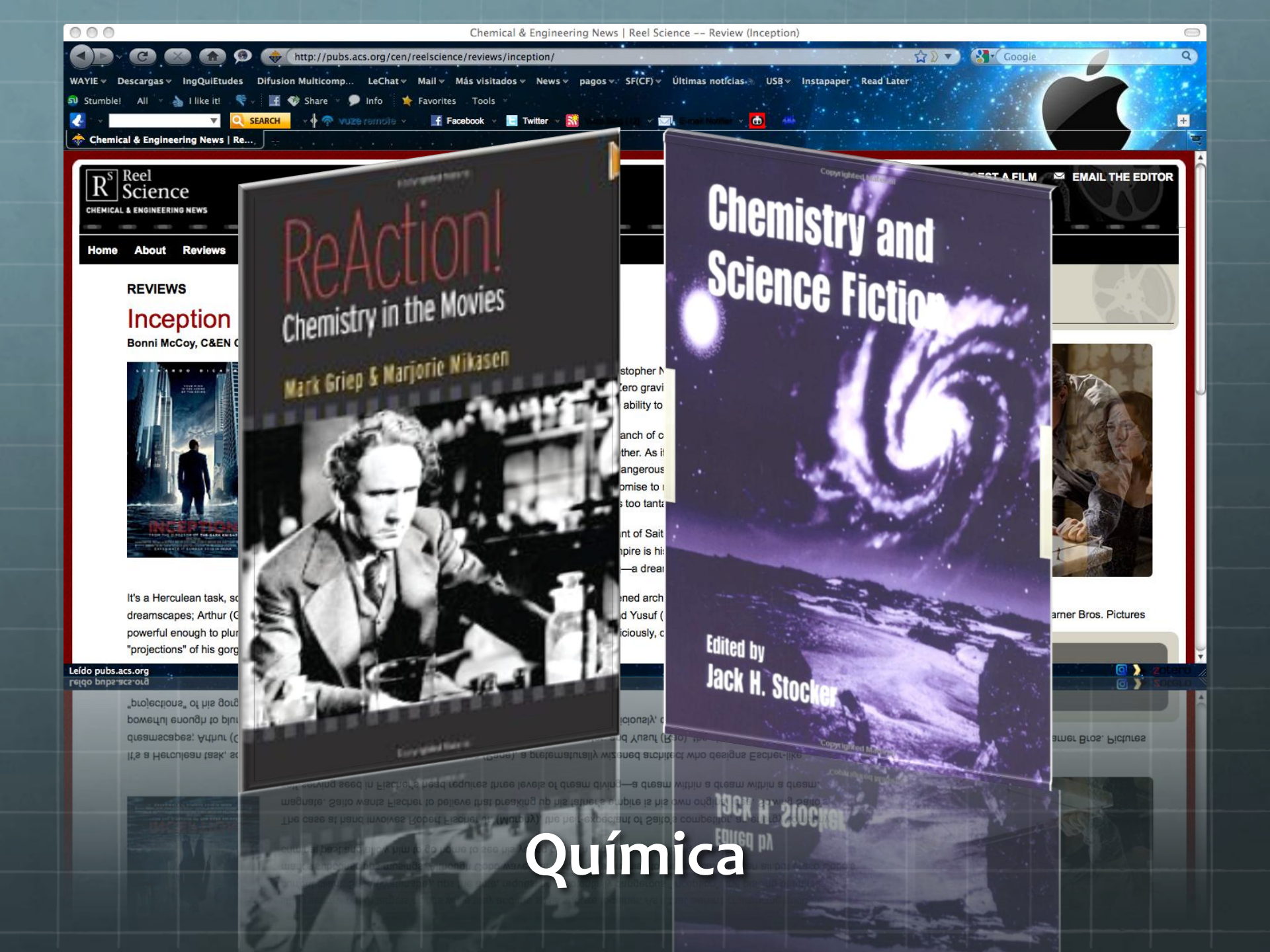
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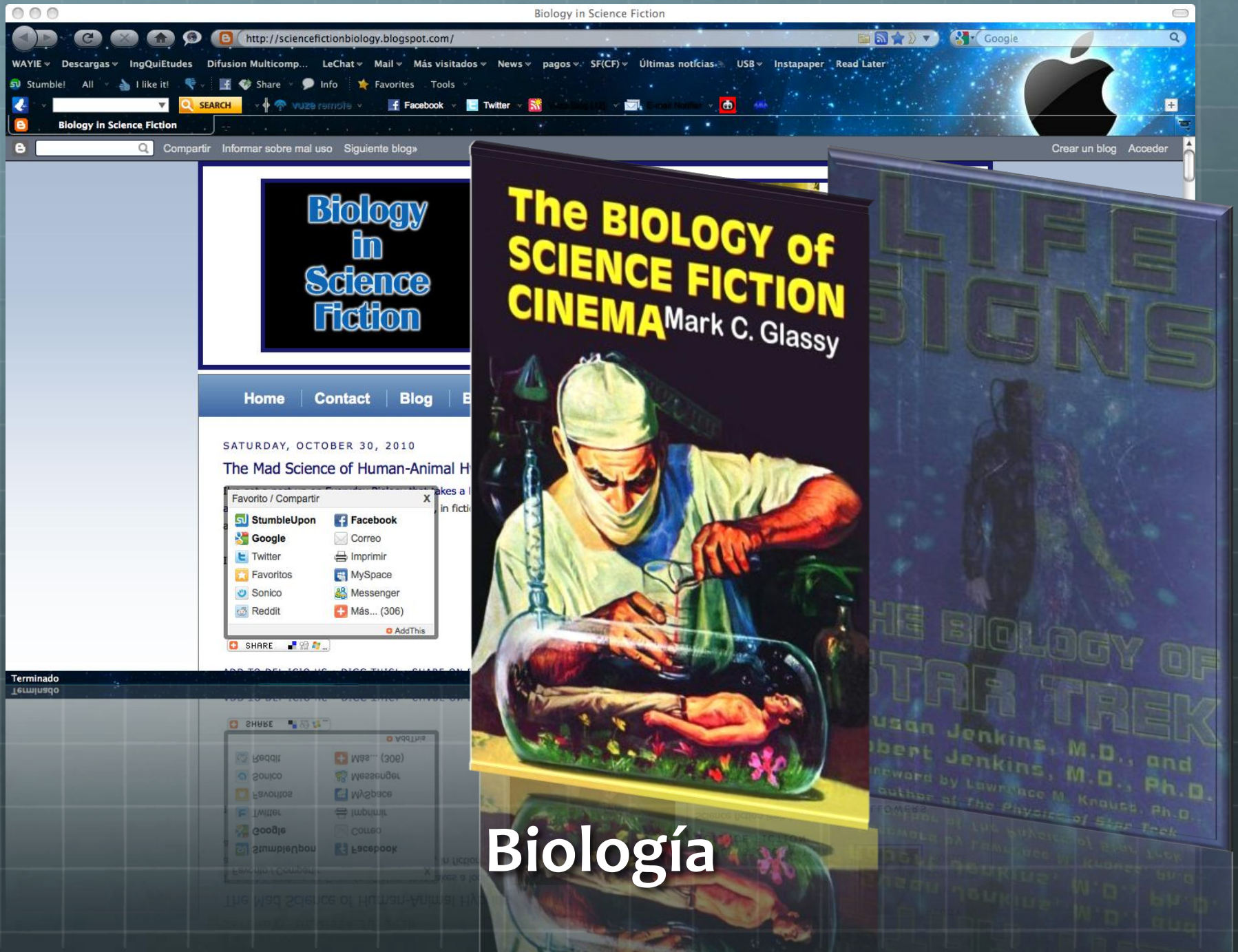
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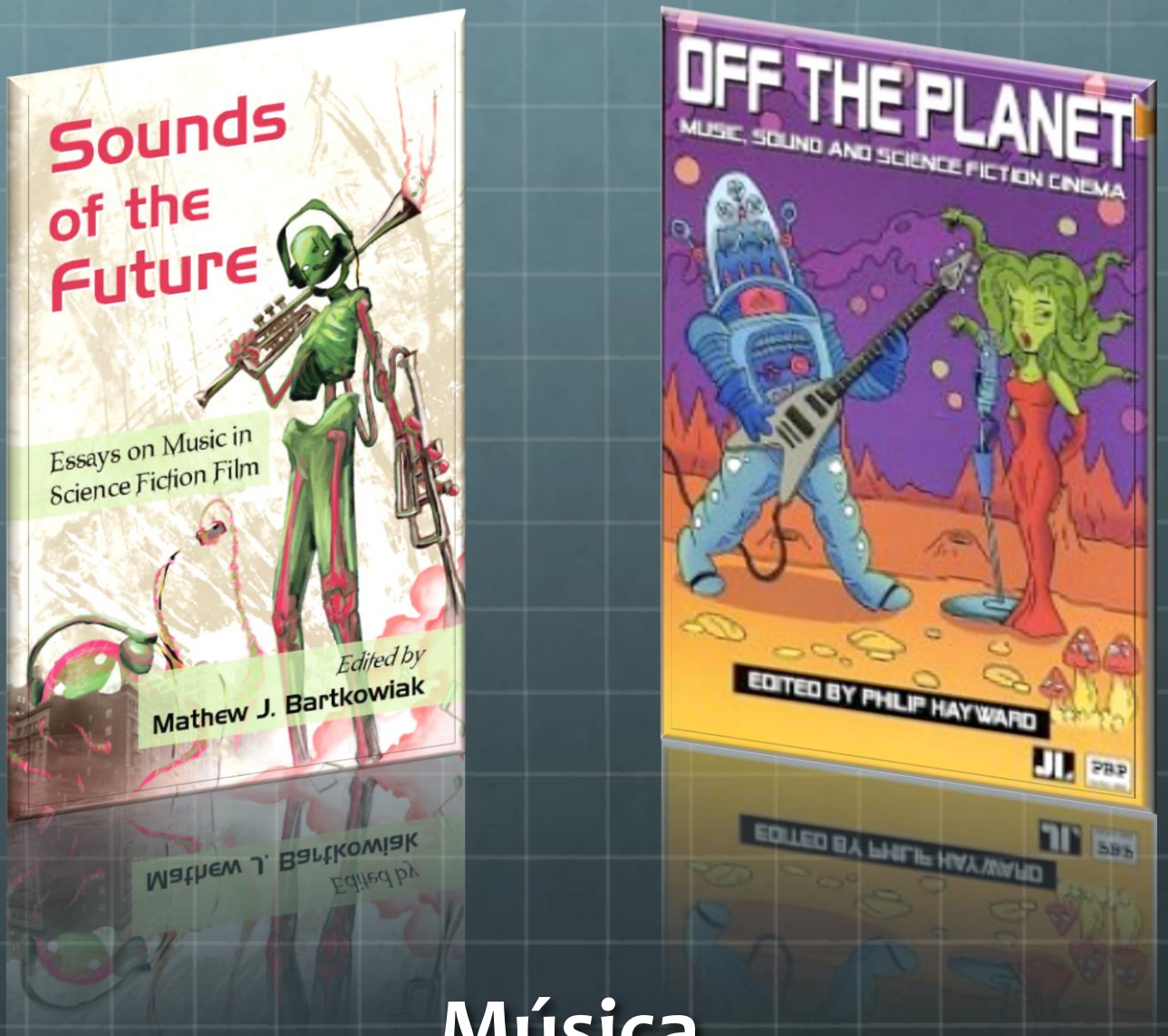
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Mathew J. Bartkowiak
OFF THE PLANET
MUSIC, SOUND AND SCIENCE FICTION CINEMA
EDITED BY PHILIP HAYWARD

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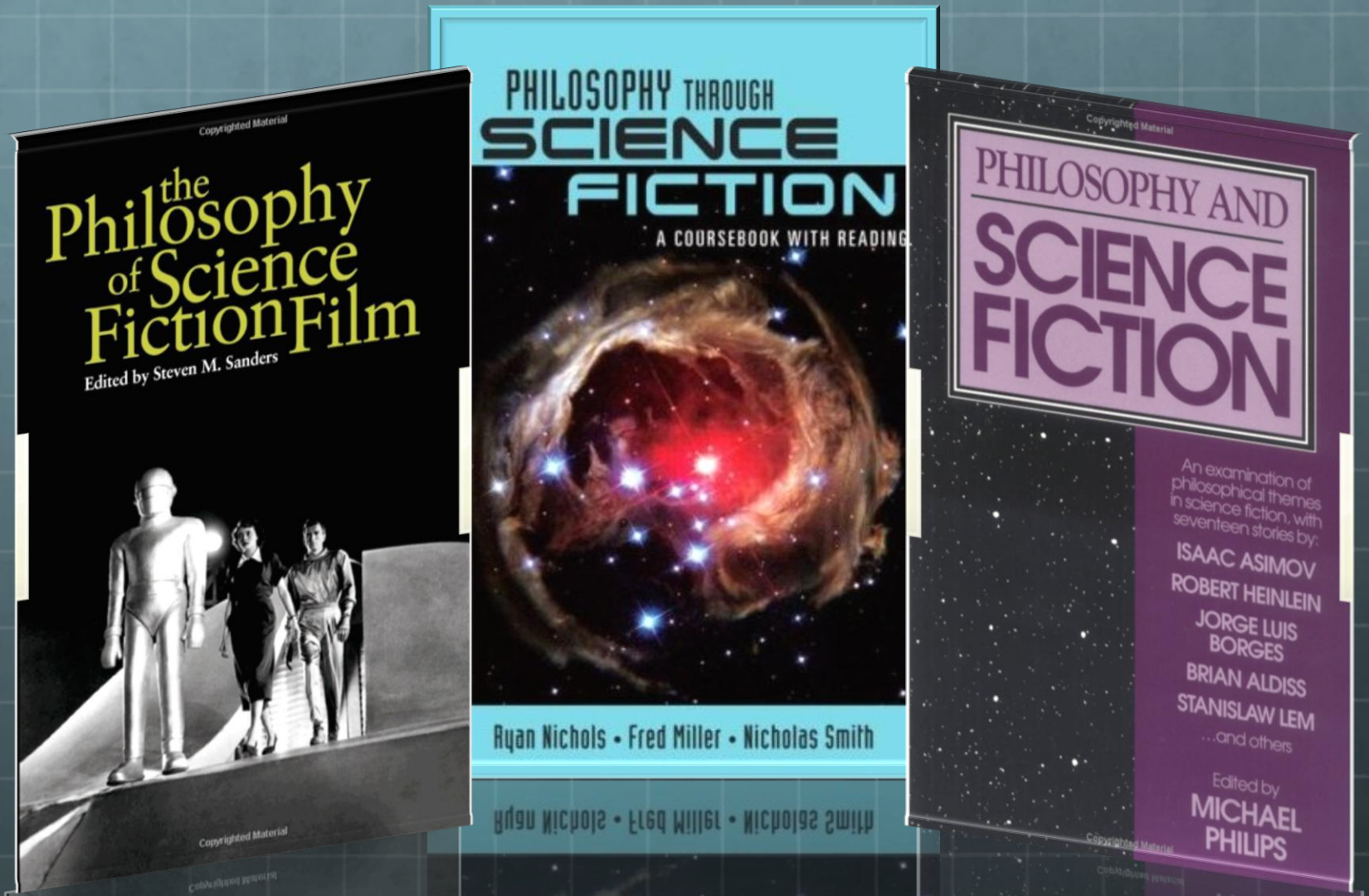
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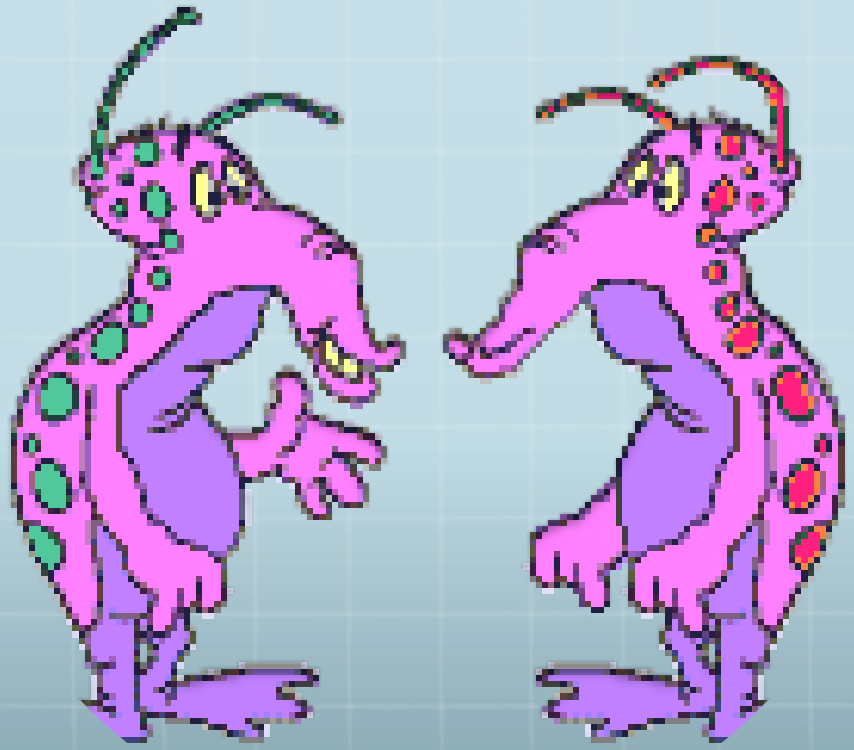
BRIAN ALDISS
STANISLAW LEM
...and others
Edited by
MICHAEL PHILIPS

Filosofía



¿Y en Ingeniería Química?

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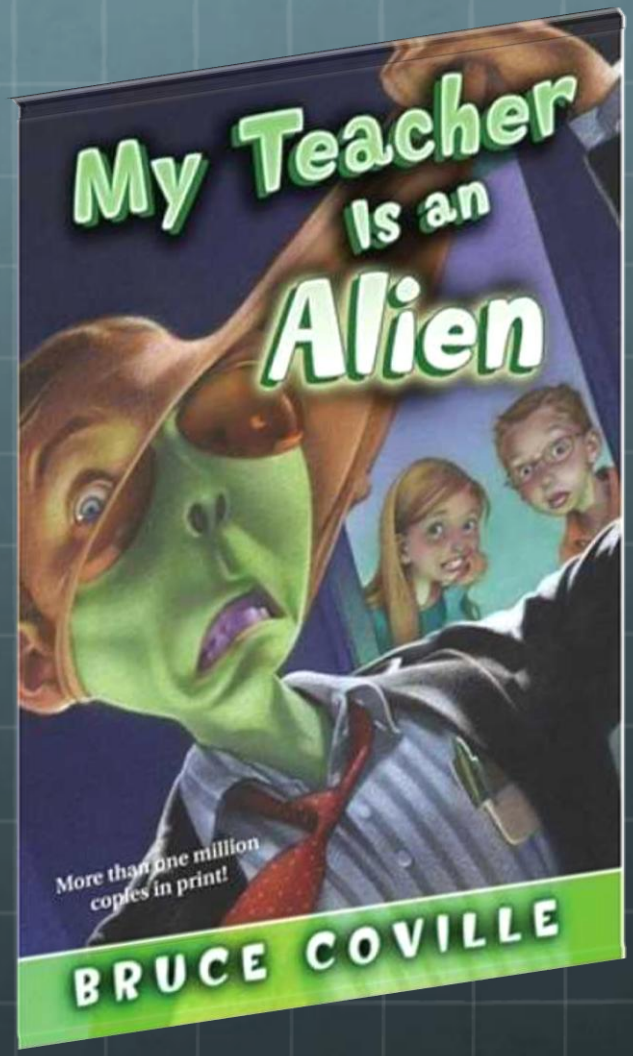

7. CONTENIDOS

1. Definiciones y conceptos fundamentales de la Ciencia Ficción [2 horas]

2. Los superhéroes [4 horas]

2.1 Superman: Conversión de grafito en diamante. Criterio de estabilidad de un sistema termodinámico. Criterio de espontaneidad de una reacción química. Variación de la energía de Gibbs con la presión y temperatura. Discusión sobre otros superpoderes que involucran factores termodinámicos o de transporte.

2.2 Flash: Balance energético del metabolismo humano. Requerimiento energético de la supervelocidad. Energía y peso del combustible.

3. Los planetas [12 horas]

3.1 Venus: Información general. La segunda ley de la termodinámica. Procesos reversibles e irreversibles. El demonio de Maxwell. Cambios de entropía en la separación térmica de un gas y en la separación de mezclas. Velocidad molecular y tiempo de separación. El tubo de Ranque-Hilsch. Resultados experimentales y disponibilidad comercial. Cálculos termodinámicos de primera y segunda ley en el proceso Ranque-Hilsch. Límites de operación. Otras propuestas de violación o inversión de la segunda ley.

3.2 Marte: Información general. Diagrama de fases del dióxido de carbono. Curva de sublimación del hielo seco. Comparación con el diagrama de fases del agua. Fusión del hielo por compresión. Termodinámica del patinaje sobre hielo. Fusión superficial.

3.3 La Tierra: Información general. Equilibrio sólido - líquido de sistemas ideales. Diagrama de fases del sistema nitrógeno – oxígeno. Cristalización conjunta de dos sólidos. Puntos eutécticos.

3.3 Mesklin: Información general. Equilibrio sólido – líquido de sistemas no ideales. Diagrama de fases del sistema amoníaco - agua. Formación de hidratos. Puntos de fusión congruente.

4. Errores de película [6 horas]

Errores científicos y tecnológicos en cine y televisión. "Superman IV". Diagramas de operación de plantas nucleares. Torres de enfriamiento hiperbólicas. "Dante's peak". Influencia de la actividad volcánica sobre la acidez del agua. Resistencia de aleaciones metálicas a la corrosión. Otros ejemplos de ciencia y tecnología errada en cine y televisión.

5. Desafíos y peligros de la extrapolación [12 horas]

5.1 Futuro energético: Predicciones exitosas y fallidas de la Ciencia Ficción. La regla de cálculo y las supercomputadoras. Carbón, petróleo e hidrógeno como fuentes energéticas. Otras fuentes de energía alterna y renovable.

5.2 Iniciativa tecnológica: El mundo de "1632" y "Grantville Gazettes". Desarrollo de procesos industriales. El mundo de "Slow River". Procesos de tratamiento de aguas.

Smallville S05 E12

$C_{(grafito)} \rightarrow C_{(diamante)}$

- Superman tiene el superpoder de transformar el grafito en diamante con solo apretarlo en su mano.
  - ¿Qué presión debe ejercer como mínimo, si la conversión ocurre a su temperatura corporal de 308 K?
  - ¿Cómo hizo Clark / Kal-El para obtener el diamante cortado, pulido y faceteado?
  - ¿Por qué no usó un trozo más grande de carbón?
  - ¿Qué respondió Lana? [ver anterior!]

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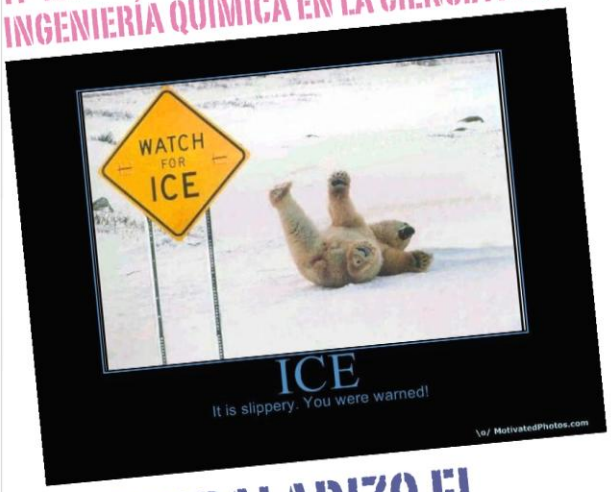
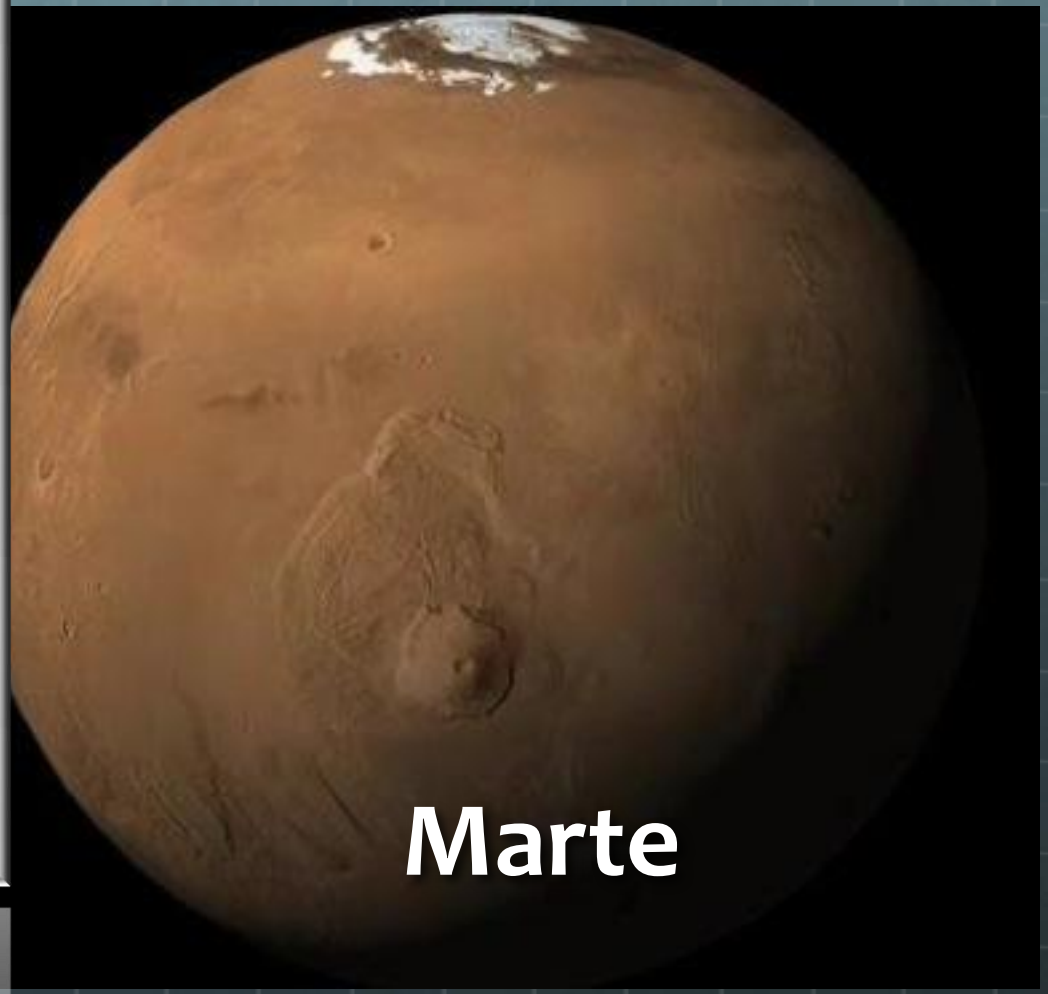
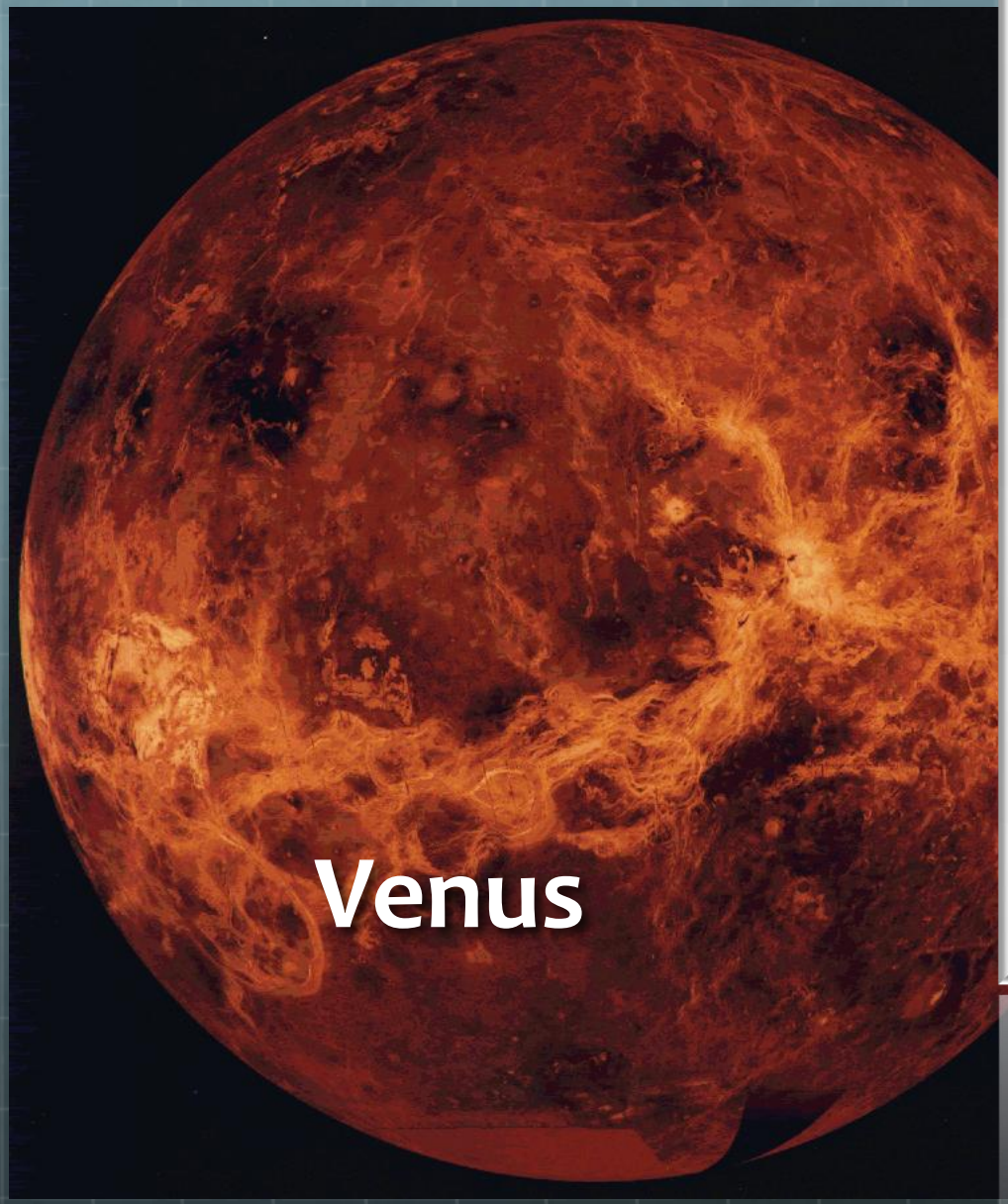


¿ES RESBALADIZO EL HIELO SECO?

ENERO - MARZO 2012

Prof. Sylvana Derjani & Prof. Claudio Olivera





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¿EXISTE EL DEMONIO DE MAXWELL?

ENERO - MARZO 2012

Prof. Sylvana Derjani & Prof. Claudio Olivera

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IChemE Institution of Chemical Engineers

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Winds are from Venus, mountains are from Mars: Science fiction in chemical engineering education

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ABSTRACT

In an elective course recently created at Simón Bolívar University, Chemical Engineering students are encouraged to apply their previously acquired knowledge of thermodynamics, transport phenomena and other core subjects to the analysis and solution of problems drawn from science fiction works. We present a brief outline of the course contents, and describe two case studies that illustrate the general approach. The first example deals with the sublimation of carbon dioxide in Mars, and provides the basis for a discussion of the thermodynamics of phase transitions, the differences between water ice and dry ice, and the phenomenon of surface melting. The second example involves the thermal separation of strong winds in Venus, and is used to develop a simplified model of the Ranque–Hilsch vortex tube that helps understand its working principles, limitations and differences with the equivalent but physically impossible action of Maxwell's demon. In both cases, the science fiction narratives are concluded to be unrealistic, either theoretically unsound or based on inaccurate information.

Keywords: Science fiction; Surface melting; Sublimation; Maxwell's demon; Ranque–Hilsch vortex tube

1. Introduction

The extraordinary potential of science fiction (SF) as an educational resource has been recognized from the very beginnings of the genre. In what was possibly the first use in print of the term "science fiction", Wilson (1851) wrote: "We hope it will not be long before we may have other works of Science-Fiction, as we believe such books likely to fulfil a good purpose, and create an interest, where, unhappily, science alone might fail." Indeed, to this day, SF works in print or audiovisual format are excellent sources of illustrations and problems that can be used to stimulate students' interest in learning, discussing and investigating scientific principles and their applications. Not surprisingly, therefore, considerable attention has been given to SF as a vehicle for exploring science in general (Barnett et al., 2006; Batchelor, 1993; Cavanaugh and Cavanaugh, 2004; Dubeck et al., 2004; Gresh and Weinberg, 2002, 2005; Perkowitz, 2007; Raham, 2004; Wolverton, 2002), and more specifically physics (Kakalios, 2005; Krauss, 1997, 2007; Perkowitz, 2006), chemistry (American Chemical Society, 2010; Griep and Mikasen, 2009; Stocker, 1998; Sun, 2007), biology (Glassy, 2005; Jenkins and Jenkins, 1998; Kolm, 2010; Pickover, 1999; Rose, 2003), philosophy (Kowalski, 2007; Nichols et al., 2008; Philips, 1984; Rowlands, 2005; Sanders, 2008), psychology (Iaccino, 1998), and music (Bartkowiak, 2010; Hayward, 2004). Perception of the relevance of SF in education has become so strong that at least one University opened a bachelor's degree programme in Science and Science Fiction (Brake and Griffiths, 2003), although this initiative appears to have been short-lived and the programme is no longer listed in the institution's webpage (University of Glamorgan, 2010).

The situation is somewhat different when it comes to engineering. While it has been suggested that a distinct subgenre of speculative literature exists that could be called "engineering fiction" (Hunter, 2009), technological (mechanical, electronic, chemical, genetic or any other) advances tend to be depicted in SF as scientific rather than engineering achievements, and scientists – frequently of the "mad" or "evil" persuasion – are more likely protagonists than engineers. Segall (2002, 2007) has pointed out that SF has not been employed extensively as a resource in engineering education. He has discussed many advantages to be gained from incorporating SF themes in the curriculum, and has described his

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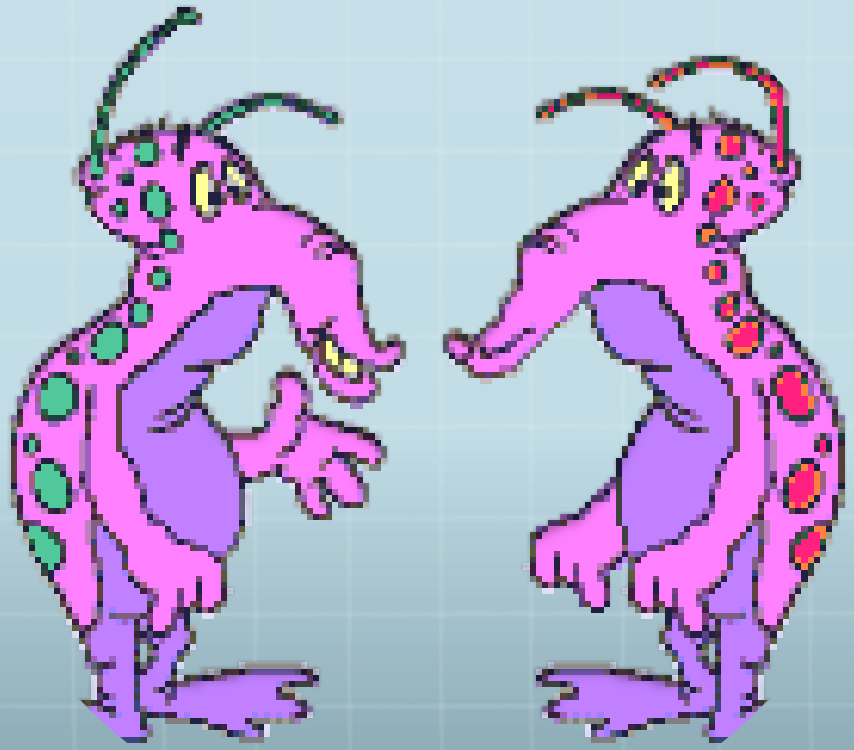


¿Pero en fin, por qué la CF?

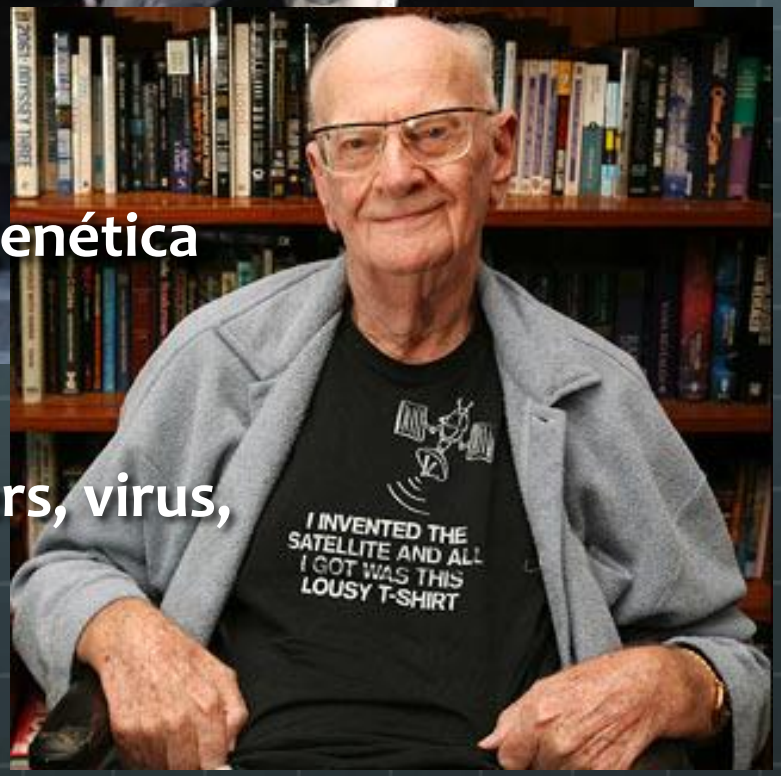
[Primer uso histórico del término "ciencia ficción"]

"Esperemos que no pase mucho tiempo antes de que tengamos otras obras de Ciencia-Ficción, porque nos parece que tales libros cumplen un buen propósito, y **generan un interés que, lamentablemente, la ciencia por sí sola no puede lograr**".

W. Wilson, *A little earnest book upon a great old subject* (1851)
citado en G. Westfahl, *Science fiction quotations* (2005)

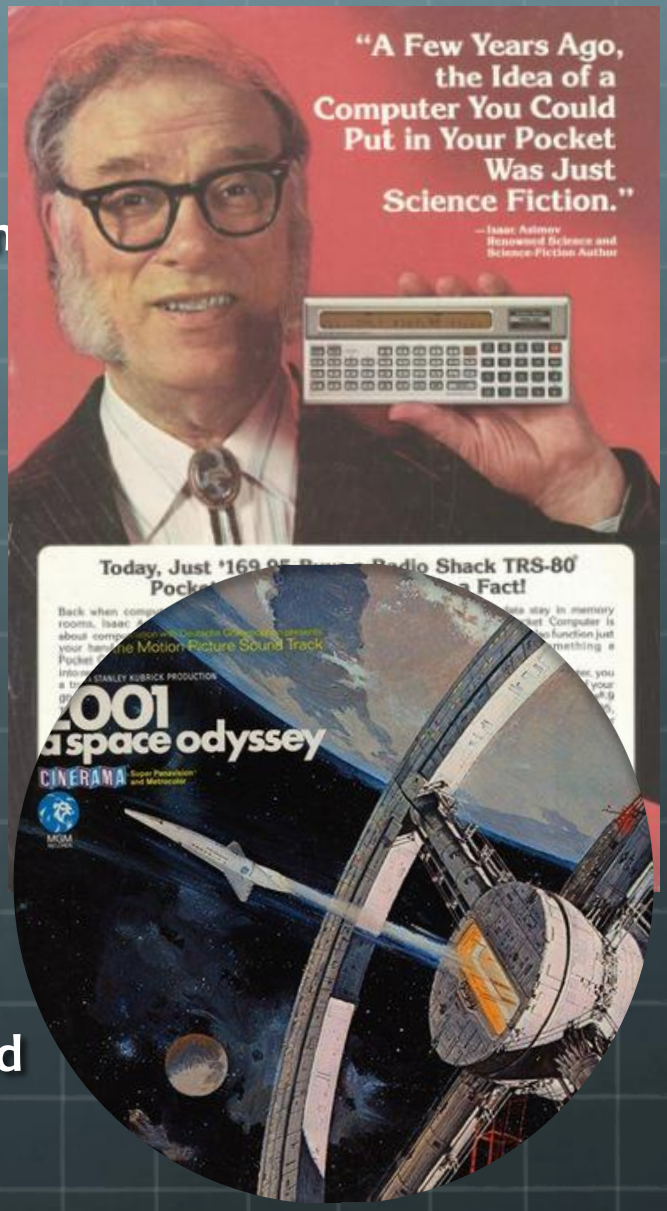
Algunos aciertos

- Exoesqueletos
- Robots
- Comunicación vía satélites
- Viajes a la Luna
- Clonación / Ingeniería genética
- Puertas automáticas!
- Internet / WWW (hackers, virus, gusanos…)
- Colchones de agua!



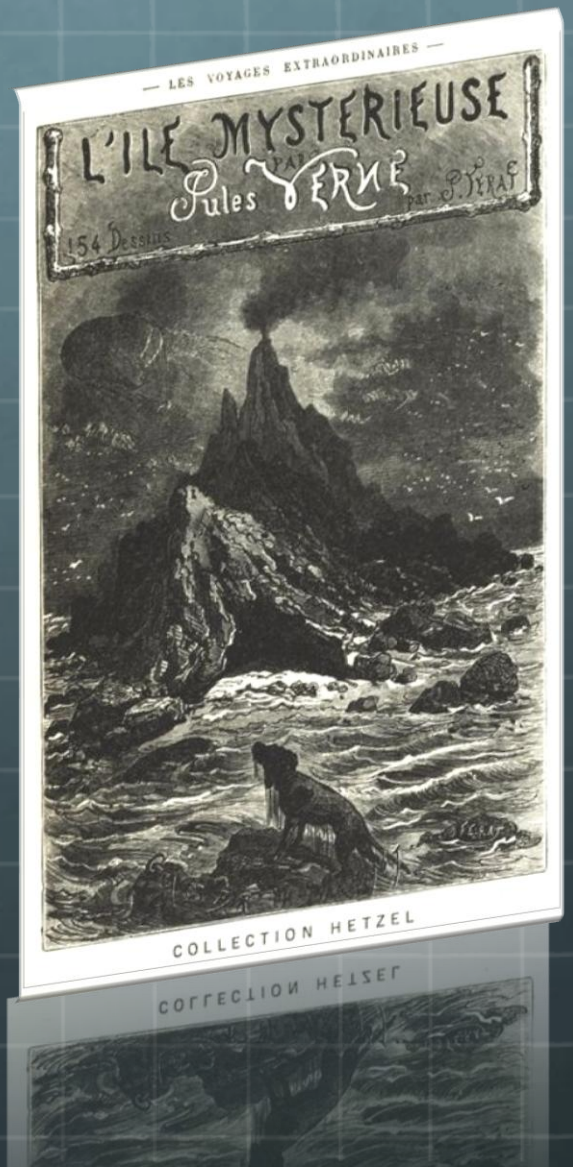
Algunas fallas

- Computadoras:
  - La regla de cálculo
  - Miniaturización y personalización
  - Inteligencia artificial
- Política y economía:
  - Gobierno mundial
  - Prosperidad, igualdad, salud
  - Energía ilimitada y barata
- Conquista del espacio:
  - Colonización del sistema solar
  - Viajes interestelares
  - Gravedad artificial y antigravedad
  - Encuentros cercanos
- Teleportación y viaje en el tiempo



- “Si algo hemos aprendido de la historia de los inventos y descubrimientos, es que a largo (y a veces también a corto) plazo, las profecías más audaces parecen ridículamente conservadoras”.
  - Arthur C. Clarke
- “Science fact = science fiction + time”.
  - James Kakalios
- “Profetizar es muy difícil, sobre todo acerca del futuro”.
  - Proverbio chino
- “Nada está más muerto que la ciencia ficción de ayer. Y Julio Verne es de anteayer”.
  - Arthur C. Clarke

De anteayer…



"-¡Agua! -respondió Ciro Smith- agua descompuesta sin duda por la electricidad se usará un día como combustible. El hidrógeno y el oxígeno que la constituyen arderán en los hornos con un enorme poder calorífico. El agua es el carbón del porvenir."

J. Verne, *La isla misteriosa* (1874)

Madrid (2003)

BOOKS

All-TIME 100 Novels

TIME Entertainment

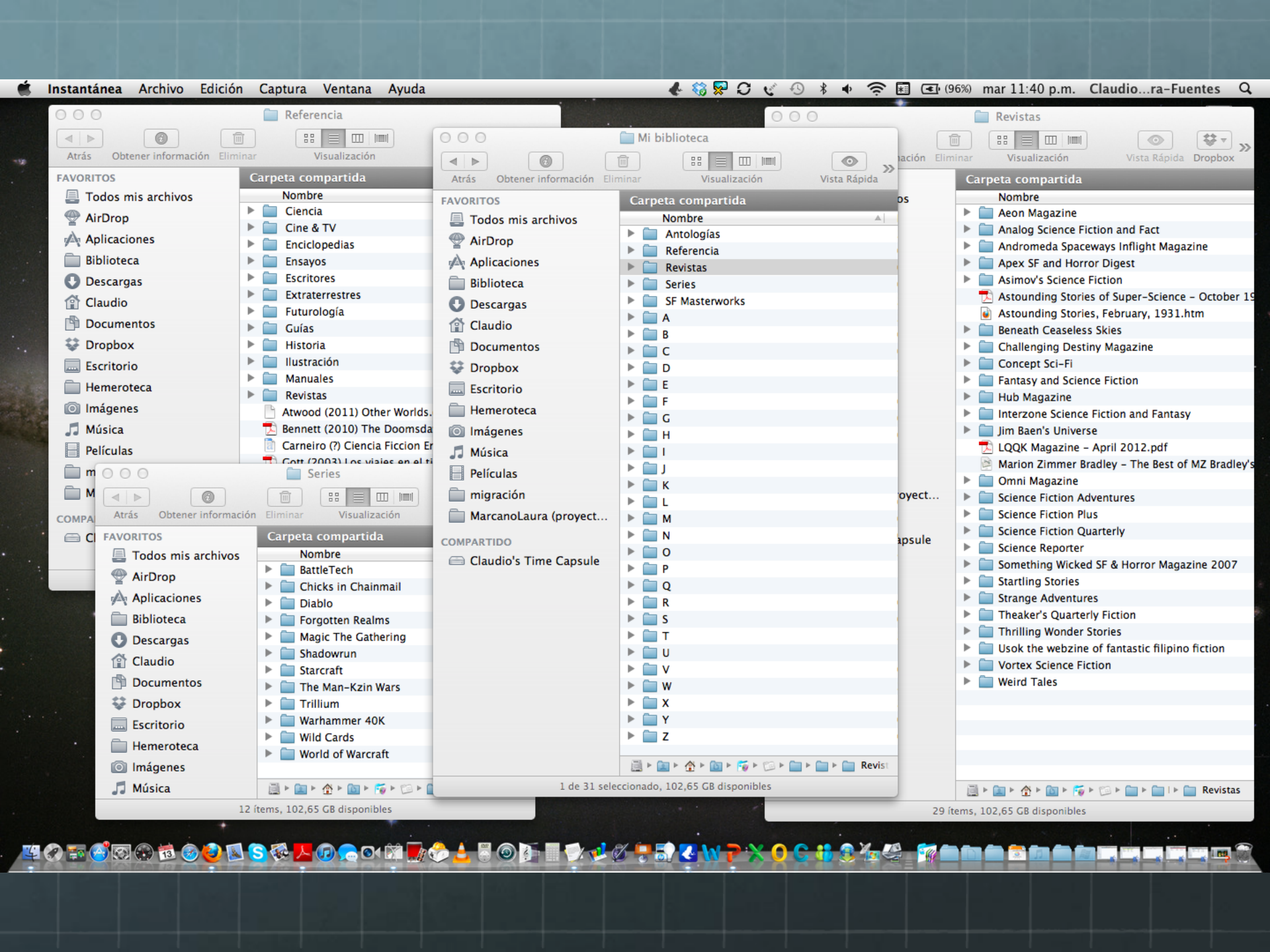
Critics Lev Grossman and Richard Lacayo pick the 100 best English-language novels published since 1923—the beginning of TIME.

- Margaret Atwood - The blind assassin
- Anthony Burgess - A clockwork orange
- Thomas Pynchon - Gravity's rainbow
- David Foster Wallace - Infinite jest
- William Gibson - Neuromancer
- Kazuo Ishiguro - Never let me go
- George Orwell - 1984
- Kurt Vonnegut - Slaughterhouse-five
- Neal Stephenson - Snow crash
- Philip K. Dick - Ubik
- Don DeLillo - White noise

"…la ciencia ficción es más que un género de libritos dedicados al consumo masivo; es una herramienta crucial por medio de la cual nuestra era, moldeada por y obsesionada con la tecnología, puede comprenderse a sí misma"

Lev Grossman


¿Es hora, no?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Atwood (2011) Other Worlds.
Bennett (2010) The Doomsda
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Astounding Stories, February, 1931.htm
Beneath Ceaseless Skies
Challenging Destiny Magazine
Concept Sci-Fi
Fantasy and Science Fiction
Hub Magazine
Interzone Science Fiction and Fantasy
Jim Baen's Universe
LQQK Magazine - April 2012.pdf
Marion Zimmer Bradley - The Best of MZ Bradley's
Omni Magazine
Science Fiction Adventures
Science Fiction Plus
Science Fiction Quarterly
Science Reporter
Something Wicked SF & Horror Magazine 2007
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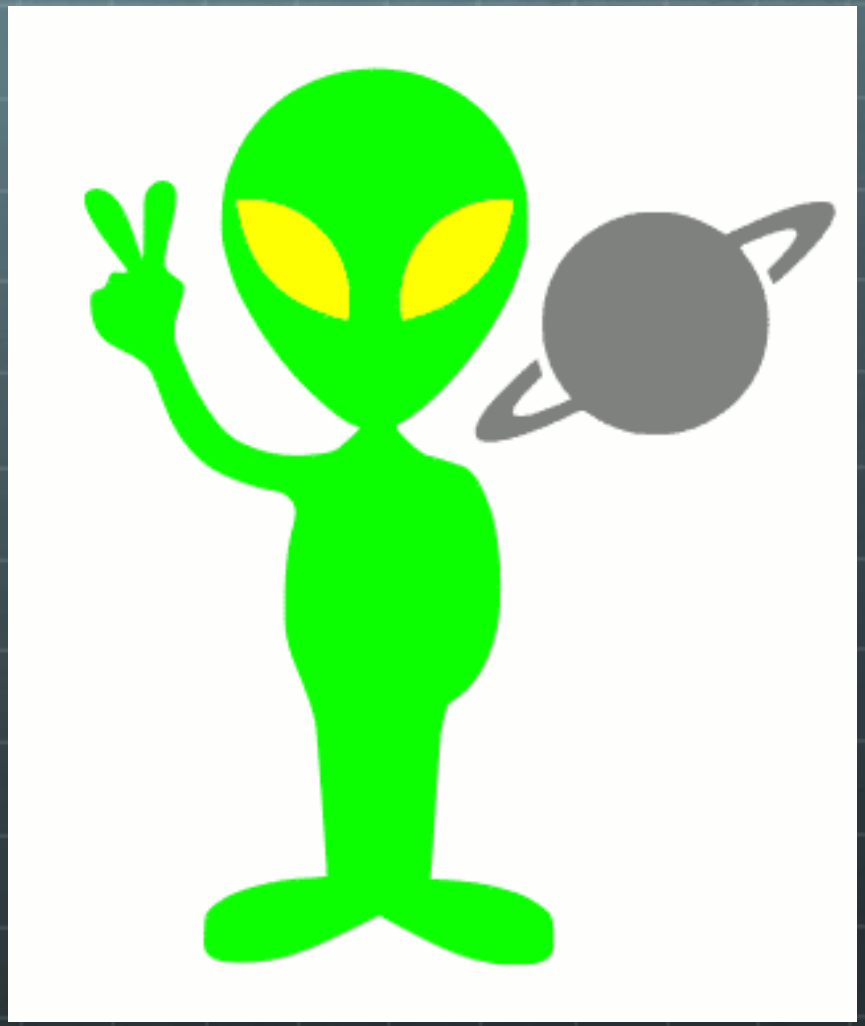

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