

Fisica e cultura

La rappresentazione dei fisici nel cinema

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Then there is the question of the energy involved. The man who travels for 21 years at 1 g reaches a value of γ equal to 1.2×10^9 , at which point his kinetic energy is utterly fantastic. If his vehicle weighs (at rest) 1 ton, then its energy content is equal, in round numbers, to the energy released in the annihilation of 10^6 tons of matter, or in

the fission of 10^{12} tons of uranium; it would be sufficient to melt the entire crust of the earth to a depth of about 30 miles. The man who makes the more modest trip to Neptune at 10 g reaches $\gamma = 1.0025$, and the kinetic energy of his 1-ton ship (2×10^{17} joules) corresponds to that released in the fission of about 2 tons of uranium: because of the limited efficiency of rocket propulsion, the actual energy needed would be much greater. The use of such energy quantities in a rocket ship is so far beyond any foreseeable practical limits, and the time gain in that case is so small, that it is hard to picture a practical case of space travel

in which the time dilatation can be considered important. This conclusion, of course, does not detract from the interest of the fundamental principles involved in the "clock paradox" (§4).

References and Notes

1. W. H. McCrea, *Nature* 167, 601 (1951); 177, 794 (1956); 178, 181 (1956); 179, 909 (1957).
2. H. Dingle, *Nature*, 137, 362, 785 (1956); 178, 619 (1956); 179, 465, 1342 (1957).
3. P. A. Crawford, Jr., *Nature* 179, 33, 171 (1956).
4. I would like to express my appreciation to Frank S. Crawford, Jr., David L. Judd, W. K. H. Panofsky, Henry P. Stapp, and Edward Teller for many useful discussions. Since I have not read widely in the literature of this subject, I apologize to any authors who may have already published any of the material given.

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This is not a study of what proportion of high-school students are choosing, or will eventually choose, a scientific career. It is a study of the state of mind of the students among whom the occasional future scientist must go to school and of the atmosphere within which the science teacher must teach. It gives us a basis for reexamining the way in which science and the life of the scientist are being presented in the United States today.

Objectives

Our specific objectives in this study were to learn the following:

- 1) When American secondary-school students are asked to discuss scientists in general, without specific reference to their own career choices or, among girls, to the career choices of their future husbands, what comes to their minds and how are their ideas expressed in images?
- 2) When American secondary-school students are asked to think of themselves as becoming scientists (boys and girls) or as married to a scientist (girls), what comes to their minds and how are their ideas expressed in images?
- 3) When the scientist is considered as a general figure and/or as someone the respondent (that is, the student writer) might like to be (or to marry), or, alternatively, might not like to be (or to marry), how do (i) the positive responses (that is, items or phrases, not answers) cluster, and (ii) the negative responses (that is, items or phrases) cluster?
- 4) When clusters of positive responses and clusters of negative responses are compared and analyzed, in what respects are the two types of clusters of responses (i) clearly distinguishable, and (ii) overlapping?
- 5) Is a generally positive attitude to the idea of science, an attitude which we

Image of the Scientist among High-School Students

A Pilot Study

Margaret Mead and Rhoda Métraux

This study is based on an analysis of a nation-wide sample of essays written by high-school students in response to uncompleted questions. The following explanation was read to all students by each administrator: "The American Association for the Advancement of Science (1), a national organization of scientists having over 50,000 members, is interested in finding out confidentially what you think about science and scientists. Therefore, you are asked to write in your own words a statement which tells what you think. What you write is

confidential. You are not to sign your name to it. When you have written your statement you are to seal it in an envelope and write the name of school on the envelope. This is not a test in which any one of you will be compared with any other student, either at this school, or at another school. Students at more than 120 schools in the United States are also completing the statement and your answer and theirs will be considered together to really find out what all high-school students think as a group of people."

In general, the study shows that, while an official image of the scientist—that is, an image that is the correct answer to give when the student is asked to speak without personal career involvement—has been built up which is very positive, this is not in when the student's personal choices are involved. Science in general is represented as a good thing; without science we would still be living in caves; science is responsible for progress, is necessary for the defense of the country, is responsible for preserving more lives and for improving the health and comfort of the population. However, when the question becomes one of personal contact with science, as a career

There is a great disparity between the huge amount of effort and money being devoted to educating young people in careers as scientists or engineers and the small amount of information we have on the attitudes these young people hold toward science and scientists. The Board of Directors of the AAAS has on several occasions discussed this disparity and the desirability of learning more about what high-school students actually think of science and scientists. This paper is one result of those discussions. Hilary Thoreau, director of the association's Traveling High-School Science Library Program, made all of the arrangements with the high schools and supervised the collection of raw student essays. The editors of these essays and the preparation of this report were the responsibility of the two authors, Margaret Mead and Rhoda Métraux. Dr. Mead is associate curator of anthropology, American Museum of Natural History, New York, and Dr. Métraux is a research fellow at Cornell Medical College, New York.

Science 1957, 30 August, CXXVI, 384-390

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References and Notes

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“ ... lo studio mostra che, mentre l’immagine ufficiale dello scienziato - vale a dire quando si chiede allo studente di parlare senza un coinvolgimento personale per quel che riguarda la sua carriera - è molto positiva, **questo non è vero quando sono coinvolte le scelte personali dello studente.**

La Scienza in generale è rappresentata come una buona cosa: **senza scienza vivremmo ancora nelle caverne, la scienza è responsabile del progresso, è necessaria per la difesa della nazione, è necessaria per salvare vite e per migliorare la salute e il benessere della popolazione.** Comunque, quando si parla di contatti personali con la scienza, come una carriera o per la scelta del marito, allora l’immagine è terribilmente negativa.”

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However, when the question becomes one of personal contact with science, as a career choice or involving the choice of a husband, the image is overwhelmingly negative. This is not a study of what proportion of high-school students are choosing, or will eventually choose, a scientific career.

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Gli stereotipi sono poco cambiati negli anni:

“Lo scienziato è un uomo che indossa un camice bianco e lavora in un laboratorio. E’ anziano o di mezza età, può avere la barba, è circondato da attrezzature: provette, becchi Bunsen, ampolle e bottiglie, una miriade di macchine misteriose con indici, scrive in maniera precisa su quaderni neri. Un giorno si può alzare e urlare: “Eureka. Eureka”. Attraverso il suo lavoro si potranno avere prodotti nuovi e migliori, custodisce pericolosi segreti, il suo lavoro può essere pericoloso, legge sempre un libro.”

Chambers, D.W. (1983) Stereotypic images of the scientists: the draw-a-scientist test. *Science Education*. 67 (2): 255-265.

Gli stereotipi sono poco cambiati negli anni:

“The scientist is a man who wears a white coat and works in a laboratory. He is elderly or middle aged and wears glasses/he may wear a beard/he is surrounded by equipment: test tubes, Bunsen burners, flasks and bottles, a jungle gym of blown glass tubes and weird machines with dials/he writes neatly in black notebooks/One day he may straighten up and shout: "I've found it! I've found it!"/Through his work people will have new and better products/he has to keep dangerous secrets/his work may be dangerous/he is always reading a book.”

Chambers, D.W. (1983) Stereotypic images of the scientists: the draw-a-scientist test. *Science Education*. 67 (2): 255-265.

Anche per gli adulti la percezione non è diversa:

“... gli scienziati riconoscono che i loro colleghi sono amichevoli, socievoli, aperti, non convenzionali, aventi parecchi interessi e popolari.

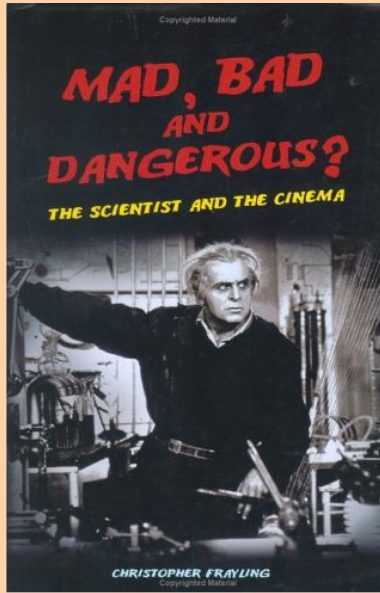
I lettori non scienziati, invece, vedono esattamente l'opposto: inavvicinabili, ritirati, chiusi e convenzionali. Gli scienziati, inoltre, hanno pochi interessi e sono piuttosto impopolari.”

Hills, P., & Shallis, M. (1975). "Scientists and Their Images", *New Scientist*, August 28, 1975. 471-475

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“... whereas the scientists reckoned that their colleagues were typically approachable, sociable, open, unconventional; as having many interests and as being popular, no-scientist readers saw them as typically the opposite - remote, withdrawn, secretive and conventional. Scientists have few interests and are rather unpopular.”

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Christofer Frayling

Mad, bad and dangerous?

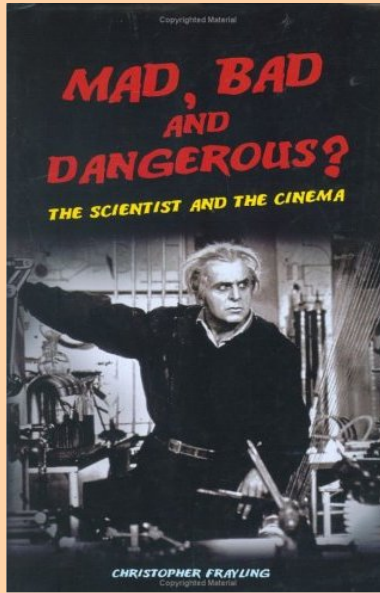
Reaktion, 2005

“... in preparazione del mio libro ho condotto un’indagine su un piccolo campione di studenti in scuole inglesi. Pensavo onestamente che avrei ottenuto risultati diversi. Dopo tutto, scienziati eroici sono diventati molto più comuni nei film, per non menzionare la presenza di progressi tecnologici in Star Treck, Star Wars e negli innumerevoli fumetti che ne sono derivati.

Mi sbagliavo. Quasi la stessa proporzione di giovani tra i 9 e 11 anni disegnavano scienziati pazzi in camice bianco - sebbene ci fossero più donne scienziate pazze, gli scienziati erano più giovani e più punk ed erano vestiti con T-schirt e scarpe griffate. ...

Inoltre la stereotipizzazione sembrava partire prima, tra i 7-9 anni. ... Gli stereotipi dei film degli anni ‘60 erano migrati nei cartoni animati, nei fumetti, nei giochi dei computers e nei nuovi comici (Eddy Murphy come il Professore pazzo, Steve Martin come l’uomo con due cervelli).

(*INTERACTIONS. The newspaper of the physics community* Institute of Physics, July 2006, p. 8)



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Mad, bad and dangerous?

Reaktion, 2005

“... in preparation for my book ... I arranged a similar, smaller-scale test at a school in England. I honestly thought the findings would have changed. After all, in recent years heroic scientists ... have become much more common in film, not to mention the gungho attitude towards technological progress in Star Treck, Star Wars and countless comic-book derivatives.

I was wrong. Roughly the same proportion of 9-11 years-old drew lunatic or manic scientists in white labcoats - although there were more females lunatics, the scientists were younger and more punkish and they wore branded T-shirts or shoes. ... Also, the stereotyping seemed to be starting younger - among the 7-9 year olds. ... The 1960s movie stereotype had migrated towards children's cartoons, comics, computer games and stand-up comedians (Eddy Murphy as the Nutty Professor, Steve Martin as The man with Two Brains.)

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- 1) Gli stereotipi non si formano in ambito scolastico ma derivano oltre che dai giochi al computer, essenzialmente dalla visione, in televisione, di cartoni animati film, documentari e spettacoli teatrali.
- 2) I film, i documentari, gli spettacoli teatrali molto spesso sono ispirati da racconti di carattere letterario.
- 3) Se vogliamo capire l'origine e la ragione della persistenza di stereotipi anche in età adulta dobbiamo quindi analizzare le fonti degli stereotipi.
- 4) Dobbiamo avere inoltre strumenti metodologici per capire la rilevanza delle analisi di questi fenomeni fatte da esperti.

La Fisica a Cinema



Le voyage dans la Lune, 1902

Homunculus, 1916

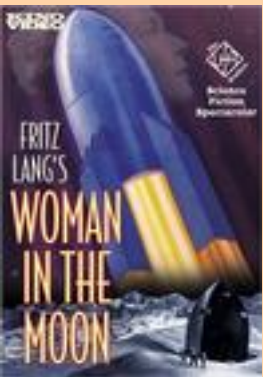


Frankenstein, 1931.

La Fisica a Cinema



Metropolis, 1927.



The Woman in the Moon, 1929

La Fisica a Cinema

Just imagine, 1930

The invisible man, 1933

Things to come, 1936

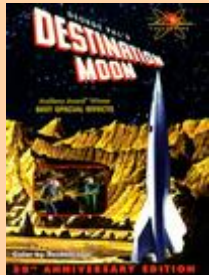
The Invisible Ray, 1936



Marie Curie, 1943..



Destination Moon, 1950.

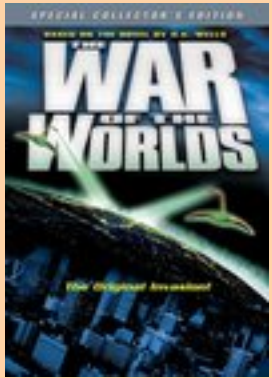


The Thing from Another World, 1951.

The Day the Earth Stood Still, 1951.



When Worlds Collide, 1951.



The War of the Worlds, 1953.



On the beach, 1959.

Dr. Strangelove, 1964.



2001: A Space Odyssey, 1968.



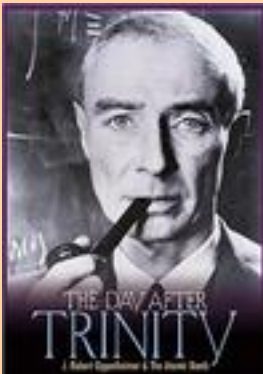
Star Wars, 1977.



Meteor, 1979.



The Day after Trinity, 1981.





The Manhattan Project, 1986.



Chain Reaction, 1996.



Saint, 1997.

Deep Impact, 1998.





Armageddon, 1998.

Star Wars: Episode I - The Phantom Menace (1999).



The core, 2003.



What the bleep, 2004.

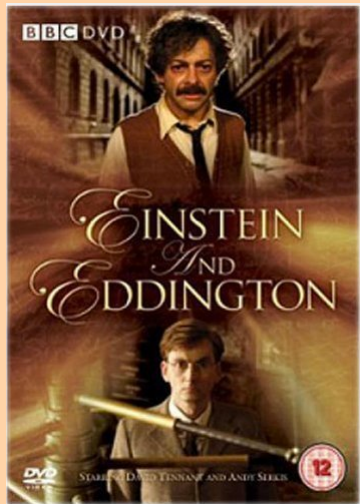


The day after tomorrow, 2004.



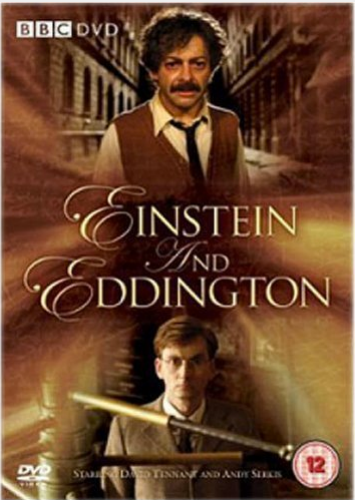
The Big Bang theory, 2007

Ipotesi sulla scomparsa di un fisico atomico, 1971



Il mio amico Einstein, 2008 Einstein and Eddington

Physics, 2012. Cortometraggio. When
Rona and Sandi find the God particle on
the beach, they think it may be able to
bring energy back into their rundown
town



Ipotesi sulla scomparsa di un fisico atomico,
1971

Il mio amico Einstein, 2008
Einstein and Eddington

The Abyss, 1989
 $E=mc^2$ Einstein's big idea(2005)

The Dish (2000)

Cielo d'ottobre (1999)
October Sky (original title)

Uomini veri (1983)
The Right Stuff (original title)
Agorà, 2009 (Ipazia e la relatività del moto)

The Story of Alfred Nobel, 1939

Infinity, 1996

STEREOTIPI

- 1) Lo scienziato colui che è in grado di carpire i segreti alla Natura, di disvelarla: sia per meglio controllarne gli aspetti distruttivi per il bene dell'umanità, sia per piegarla a propri turpi fini.
- 2) Lo scienziato è un persona generosa e altruista che pensa solo al bene dell'umanità
- 3) Lo scienziato è una persona matta o nevrotica che usa le conoscenze scientifiche per fini distruttivi.
- 4) Lo scienziato è una persona con la testa nelle nuvole, che si presta alla descrizione di esilaranti situazioni.
- 5) Lo scienziato è un catastrofista che usa le sue conoscenze come pretesto per descrizioni di terribili e coinvolgenti tragedie.
- 6) Lo scienziato è un esploratore, presente peraltro anche in alcuni documentari scientifici naturalistici.

STEREOTIPI degli studiosi

- 1) Prometeo
- 2) Icaro
- 3) Mago Merlino
- 4) Adamo
- 5) Vaso di Pandora

Gli strumenti di analisi degli studiosi evidenziano un retroterra culturale dal quale sembra essere completamente assente un'immagine della scienza coerente con gli sviluppi che essa ha avuto dal 1500 in avanti.

Altrettanto potrebbe dirsi dei “mediaori culturali” tra gli scienziati e i letterati, i filmmakers, i commediografi.

Il problema non è costituito dagli errori quanto da un'immagine della scienza inadeguata a rappresentare il ruolo che essa gioca nel mondo contemporaneo.

“... most of the films I have discussed have at least a modicum of real physics. The fact that many are science fiction is a plus: having interviewed numerous scientists Many told me it was science-fiction books and movies that inspired them to go into science.

Complete and exact scientific accuracy in films is therefore not as important as you might think; even if the movies do not get every detail right, they may excite young people to do science as it should be done.”

Perkowitz, Sidney (2006). “Hollywood physics” *Physics World* July 2006, p. 23.

IPOTESI DI INTERVENTO

continua

I film popolari sono visti da oltre il 50% della popolazione europea.
Più di 2/3 degli europei vedono film o DVD.

L'84.3% dei programmi della televisione è costituito da film.

Il 55% degli spettatori a cinema è costituito da gioventù al di sotto di 24 anni.

Secondo l'“Eurobarometer Survey” la cultura scientifica (scientific literacy) tra gli europei è rimasta praticamente la stessa tra il 1992 e il 2001 con l'eccezione della conoscenza dei dinosauri (“Jurassic Park”).

IPOTESI DI INTERVENTO

Continua

I film e i documentari scientifici, il teatro scientifico sono oggetti molto diffusi tra i giovani e ne influenzano i comportamenti.

Gli scienziati, gli storici della scienza, gli esperti di educazione scientifica e di didattica delle scienze potrebbero elaborare analisi in grado di evidenziare il carattere obsoleto delle immagini della scienza veicolate dai mezzi di comunicazione.

“ ... the cinema is a major source for learning about the various forms that history has taken in the XX century, but also that particular cinematic styles signal important cultural changes closely tied to pedagogical conceptions of the nation or its critique.”

“Marcia Landy (Editor). *The Historical Film. History and Memory in Media* Rutgers 2000.