Università
degli Studi
di Padova

Neology in popular science discourse. Challenges of reporting news and controversies in translation

Maria Teresa Musacchio

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Outline

- Leading-edge research and its new terminology
- Accounting for new discoveries and inventions in the social construction of science
- How terms enter popular science discourse
- How neology is accounted for as texts unfold
- What happens when new discoveries and inventions alter the original context of use
- Science communication and understanding for the purposes of information
- Science communication and understanding to engage public support in scientific controversies
- Implications for termbases

Leading-edge particle physics

One of the primary goals of physics is to **understand the wonderful variety of nature in a unified way**. The greatest advances of the past have been steps toward this goal: the unification of terrestrial and celestial mechanics by Isaac Newton in the 17th century; of optics with the theories of electricity and magnetism by James Clerk Maxwell in the 19th century; of space-time geometry and the theory of gravitation by Albert Einstein in the years 1905 to 1916; and of chemistry and atomic physics through the advent of quantum mechanics in the 1920s(..).

Steven Weinberg, "A unified physics by 2050?" *Scientific American*, 12/1999

When physicists are forced to give a single-word answer to the question of why we are building the **Large Hadron Collider (LHC)**, we usually reply "Higgs." The **Higgs particle** – the last remaining undiscovered piece of our current theory of matter – is the marquee attraction. But the full story is much more interesting. The new collider provides the greatest leap in capability of any instrument in the history of particle physics. We do not know what it will find, but the discoveries we make and the new puzzles we encounter are certain to change the face of particle physics and to echo through neighboring sciences.

Chris Quigg, "The coming revolutions" *Scientific American*, 2/2008

Fermi on the 'relativity' of elementary particles

(…) se voi mi domandaste che cosa si intenda per **particella elementare**, resterei imbarazzato in quanto il termine **"elementare" va inteso in senso piuttosto relativo alle nostre conoscenze**.

Se si fosse chiesto ai chimici o ai fisici di una cinquantina d'anni fa se l'**atomo** poteva considerarsi come una particella elementare, probabilmente molti di essi avrebbero risposto affermativamente, perché allo stato delle conoscenze di allora non si conosceva la struttura dell'atomo, anzi non si sospettava nemmeno che ne potesse avere una. Poi, quando esso si rivelò come un organismo complesso e quando questa natura complessa fu più profondamente esplorata, la nozione di elementarità si trasferì ad oggetti più piccoli, e cioè al **nucleo** ma oggi anche questo ha rivelato molto della sua natura complessa. In generale si potrebbe dire quindi che ad ogni stadio della scienza **si chiamano elementari le particelle di cui non si conosce la struttura** e che pertanto si possono considerare come punti. (135-136)

Enrico Fermi "Le particelle elementari" (1950) in *Atomi nuclei particelle. Scritti divulgativi ed espositivi 1923-1952*, Torino, Bollati Boringhieri, pp. 135-143.

Public communication of science or popularization: sociological view

- In the past, pbs or popularization was seen as a sort of linguistic translation – a 'third person' reformulated scientific discourse more simply
- Nowadays, popularization can celebrate theory and results, but it can also be deviant.
- Deviation emerges during crises when the general public may be involved in a debate to support one side

Communication for the purposes of information (scientifically-oriented) → understanding

Communication with a view to involving the public in a controversy (problem-oriented) usu with uncertain outcome → deviation

Functions of the appeal to the public

- Boundary bargaining of new subjects and fields of research → constitutive boundary work
- At the border between subjects/domains → (re-) negotiation of boundaries between subjects/domains
- Within subjects/domains → change of paradigm
- In most cases communication takes place at different levels at the same time and each level influences the others
- The popular level of communication offers an open space where ideas can be exchanged and debated
- Deviation can however exclude actors and hypotheses that are not suitable for presentation to the public

The 'popularization' cline:

- Intraspecialist level (*Physical Review Letters*, *Cell*)
- Interspecialist level (*Nature*, *Science*)
- Medium-level interspecialist popularization (*Scientific American* – *New Scientist*)
- Instruction level: manuals, handbooks and textbooks
- 'Popular' level: newspapers, weekly and monthly magazines [(a) in the science pages; (b) in the news sections], TV programmes, websites, blogs

Bianucci P. (2008) *Te lo dico con le parole tue*, Bologna, Zanichelli, pp. 50-5.

Tools for communication with the public

- Science as narrative
- Definitions, glosses, explanations, notional/conceptual relations, examples, visuals, figures of speech – esp. exegetic metaphors
- Boundary objects: notions that can be easily adapted to different uses by various groups involved in communication but still preserve a general identity. Metaphors and paradoxes can be boundary objects when used by different social groups

Bucchi M. (2000), *La scienza in pubblico. Percorsi nella comunicazione scientifica*, Milano McGraw-Hill

Armeni M. (2006), *Comunicare la fisica/Communicating Physics*, Roma, Zadigroma

Bauer M.W. & Bucchi M. (2007), *Journalism, Science and Society*, London, Routledge

Cross-linguistic and cross-cultural terminological problems

- Conceptual links: semantico-conceptual links to establish a cognitive structure of the specialised domain
- Extralinguistic/encyclopaedic information to improve understanding of terms and categories of SL and TL e.g. diachronic information
- Terminological variation:
  - morphological variation → *rilevatore* vs. *rivelatore* (particle detector)
  - orthographic variation → *positrone* vs. *positone* (positron)
  - elliptic forms → *bosone di Higgs* vs. *Higgs* (Higgs boson)
  - abbreviations → *large hadron collider* vs. *LHC*
  - permutation → *parità di carica* vs. *carica parità*
  - combining forms → *collisore* vs *collisionatore* (collider)

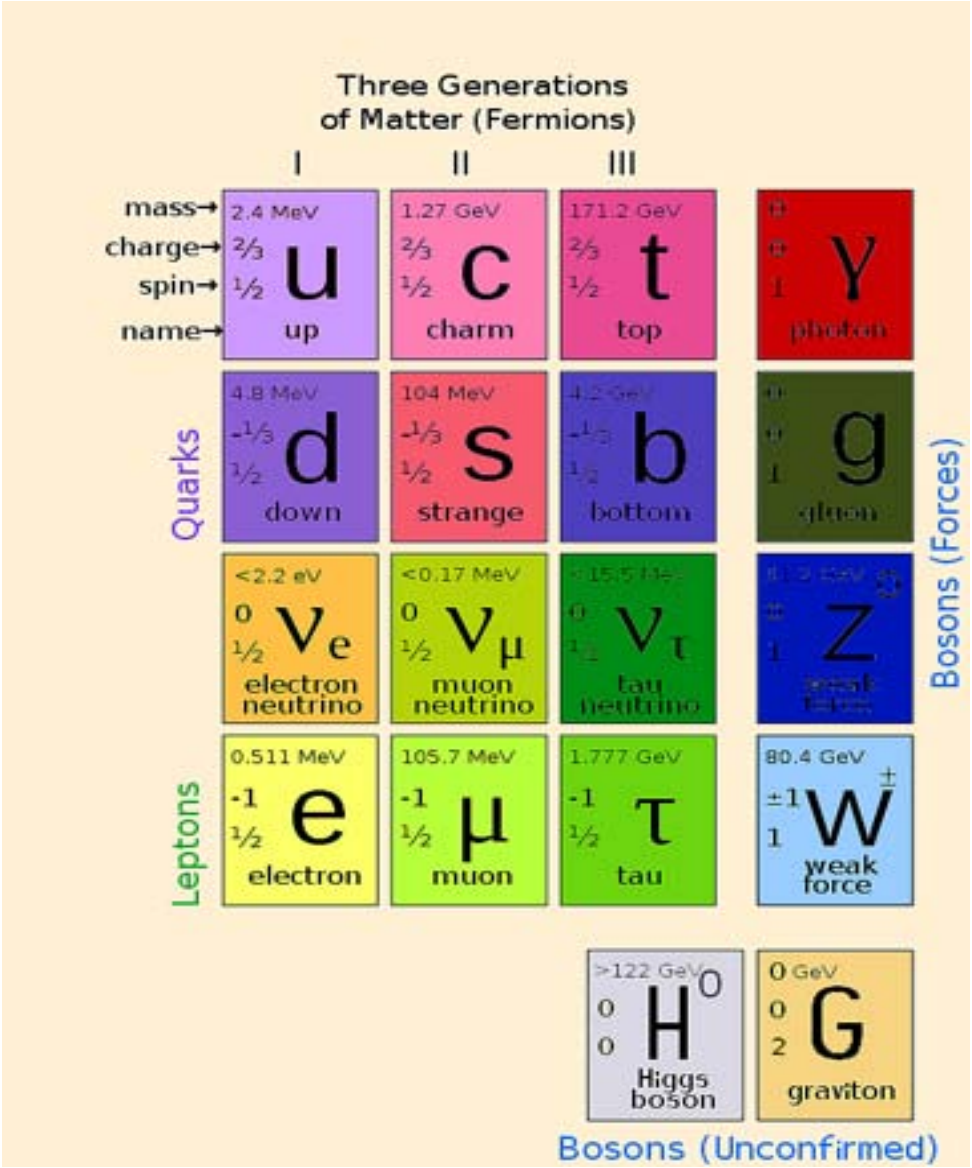
Temmerman R. & Gentjens S. (2010) "Ontological support for multilingual domain-specific translation dictionaries" (pp. 137-146); Kerremans K., De Baer P. & Temmerman R. (2010) "Competency-based job descriptions and termonotography: The case of terminological variation" (pp. 181-193) in M. Thelen & f. Steurs *Terminology in Everyday Life*, Amsterdam/ Philadelphia, Benjamins.

Corpora

- English
  - Nobel prizes for physics 1902-2009 (168 files, 1,105,741 tokens)
  - *Scientific American* corpus 1993-2009 (parallel : 22 files, 95,949 tokens)
  - LHC corpus (24 files, 47,536 tokens)
  - TOE magazine-newspaper corpus (34 files, 108,021 tokens); TOE blogs (9 files, 102,453); PNAS articles
- Italian
  - Physics textbooks (3 files, 87,981 tokens)
  - *Le Scienze* corpus 1993-2009 (parallel: 22 files, 99,413 tokens; comparable 1968-2009: 21 files, 97,359 tokens; parallel 1968-1992: 54 files, 396,029 tokens)
  - *Tuttoscienze* /newspaper-magazine corpus (56,592 tokens)
  - TOE magazine-newspaper corpus (13 files, 13,596 tokens); TOE blogs (8 files, 13,324 tokens)

A brief overview of elementary particles

- **Quarks** and **leptons** are currently regarded as the ultimate building blocks of matter
- These fundamental particles of matter are **fermions**, come in three generations and obey Fermi-Dirac statistics
- To understand the structure of matter, interactions or forces binding particles should also be considered
- The fundamental interactions are strong, weak, electromagnetic interactions/forces and gravity
- Interactions require force particles with integer spin, i.e. bosons – photons for electromagnetic interactions, W+, W- and Z0 bosons for weak interactions, gluons for strong interactions and the hypothetical graviton for gravity.
- **Bosons** are elementary particles too and obey Bose-Einstein statistics. The Higgs boson interacts with other particles giving them mass. Its existence is yet to be confirmed by LHC experiments



http://www.google.it/imgres?imgurl=http://farm4.static.flickr.com/3177/3108155163_8426e40e1b.jpg&imgrefurl=http://www.flickr.com/photos/kurtasbestos/3108155163/&usg=__frn3dVMd4EL8aqTn-MjdOuEXL9Y=&h=500&w=364&sz=97&hl=it&start=196&zoom=1&tbnid=yXGmYJWbJcFqSM:&tbnh=161&tbnw=117&ei=ZrG2Td_XB8iy8QO6-pxN&prev=/search%3Fq%3D%2522elementary%2Bparticles%2522%26hl%3Dit%26client%3Dfirefox-a%26sa%3DG%26rls%3Dorg.mozilla:it:official%26biw%3D1229%26bih%3D489%26tbm%3Disch0%2C6102&itbs=1&iact=hc&vpx=375&vpy=119&dur=1631&hovh=263&hovw=191&tx=85&ty=137&page=17&ndsp=13&ved=1t:429,r:8,s:196&biw=1229&bih=489

The Higgs boson

- The Higgs boson was hypothesised by the Edinburgh physicist Peter Higgs in 1964. As a term it is a 'double' eponym as it takes its name from Higgs but boson comes from Bose of Bose-Einstein statistics' fame
- In the Nobel prize for physics corpus boson/s (159 occurrences) was used by Alvarez in 1968 for the first time. The full form 'Higgs boson' is mentioned for the first time by Weinberg in 1980. The elliptic form 'Higgs' had been used by Salam in1979 to refer to the Higgs field
- In the *Scientific American* corpora there are 256 occurrences of terms formed using 'Higgs' as an eponym – Higgs boson, field, mass, mechanism and particle. Where 'Higgs' is used as a short form it stands for Higgs boson

The Higgs family of terms

Term (absolute frequency of occurrence)	Nobel Prize Lectures 1,105,741 w	*Scient.Amer. parall.199 3-* 95,949 words
Higgs boson/s	6	60
Higgs particle/s	12	38
Higgs	11	51
Higgs meson/s	2	-
Higgs field	4	56
Higgs mass/es	12	11
Higgs mechanism	11	12
Higgs interactions	2	1
Higgs phenomenon/a	3	-
Higgs sector	12	-
Higgs system	8	-

Term	*LeScienze* parall. 99,413	*LeScienze* comp. 97,359	*Tuttoscienze* 56,592
bosone/i di Higgs	109	3	12
particella/e di Higgs	27	1	18
Higgs	3	2	5
particella/e di Dio	-	-	11
bosone H	-	-	1
campo/i di Higgs	55	-	4
fisica di Higgs	2	-	-
interazione/i di Higgs	4	-	-
meccanismo di Higgs	10	-	-
Peter Higgs	2	-	-

Comparing Nobel Lectures, *Scientific American*, *Le Scienze* and *Tuttoscienze*

- In *Scientific American* there is a preference for the more specific *Higgs boson/s*; 'Higgs' for Higgs boson is more frequent than Higgs particle/s
- Another frequent term is *Higgs field/s* as a notion that is closely related to Higgs boson
- Apart from different frequencies, in the parallel corpus the more specific term *bosone/i di Higgs* is preferred while in the newspaper corpus the more general term is also combined with the idea of 'God particle', a metaphoric term coined by Nobel laureate Leon Lederman to 'describe' the relevant functions of the Higgs in the creation of the Universe
- In Italian Higgs for Higgs boson/s is comparatively rare
- The greatest productivity of 'Higgs' is in Nobel Lectures

Term	Nobel prize	Sciam parall.	LHC
accelerator/s	**196**	**159**	**206**
colliding (beam)	2	-	-
electron/proton/ plasma	19	-	9
accelerator/s		17	-
high-energy accelerator/s	6	3	-
linear accelerator/s	41	20	42
particle accelerator/s	5	11	34
collider/s	**61**	**141**	**182**
e+e-/pp colliders	16	-	-
electron-positron ... collider/s	16	16	13
linear collider/s	-	22	16
particle collider/s	-	5	11
large hadron collider	2	30	61
LHC	**9**	**131**	**235**
(accumulator) **ring/s**	**95**	**33**	**20**
(colliding beam) storage ring/s	32	9	12
damping rings	-	6	1
machine/s	**75**	**38**	**60**

Term	*Scienze* par.	*Scienze* com.	*Tuttoscienze*	LHC ital.
cceleratore/i	**152**	**50**	**60**	**19**
cceleratore/i lineare/i	3	-	-	-
cceleratore/s di particelle	15	14	14	6
cceleratore/i al plasma	18	-	-	-
Large hadron collider	26	5	19	6
Lhc	**145**	**34**	**61**	**44**
collisore/i	**48**	**20**	**8**	-
collisore/i di elettroni/ elettrone-positrone	6	4	2	-
collisore/i lineare/i	2	-	-	-
collisore/i di particelle	1	-	-	-
anello/i (di collisione)	**14**	**5**	**1**	-
anello/i di accumulazione	7	3	-	-
anello/i di attenuazione	6	-	-	-
macchina/e	**41**	**38**	**43**	**29**

Comparing 'machines' across corpora

- In Nobel Lectures there is a marked preference for more specialised terminology
- In all corpora the initialism LHC is preferred to the full form
- Use of *accelerator* and *collider* both as standalone and in compounds is very similar in *Scientific American* and the LHC corpus; frequencies are considerably different in Nobel Lectures
- In popular science a selection of conceptual links rather than full representation seems to emerge
- In Italian there is progressive simplification from *collisore* ***tra*** *elettroni* ***e*** *positroni*, *collisore* ***di*** *elettroni* e *positroni* and *collisore* ***per*** *protoni* e *antiprotoni* to **collisore protone-antiprotone**

A scientific controversy

In 2007 the physicist (and sometime surfer) Garrett Lisi made headlines with a possible theory of everything . The fuss was triggered by a paper discussing E8, a complex eight-dimensional mathematical pattern with 248 points. Lisi showed that the various fundamental particles and forces known to physics could be placed on the points of the E8 pattern, and that many of their interactions then emerged naturally. Some physicists heavily criticised the paper, while others gave it a cautious welcome. (*New Sicientist*, 04 March 2010)

The theory in the press

"Surfer dude stuns physicists" *Daily Telegraph* 14.11.2007

"Is this the theory of everything? *New Scientist* 17.11.2007

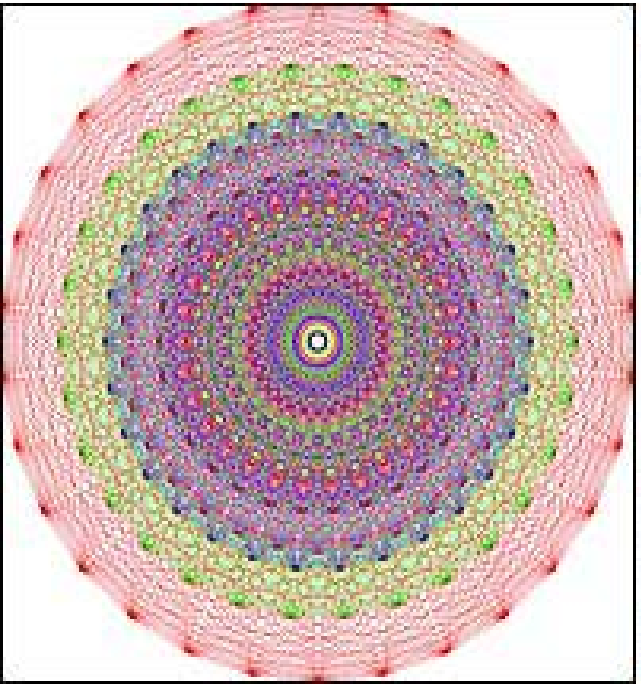
"Is this the fabric of the universe?" *Daily Telegraph* 21.11.2007

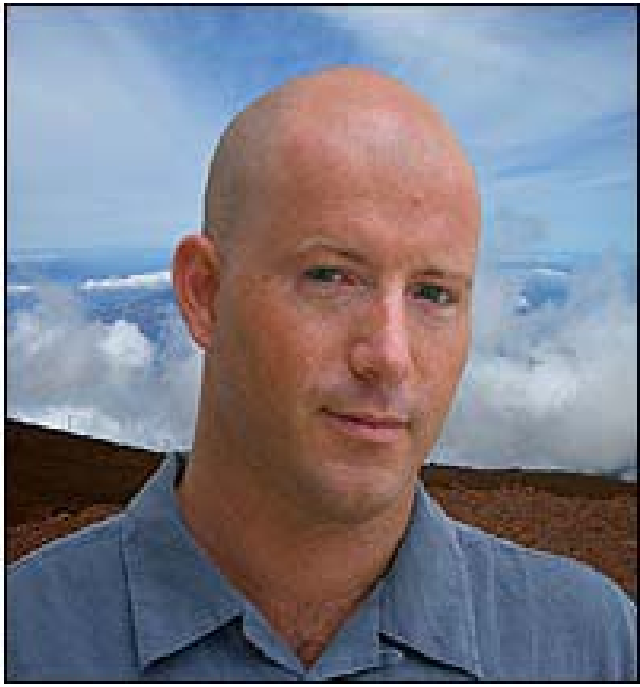
"E8. L'universo è così. Parola di surfer" *Repubblica* 16.11.2007

"Il surfer che ha unificato la fisica" *La Stampa Tuttoscienze* 21.11.2007

"La scienza che fa il surf svela i segreti dell'universo" *Corriere della sera* 25.11.2007

An exceptionally simple theory of everything





http://arxiv.org/pdf/0711.0770 November 6th, 2007

An Exceptionally Simple Theory of Everything

The title of his paper "An Exceptionally Simple Theory of Everything" is a pun. His theory relies on E8, which, in mathematician's jargon is the largest exceptional simple Lie algebra over the complex field. The jargon words “exceptional” and “simple” have a special technical meaning.

Daily Telegraph blog

Terms and variants

English

Term

Exceptionally Simple Theory of Everything

exceptionally simple theory of everything
"Exceptionally Simple Theory of Everything"
simple theory of everything
"theory of everything"
"Theory of Everything"
Garett Lisi theory of everything
Lisi's theory
E8 theory
E8 unified theory

Italiano

Term

Teoria del Tutto
Straordinamente Semplice

Teoria del tutto eccezionalmente semplice
semplice teoria del tutto
straordinariamente semplice teoria di ogni cosa
"Teoria del Tutto"
"teoria del tutto"
teoria del tutto di Garrett Lisi
teoria E8

Terms and variants

English

Term

Theory of Everything

theory of everything
TOE
ToE
"theory of everything"
unified theory
ultimate theory
grand unification theory
GUT

Italiano

Term

Teoria del Tutto

TOE
Teoria del tutto
teoria del tutto
Theory of Everything
teoria di ogni cosa
teoria unificata
teoria finale
teoria di grande unificazione
GUT
grande unificazione

The Theory of Everything – a boundary object

English

- string theory
- superstring theory
- M-theory M theory
  Master theory

A **theory of everything** (TOE) is a hypothetical theory of theoretical physics that fully explains and links all known physical phenomena.

Wikipedia

Italian

- teoria delle stringhe (once called *teoria delle corde*)
- teoria delle superstringhe
- teoria M M-teoria

Una **teoria del tutto** (in inglese *TOE*: Theory Of Everything) è, in fisica, una teoria che ha l'ambizione di spiegare, da sola, tutti i fenomeni fisici conosciuti.

Wikipedia

Graham P. Collins

"Wipeout", *Scientific American* April 2008

Today the theory is being largely but not entirely ignored. Lisi, naturally, continues to work on it, as does Smolin. Lisi says that even if what Distler claims is true, it would only be true for the variant of E8 ("real E8") used in his paper and that another variant ("complex E8") would certainly work. **Smolin argues that the press coverage gave the false impression that Lisi's proposal was a finished work. "In reality", he says, "almost every new theoretical proposal is first presented in a way that is flawed and incomplete, with open issues that need to be filled in…** While Lisi's proposal has exciting aspects, **this is the case with it as well**."

[In late 2008, Lisi was given a grant to continue his studies of E8. (*New Sicientist*, 04 March 2010)]

Implications and applications

- Analysis of the corpus suggests that when new terms are introduced in popular science their 'simpler form' is chosen with reference to its pragmatic use for the targeted readership and specific text types
- As a consequence, the accompanying definitions, figures of speech etc. differ
- Change of terminology is not always accounted for
- Point of view may be relevant in the presentation of scientific research in a controversy
- Term collections – especially when including languages where science in translation means mostly popular science in translation – should take this diversity of uses of terminology into account