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Book of Proceedings Communicating Astronomy with the Public Conference 2018 2nd Edition
ISBN:978-4-908895-02-9

Published by NAOJ
on behalf of the conference organizers,
the Scientific Organizing Committee,
the Local Organizing Committee
and the supporting organizations.

September, 2018, Tokyo, Japan

Conference website
https://www.communicatingastronomy.org/cap2018/

Communicating Astronomy with the Public Conference 2018

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Costellazione Manga: a Space Journey Through Astronomy, Japanese Comics and Animation

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Abstract. We present Costellazione Manga, an outreach format that considers astronomical references present in manga and anime and highlights the physics behind them. We take the cue from realistic comics to illustrate the harsh reality of space travel. We use works with a more fantastic perspective to introduce general topics: the difference between stars, planets and galaxies, and the possibility of finding life on other planets. This format has been well received by the public and can be considered a powerful pedagogical tool.

1. Introduction

Comics and animation have a long history as tools for teaching and outreach. Walt Disney was a strong supporter of educational animation [1], and since the 1940s the Disney studios produced a number of short animated films on different themes, such as psychology, medicine, health, and economy. Sweden has a tradition of animated documentaries. In Italy, artist Bruno Bozzetto won prizes for the animations made for the science outreach TV programme *Quark*. Japan is no exception, with planetarium shows [2,3] inspired by animated cartoons such as Leiji Matsumoto's *Galaxy Express 999,* or with books that discuss history in the form of comics where the characters are represented as dogs [4].

However, most comics and animation works are made with entertainment purposes rather than teaching. Yet many of them offer several connecting points from which to start discussing astronomy. Our project *Costellazione Manga* (in English: Manga Constellation; hereafter CM) builds on Japanese mainstream works that are effective in catching the attention of the public. This approach is similar to that followed by books that explain physics and astronomy taking cues from American superhero comics [5] or Japanese cartoons [6].

In the following, we briefly describe our approach and our results. We refer Japanese comics and cartoons by their Japanese names *manga* and *anime*, respectively. More details and updates can be found www.costellazionemanga.eu or on [7].

2. Birth of a common language: popularity of anime and manga in Italy

Anime started to be imported and screened on European TVs in the late 1970s; among the first works were co-productions between European coun-tries and Japan (e.g., *Vicky the Viking; Barbapapa)*, and Japanese works based on European books and comics (*Heidi, Girl of the Alps)*. The first science-fiction work to be imported in Italy was *UFO Robot Grendizer*, which sparked wide interest across the country, was a subject of debate in the parliament, and whose (Italian-written) opening song single sold more than 1 million copies [8].

Local TV broadcasting had been liberalised in Italy in 1976, and after the success of the first imports by national broadcaster RAI, local TVs turned to the Japanese market to acquire massive amounts of animation to fill their schedule. This situation persisted even after many local TVs consolidated into national networks, for all the 1980s and 1990s. Manga popularity grew slowly, but since the 1990s manga represent an important fraction of all comics published in Italy.

Therefore there are two generations that have had anime and manga as staples of TV and printed entertainment. They share a *common language* made of references to cartoon plot lines, graphics and tropes.

Similar phenomena occurred also in other countries, ranging from the United States to Europe to the Middle East, making the popularity of anime and manga more than just an Italian circumstance.

3. The Costellazione Manga project

The CM adventure started in October 2011 as a cultural event organized by the Association for Cultural Exchanges between Italy and Japan (ASCIG) and the *Rheyta* Amateur Astronomers Association (ARAR), both in Ravenna, Italy, and has been often hosted by the Planetarium of Ravenna. Since the first conference we started to collect ideas and materials from several manga and anime. We considered both mainstream and avant-garde works. The proposed stories are often pure fantasy or sci-fi, yet they offer many cues that can lead to the discussion of astronomy and physics topics. CM is an outreach show that aims to conduct the public through an unusual uni-

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Fig.1 The Costellazione Manga logo.

verse, where fiction and reality both concur to increase knowledge.

For a typical event, we choose three or four anime that are well-known by the local public. We recall the cartoons by showing images and playing their opening tunes. We briefly recap the plot lines, and we identify some connections with astronomy from where we start to discuss contemporary knowledge. For example, in *Galaxy Express 999*, *Starzinger* and *Starblazers* (original title: *Space Battleship Yamato*) the main characters visit many planets, some in our Solar System, and some outside of it. We take the cue from it to review what astronomers know about planets, and to show the latest discoveries in the field of extra-solar planets. Nowadays, more than 3000 extra-solar planets are known: they are of different types, sizes and chemical compositions. Depending on their orbit, they can have freezing or scalding climates. Some of them lie in the so-called "habitable zone", where temperatures are mild and liquid water might be present, but we still don't know any planet whose climate is similar to that of Earth. Sometimes we have "bad news": the fans of *UFO Robot Grendizer* might be disappointed to learn that astronomers have found no signs of planets around the star Vega [9], from which their favourite giant robot supposedly comes from.

Among the animes that get regularly featured in Costellazione Manga there are also *Fist of the North star* and *Saint Seiya*. From both of them we introduce the topic of constellations, both according to the Western tradition, and to the Chinese-Japanese one.

Some works deal with more adult and authorial topics, e.g. *2001 Nights* or *Planetes*. They can introduce introspection on the relationship between humanity and space: what are the risks, the benefits, and how fragile is the human presence in space?

4. Reception and summary

Costellazione Manga has been proposed in several forms: as planetarium shows, as night observations of the sky, or as seminars. All times we had enthusiastic reactions from our public, that included both adults and children. Adults were familiar with the cultural references and enjoyed connecting childhood memories to science. Children were less familiar with some of the material but after our introductions they were immediately engaged with the stories and curious about the astronomical aspects of the series. Children and their parents (and grandparents too!) were linked together by a common fascination for astronomy. A nice and somewhat unexpected outcome was that they started sharing appreciation for the stories and heroes, therefore establishing a fruitful dialogue between generations.

Thus Costellazione Manga has demonstrated to be a really efficient and pedagogical tool to popularise and communicate astronomy. The use of comics and anime deeply engages the public. It also stimulates important aspects of the learning development as the critical thinking and the curiosity of the discovery; moreover it motivates people to read more about the astronomical references, and helps them in remembering concepts and building connections between different topics and subjects, which is a fundamental part of the deep learning processes.

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