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Popularised science communication modes in Italian popular science magazines (1788-2002)

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Analysis of popular science magazines can offer a significant contribution to the study of the history of science popularisation and the relation between the language of science and everyday language in Italy. This paper reconstructs the history of science popularisation through analysis of popular science magazines published in Italy from 1788 to date. The material examined consists of 80 popular science magazines covering various scientific disciplines, reporting current issues and targeted at a non-specialist public. Such material had never been gathered and organised in a systematic way before. The analysis did not take into account academic scientific journals which generally cover a single discipline and use technical language or high-quality science popularisation journals which also use specialist language. The element that all 80 magazines have in common is the use of non-technical, easily understandable language for a public that does not possess any specialist scientific knowledge. The analysis of the material offers an overview of the scientific disciplines that have been covered more extensively in popular science magazines from the end of the 18th century to date. In addition, it shows how priorities in coverage changed in different historical periods and how a variety of science communication modes have been established over time

Material division into periods

Every historical or critical analysis of the language of science popularisation is based on a corpus of documents which should be as complete as possible. Furthermore,

it should be coherently organised. On the basis of this assumption, a bibliographical search was conducted in order to compile the first catalogue of Italian popular science magazines from their first appearance to date.

In order to organise the analysis of the corpus, the material gathered was divided into periods. These periods are not equally long but they correspond to the variations in the number of popular science magazines in circulation over time. Consequently, the following periods have been identified: a long initial period (1788-1863), followed by a period of intensive publishing activity after the unification of Italy when the number of popular science magazines multiplied (1864-1914), the difficult period between the two World Wars when few new magazines appeared (1915-1945) and the period ranging from the end of the Second World War to 2002 when the publishing sector of popular science magazines gradually began to flourish (1946-2002).

The first popular science magazines in Italy the 18th and 19th centuries

Towards the end of the 18th century in Europe up-to-date information on the latest events and the most interesting innovations in all scientific fields of knowledge started circulating. Facts and events directly related to science and its applications in society and industry were reported along with that information. This phenomenon, which follows the genesis of public opinion on science, is part of a wider process described by Jürgen Habermas that is, the formation of public opinion in 17th century Great Britain, when the circulation of goods was accompanied by the spread of commercial news.

Along with the first news-sheets and newspapers, new communication channels and forms were created for science as well. Science news aroused interest mainly because of its resulting applications in agriculture and industry. In 18th century Italy, science news also appeared for the first time in periodicals aimed at a non-specialist audience which resembled commercial news-sheets rather than traditional academic publications.

One of the first examples of a periodical of this type is *Biblioteca fisica d'Europa* published in Milan in 1788 by doctor, chemist and naturalist Luigi Valentino Brugnatelli (1761-1818). Probably modelled on French popular science magazines of

that time, *Biblioteca fisica d'Europa* was created in order to "acquaint the Italian public with the most important papers of foreign scientists". The great interest in various fields of natural philosophy, characteristic of that time, along with the keenness to present progress in natural sciences led Brugnatelli to the creation of another popular science periodical, *Giornale di fisica, chimica e storia naturale* (1808-1818), which was so successful that each issue sold more than 500 copies.

At the same time, interest in science popularisation was beginning to awake in Southern Italy as well. A young doctor and manufacturer from Teramo (a town in the South of Italy), Vincenzo Comi (1764 - 1839), founded the bi-monthly *Commercio scientifico d'Europa col Regno delle Due Sicilie* (1792 -1793). Just like Brugnatelli's periodical, Comi's publication was aimed at "every learned man" and featured a wide range of disciplines and stories often linked to current events written in comprehensible language.

Similarly to *Biblioteca fisica d'Europa*, the principal source of *Commercio* was Comi's correspondence with numerous European scientists, among whom Antoine Lavoisier, Erasmus Darwin and Luigi Galvani, members of the Royal Society and academies throughout Europe. In both magazines, scientific papers and reports were summarised in less technical language and commented on. The most interesting points of the scientists' work were gathered and disseminated beyond the limits of the academic world, providing science communication to a larger sphere of learned men, amateur scientists and entrepreneurs who were involved in industry and were interested in "progress". Like a large number of the popular science magazines that were to follow, *Commercio* discontinued its publication in February 1793 because of the lack of subscribers. It was a hard decision to take and the interruption of the publication was mainly due to economic difficulties. Until the end, Comi tried to carry on its publication even by opening a print shop in Teramo. Other Italian popular science magazines published in Southern Italy or on the islands at the beginning of the 19th century were equally short-lived. Two examples are *Lo Specchio delle Scienze*, published in Palermo, Sicily, in 1814, and *Compilatore delle cognizioni utili*, published in Cagliari, Sardinia, from 1835 to 1839.

The catalogue of Italian popular science magazines

The overall number of science popularisation periodicals traced in Italy from the end of the 18th century to date is eighty. This figure only includes popular science magazines, that is magazines targeted at an audience who is interested in science but does not necessarily possess scientific culture.[1]

Magazine selection was based on the catalogues of periodicals of Italian libraries and the Italian Press Yearbook editions from 1895 to date. A great deal of information on the scientific publishing sector in the second half of the 19th century was provided by the first Italian periodicals review, published by Nicola Bernardini in 1890.

The period between the second half of the 19th century and the beginning of the First World War was one of the most intensive periods for Italian science popularisation. As a matter of fact, twenty-eight new magazines appeared, a figure which accounts for almost a third of the total number of popular science magazines published in more than two centuries. This unprecedented flourishing of science periodicals in the second half of the 18th century is to be understood in the light of the new scientific discoveries and theories, the technological progress in the years of slow industrial development and the rise of positivism.

Whereas the very first popular science magazines often appeared in Southern Italy, in the second half of the 19th century, Northern Italy definitely became the centre of Italian science communication. Fifteen popular science magazines were published in Northern Italy, while nine were published in Central Italy and four in Southern Italy.

New magazines mainly appeared between the 1860s and the 1890s. In all, twenty-five magazines, clearly aiming at popularising science, were published. A few examples are *La Scienza a 10 centesimi*, *Cronichetta mensuale delle più importanti moderne scoperte nelle scienze naturali e le loro applicazioni*, *la Scienza in famiglia*. Some of them, such as *Rivista Scientifico-Industriale* and *Il Progresso* mainly concentrated on interesting industrial applications and aimed at bringing their audience up to date with innovations in this field by publishing numerous brief news items, often taken from foreign newspapers and periodicals.

As a matter of fact, that was the time when industry and technology promised to transform the cities and economic and social life, albeit to a limited extent in Italy, the steam engine speeded up production and transport, faster means of communication were created, large public works were constructed and the use of electricity was introduced

for industrial and domestic purposes. That was also the time of the cultural debate on evolutionary theories and the public hygiene campaigns in Italy. The latter were supported, however briefly, by the monthly magazine *La Natura*, created by publisher Treves and edited by Paolo Mantegazza. It was a very fertile period for the popular science press, a period which was practically interrupted by the First World War.

Just one magazine, *La Scienza per tutti*, was able to survive wartime with considerable difficulties and between 1914 and 1924 it was the only popular science magazine published in Italy. No new magazine was published during the Great War and the magazines still circulating in the first decade of the 20th century discontinued their publication in a few years' time.

Things began to change when the question of redirecting public funds for research arose at international level. After an initial conference on scientific organisation held in London, another two took place in Paris and in Brussels. In the early 20th century it was decided to establish an International Research Council to coordinate the National Councils set up in European countries. In such a context of general attention to issues of research, some popular science magazines were launched. New magazines appeared in Italy only as late as 1924 when *Scienza e tecnica pratica* was published, followed by *Natura* and *Scienza e vita* four years later (1928). More popular science magazines appeared in the early 1930s such as *Mondo d'oggi* (1934) and *Sapere* (1935). In 1937, a fully illustrated popular science magazine, *Il Giornale delle Meraviglie*, was published and three more magazines appeared between 1940 and 1944.

The Second World War marked the birth of Big Science: research projects that were so complex and ambitious that required large investments and made international collaboration indispensable. However, the deep transformation of research which took place in the 1940s and the 1950s didn't seem to be reflected immediately in Italian society. On the contrary, in post-war years, due to the dramatic economic conditions in Italy, little attention was given to research: five years after the end of the war the funds of the National Research Council (CNR) were reduced to a fifth of the figure allocated for 1939.

Despite all that, the reaction of popular science press was different: nine magazines appeared from 1946 to 1949, followed by another four in the 1950s and a

further three in the 1960s. Some of them were short-lived such as *Scienza popolare* (published for just one year) and *Historia naturalis* (Rome, 1946-1947). Others managed to survive longer such as *Scienza e lavoro* (1946-1960) and *La Scienza illustrata* (1949-1956). In all, between 1945 and 1954, 14 popular science magazines circulated in Italy.

In 1979 new popular science magazines appeared following the publication of *Scienza e vita nuova* and *Test* (later *Scienza 2000*) which inaugurated the golden period of popularised science journalism. As a matter of fact, between 1979 and 1988 thirteen magazines appeared. That trend was strengthened by the law on the publishing sector which allocated funds to periodical publications. In those years of economic prosperity, science journalism was often supported financially by companies operating in the field of science and technology.

The contents of popular science magazines

Contents analysis allowed identification of the topics preferred by popular science magazines. However, since periodic publications did not appear regularly until the middle of the 19th century, contents pages of popular science magazines published from 1788 to 1863 were analysed separately. Their articles and news items were organised in topics (for instance, description of new agricultural or industrial procedures) rather than actual disciplines.

Chemistry and medicine were among the disciplines which most frequently appeared in the first popular science magazines, followed closely by industry-related news. According to the analysis of *Biblioteca fisica d'Europa* and of *Commercio scientifico d'Europa con il Regno delle Due Sicilie*, what we now call physics and natural philosophy didn't appear regularly but their presence was nonetheless significant. This is accounted for by the fact that the founders of the first popular science magazines were chemists and doctors like Brugnatelli, Comi and Todde, a pharmacist from Sardinia, whose *Compilatore delle cognizioni utili* expressed the hope that Italy, too, could become an industrially developed country. In the medical field, the most frequent items were information on surgery techniques, principles of hygiene and news related to public health. News reports where scientific innovations played a

significant role often appeared.

In order to examine the contents of the popular science magazines published between 1864 and 2002, forty-two magazines which managed to survive for more than ten years were selected. The contents of their issues for one year out of ten were analysed. In this case as well, preference was given to an organisation of articles and news into topics rather than traditional academic disciplines. The frequency with which scientific but also historical, anthropological and social topics appeared was taken into account. Interest in technological applications directly affecting everyday life was also monitored. In the second half of the 19th century articles and news on electricity were extremely widespread. Towards the end of the 19th century, photography and cinematography appeared and in the middle of the 20th century, technological applications in home and leisure activities had particular appeal to readers. Since popular science magazines devoted a great deal of space to current issues, the latter were all gathered together in a special category which includes current events and articles on aspects of social, political and economic life.

Table 1 is based on the number of articles and news items which appeared on each topic. In the upper part (in white), the more frequently covered topics can be seen, arranged from top to bottom in order of frequency. In the lower part of the table (in grey), less frequently covered topics appear.

By observing the table, one can note that new topics emerged over time while others faded into the background. Industry, medicine and physics receive constant attention. Astronomy remains for practically more than a century among the most frequently covered disciplines due to its permanent appeal to the public. Zoology and nature in general have received growing attention over the years whereas other topics fluctuated considerably over time. For example, electricity was among the most extensively covered topics during the entire second half of the 19th century. However, attention to this topic wavered considerably in the period between the two World Wars. Other topics, such as agriculture and meteorology equally lost their interest while new topics, such as computer science, space and the environment, gained appeal in popular science magazines in the second half of the 20th century.

Table 1. *The periods between 1864 and 2002 can be seen in the table. Topics covered more frequently by popular science magazines are arranged from top to bottom in order of frequency. The topics that received less than 1% of average magazine space in each period can be seen in the lower part of the table (in grey).*

1864-1914	1915-1945	1946-2002
Industry	Industry	Medicine
Physics	Medicine	Industry
Electricity	Current issues	Physics
Chemistry	Physics	Current issues
Medicine	Chemistry	Home and leisure applications
Astronomy	Astronomy	Astronomy
Current issues	Military technologies	Environment
Geology	Aeronautics	Aeronautics
Zoology and nature	Biology	Science and society
Agriculture	History of science	Zoology and nature
Military technologies	Zoology and nature	Psychology
Public works	Telecommunications	Transports
Geography	Radio and TV	Computer science
Transports	Home and leisure applications	Space
Archaeology	Public works	Military technologies
Botany	Transports	Mathematics
Telecommunications	Geography	Biology
Meteorology	Electricity	Geology
Exhibitions	Mathematics	History of science
History	Agriculture	
	Photography and cinematography	
	Geology	
History of science	Pharmacology	Public works
Aeronautics	Archaeology	Chemistry
Palaeontology	Botany	Archaeology
Mathematics	Genetics	Palaeontology
Biology	Palaeontology	Geography
Photography	Oceanography	Pharmacology
Psychology	History	Genetics
Oceanography	Computer science	Agriculture
Pharmacology	Psychology	Photography
Home and leisure applications	Science and society	Meteorology
Demography	Paranormal phenomena	Radio and TV
	Exhibitions	Paranormal phenomena
	Environment	History
	Meteorology	Electricity
	Demography	Oceanography
	Space	Biotechnologies
		Botany
		Telecommunications
		Science fiction
		Inventions
		Bioethics
		Demography
		Exhibitions

Popularised science communication modes

As could be expected, the language of the popular science magazines that were taken into account changed significantly over the two centuries monitored. However, it is possible to indicate some modes of communication which persisted over time although they were adapted to linguistic, cultural and social changes.

News reporting

Science news reporting was already present in the very first popular science magazines where reporting on current issues was one of the most prominent features. Along with scientific papers on the latest theories and discoveries, brief news items were published. Those items described interesting events which had taken place recently and not very far away, or facts "that allow for more important and direct benefits", as Comi wrote in February 1793 (*Commercio*, 1793, 774). In 50 years' time news items became the pillar of a large number of popular science magazines. They were often presented in the form of very short articles written in everyday language. Rather than popularise science, the aim of those magazines was to inform readers and bring them up to date with the latest news from the world of science and industry.

The popularisation aspect was emphasised in the years that followed the unification of Italy when a large number of popular science magazines were published. Those publications were full of news and information, including information of commercial interest, on new products, inventions, technological procedures useful to industry and objects of various nature which closely concerned everyday life. If one browses through the popular science magazines circulating in the second half of the 19th century, the importance of reporting as many news items as possible becomes evident. Those news items were often very brief, barely ten lines long, but extremely numerous. During the entire 20th century to date, popular science magazines have devoted part of their space to brief news items on current issues.

Popularisation

The need to educate readers was created along with science news. Readers

became acquainted with the contents of new theories or inventions with possible practical applications. At the same time, the need to familiarise the public with the scientific concepts and laws underlying discoveries and inventions was felt from the very beginning. It was a very difficult task, as Guido Vimercati observed in 1869, lamenting in *Rivista scientifico-industriale* the lack of adequate scientific information in Italy and proposing his model of a popular science press where the language used should be "clear, intelligible and devoid of technical or scientific specialist terms".

Narrative

From the second half of the 19th century on, some popular science magazines opted for another form of introducing readers to scientific topics: they published short stories, whose style was very similar to that of novels, describing scientists' lives and discoveries. They were based on the lines of popular books written by famous British and French writers who popularised science such as Emile Rengade's *La vita normale e la salute* or Camille Flammarion's *La terra e il cielo* (*Dans le ciel et sur la terre*). Their works appeared in the form of serial novels in *La Scienza per tutti*, a popular science magazine which also ran a serial feature on the "Martyrs of science".

Dialogue with the readers

Some popular science magazines such as *La Scienza e la fede* adopted dialogue between teacher and student as an approach used mainly in order to analyse theoretical topics such as the relation between science and faith or the nature of scientific knowledge.

Dialogue was one of the least used communication modes in popular science magazines although it never ceased to exist completely. Almost 100 years after the appearance of *La Scienza e la fede*, other popular science magazines still used dialogue in order to introduce and explain new terms and, above all, new concepts, just as *Scienza e lavoro* did in the 1940s and 1950s.

Illustrations

Illustrations were used from the very beginning in science popularisation for at least two distinct purposes: the first was essentially to inform through diagrams and designs whose function was to explain and clarify article contents; the second, which appeared in the late 19th century, rather aimed at arousing readers' interest and curiosity. Brugnatelli's magazines served the first purpose with technical diagrams which were extremely clear and easy to understand for the average reader. With very few exceptions, all popular science magazines published in the 19th century used illustrations in the same manner.

In the first few decades of the 20th century and, in particular, in the period between the two World Wars, illustrations became ever more frequent. *Sapere* was one of the first popular science magazines to make extensive use of illustrations. Its photographs were as spectacular and telling as its articles were and they were entirely consistent with the text. Photos were made using techniques that were state-of-the-art for the time, such as photomacrography. The change of approach introduced by *Sapere* marked for the first time a deeper transformation in the style of science popularisation that in some cases changed the relation between illustration and text often to the benefit of the former.

Assertion

The image of a powerful science which provides certainties and wealth appeared in full view for the first time in some popular science magazines published after the unification of Italy. The instrument used in order to convey that image of a dominant science was a language full of assertions.

That tendency was more evident during the twenty years of the Fascist regime when popular science magazines featured propaganda slogans on science using Benito Mussolini's words. Propaganda was strikingly plain and straightforward. Slogans were based on images of an efficient, competent and reliable science. In a large number of popular science magazines of that time, "Fascist" was one of the most frequent adjectives used to describe "science".

When the objective of spreading propaganda ceased to exist, part of the popular science press after the Second World War continued cultivating the image of a science which provides certainties, truths and social well-being. That tendency is confirmed by

the way in which fear that scientific research was being used to construct lethal weapons such as the atomic bomb was dealt with: positive images of a future when technology would be the pillar of an advanced society were often presented. “In 2000 we will be young at 100 years of age” claimed *La Scienza Illustrata* in 1955. It was one of the many dreams of that time with reference to the mythical 2000 when it was imagined there would be nuclear railway engines and cars that could travel at sea or in the air (*Scienza e vita,* 1965). In addition, the dividing line between scientifically grounded forecasts and pure imagination was very subtle. In fact, particularly in the 1950s, it was possible to read on the front cover of a popular science magazine: “Flying saucers exist for real” and find an illustrated report on the inside with the title “Flying saucer mystery revealed”.

Conclusions

This paper has demonstrated that a catalogue of Italian popular science magazines is absolutely necessary for a systematic analysis of the history of science communication in Italy. The 80 popular science magazines published from 1788 to 2002 are an indispensable reference in order to conduct a detailed investigation of the language of science popularisation and its relation to the language of science.

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[1] **Italian popular science magazines from 1788 to 2002**

Biblioteca fisica d'Europa

Commercio scientifico d'Europa col Regno delle Due Sicilie

Giornale di fisica, chimica e storia naturale

Specchio delle scienze

Compilatore delle cognizioni utili

La Scienza e la fede

La Scienza a 10 centesimi

Le Meraviglie dei tre regni della natura

Le Meraviglie della scienza

Cronichetta mensuale delle più importanti moderne scoperte nelle scienze naturali e loro applicazioni

La Scienza del popolo

Il tecnico enciclopedico

L'Album. La Scienza in famiglia

Rivista scientifico-industriale delle principali scoperte e invenzioni

La Scienza contemporanea

Il Progresso

La Scienza italiana

L'Elettricista

L'Italia scientifica

La Scienza per tutti

Scienza e lettere

La Natura

La Nuova scienza

La Scienza popolare illustrata

La Scienza pratica

Scienza e natura

Scienza e diletto

Giornale scientifico di Palermo

La Scienza popolare

La Scienza in famiglia

La Rivoluzione scientifica

La Scienza e la vita

Scienza e lavoro

Scienza pratica

Scienza e tecnica pratica

Natura

Scienza e vita

Mondo d'oggi

Sapere

Il Giornale delle meraviglie

La Scienza del popolo

Il Saggiatore

Scienza europea

Scienza popolare

Natura e vita

Historia naturalis

Scienza e lavoro

Selezione scientifica

Scienza e meccanica popolare

Scienza e vita

La Scienza illustrata

L'Illustrazione scientifica

Civiltà delle macchine

Sistema pratico

La Scienza nuova

Tecnica illustrata

Homo nuova scienza

Sperimentare

Le Scienze

Scienza e vita nuova

Test

Scienze digest

Scienza '81

Scienza & politica

Newton

Frontiere della scienza

Scienzasocietà

Se - Scienzaesperienza

Genius

Molto interessante

Scienza e dossier

Technology Review

Teknos

Ti con uno

Focus

Newton

Scienza nuova

La macchina del tempo

Quark

La Ricerca