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The eventful life of Guido Horn d'Arturo in a comic book

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Abstract. Sometimes, the misadventures of life interfere with the discoveries of astronomers and make their success difficult. In any case, this can be a real adventure. This project uses comics, precise drawings, and text to represent historical information about one remarkable astronomers eventful life. Comics are a unique form of media perfect for capturing adventures and reaching large audiences; in particular, young people especially appreciate them as a form of entertainment. First, we selected the life and the work of Guido Horn dArturo (1879-1967), the astronomer that observed and published the first scientific results after using multiple mirrors telescopes in the 1950s. At the time, this technology was a real breakthrough and today is widely used worldwide to build the largest telescopes. Horn dArturos success was achieved during his lifelong fight for his political beliefs and in opposition to racial laws during the Italian fascist regime.

Key words. General: History and philosophy of astronomy

1. Introduction

In recent years, comics took on a new role. Born as an entertainment form to tell histories and adventures of various types, comics are often used to illustrate real historical events. Famously in Italy, the *History of Italy* by journalist and writer Enzo Biagi was edited by Mondadori with several editions from 1978 to 2004. More recently, comics have also been used to introduce scientific themes (see e.g. PONYS - Physics & Optics Naples Young Students [1]), including the history of scientists. Italian comics like these include the histories of *Nikola Tesla*[2], by Sergio Rossi and Giovanni Scarduelli, and *Marie Curie*[3] by Alice Milani, by BeccoGiallo publisher.

Because comics like these may reach a large audience and disseminate precise physical, astronomical and historical information, this project produces comics dedicated to the lives of Italian astronomers who deeply influ-

[1] `http://home.infn.it/it/news-3/news-uffcom/1851-la-fisica-si-fa-fumetto`

[2] `http://www.beccogiallo.it/prodotto/nikola-tesla/`

[3] `http://www.beccogiallo.it/prodotto/marie-curie/`

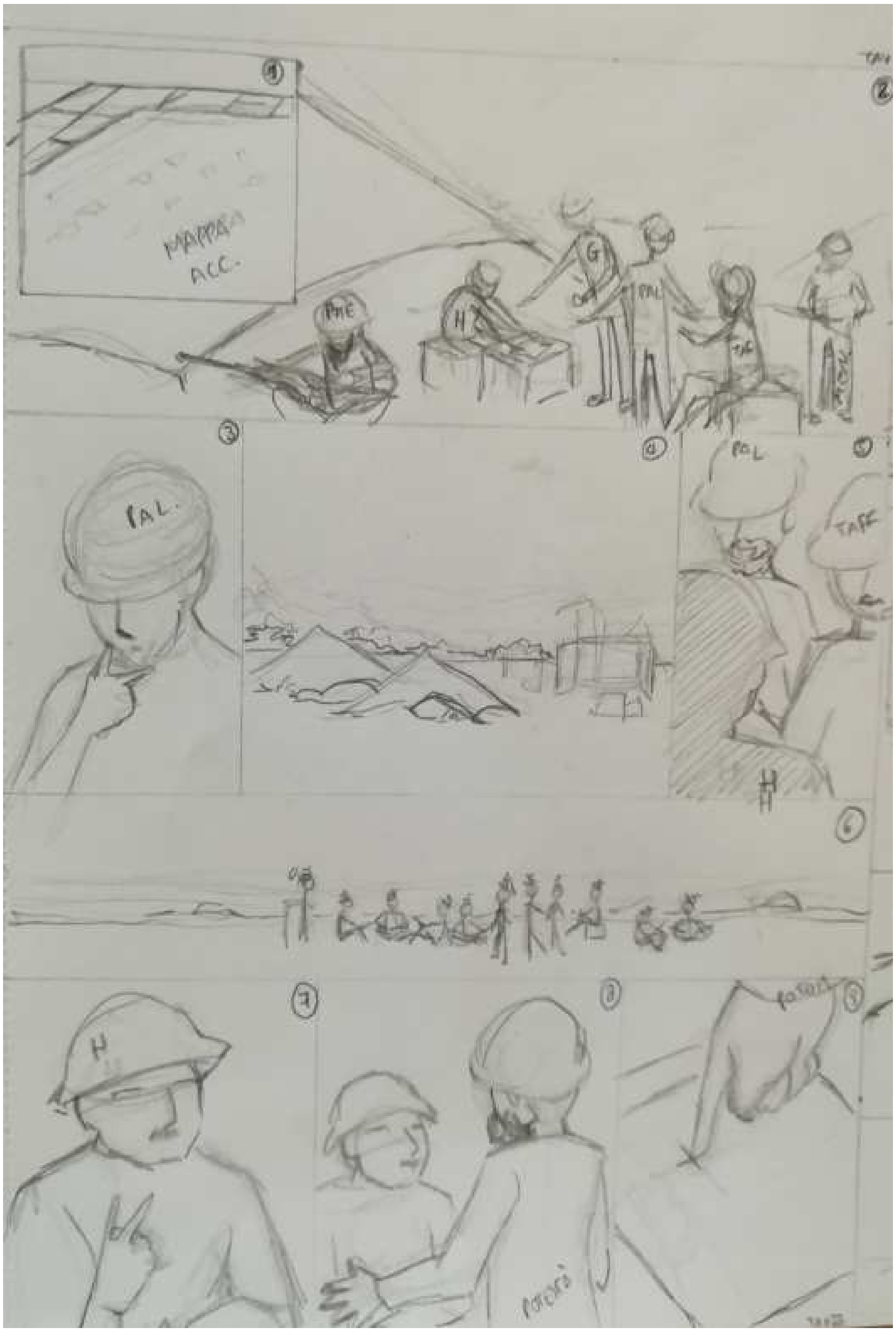

Fig. 1. TABLE III . The panels from 1 to 9 are described in the text, § 2.1. Several panels are sketched from original photographs documenting the mission.

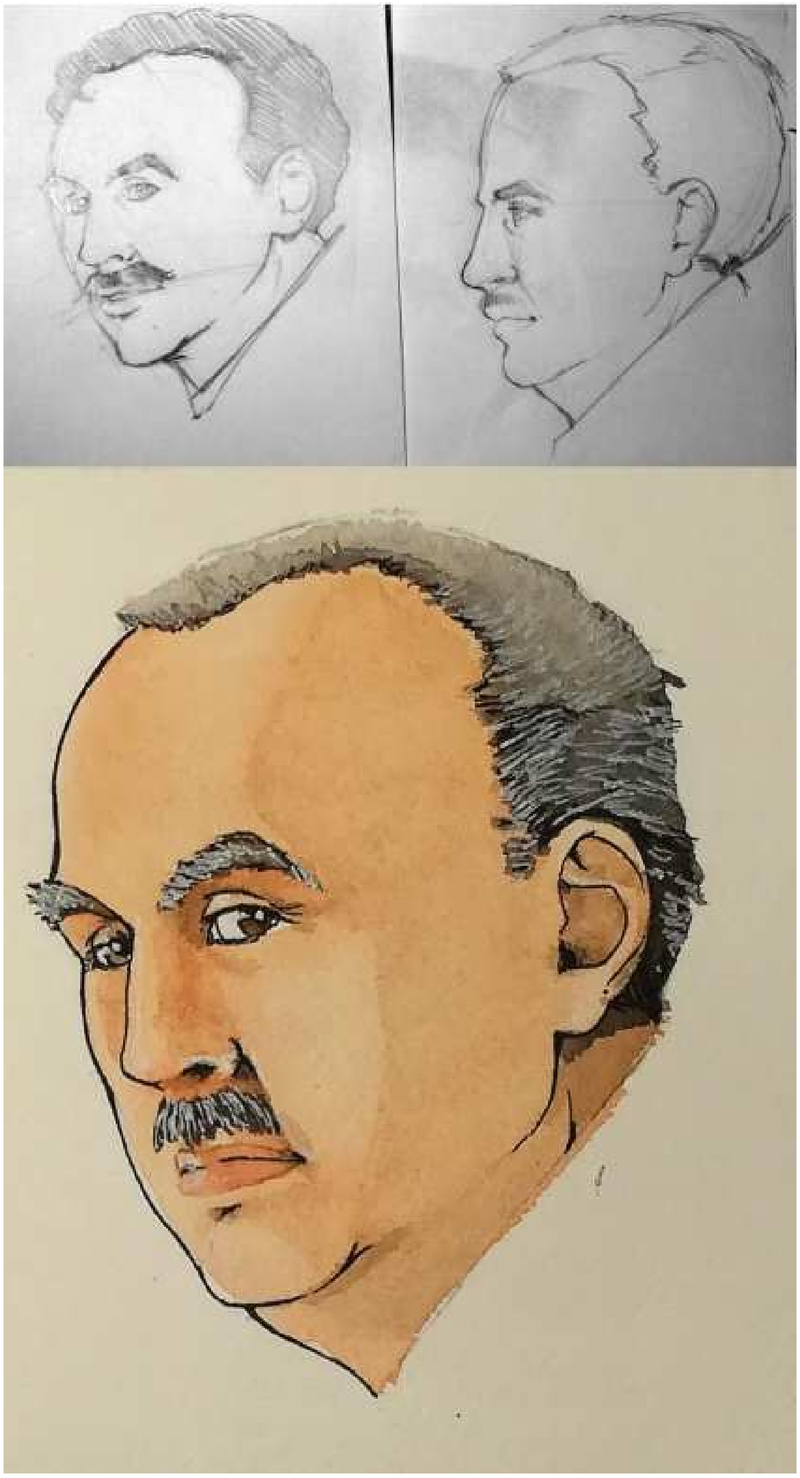

Fig. 2. The study of the face of Guido Horn d'Arturo.

Fig. 3. The study of parts of the equipment of Italian troops during World War I.

enced the history of astronomy in Italy and abroad.

In this context, we identified the figure of Guido Horn dArturo as prototypical. The character of Guido Horn dArturo is suitable for a comic book because of his courage, responsiveness, perseverance, and lastly, his beautiful mind. In 1879, he was born to a Jewish family in Trieste, which, at the time, was still part of the of the Austria-Hungary Empire. His youth is pervaded by the so called Italian irredentism, although he was educated at universities in Graz and Vienna. In 1870, Italy was just reunified, and Rome became the new Capital of the Kingdom of Italy under the Savoy dynasty. This led Horn d'Arturo to enlist as a volunteer in the Italian Army in World War I (WWI) from 1915-1918. He changed his family name from Horn to Horn d'Arturo in order to, in the case of capture, avoid being judged a traitor and shot by Austrians. He served as lieutenant in the artillery and was awarded the War Cross and preserved this new family name after the end of the conflict.

After the war, as an appointed astronomer, he participated in a scientific expedition to the new Italian territories in the Horn of Africa; this expedition was part of the new spirit of development that pervaded the country. In 1921, he was appointed Director of the Astronomical Observatory of Bologna, that he has revived after a long period of decadence. In 1931, he founded the astronomical journal *Coelum*, in a preliminary effort to introduce popular astronomy in Italy; this followed the example of foreign magazines at the time, such as the French *Revue dAstronomie populaire* by Camille Flammarion or the *American Popular Astronomy*. Additionally, *Coelum* survived until 1986, several years after Horn d'Arturos's death, when its publishing stopped.

After the promulgation of the racial laws in 1938, Horn dArturo was removed from the staff of the University of Bologna because of his Jewish origin; this was at the time when his multiple mirror telescope project just began. He was able to escape the capture by Nazi troops during the Italian Civil War from 1943 to 1945. At the end of World War II in new democratic Italy, Guido Horn d'Arturo was reappointed as Full Professor and Director of *La Specola of Bologna*. He resumed his research with the many larger versions of his multi-mirror telescope, the *telescopio a tasselli*, which is still preserved today at the Museum of La Specola in Bologna.

Detailed biographies of Guido Horn dArturo are available in Foderà Serio & Randazzo (1997), in Bonoli (2004) and in this volume. Recently, the Masters thesis by Picazzi (2016) investigated the work of Guido Horn dArturo dedicated to the concept study, discovery and astronomical application of the multiple mirror telescope; this thesis was supervised by Prof. Fabrizio Bonoli at the University of Bologna. This thesis reports various attempts to operationalize the telescope and sheds light on the different versions and sizes of the telescope. Additionally, it reports the first results of the observations from the end of the 1940s, just after the end of World War II. We referenced these studies to build our comic book.

Our project is still in progress. Some parts have been well-developed, such as the text (in Italian) and the storyboard of Horn dArturos travel in Oltregiuba, a territory in Somalia granted to Italy by a treaty in 1924. The trip to Oltreguiba was intended for studying a solar eclipse with several Italian colleagues. We aim to present our work along a set of tables with Guido Horn dArturos most important life events.

The plan for the current paper is the following. In § 2.1 , we present the draft comic storyboard and dialogue developed for Chapter 2 of our book. In § 2.2, we show some comic strips about the study of Guido Horn d'Arturo's face. Next, we show study examples of the environment dedicated to Italian soldiers WWI uniforms and the astronomical expedition to Oltregiuba (Somalia) to follow a solar eclipse. Finally, in § 3, we present the set of tables shown at the INAF Observatories in Padova and Catania.

Fig. 4.
This introductory table is reminiscent of studies of Guido Horn d'Arturo carried out in Austrian Universities in Graz and Vienna. The face of Guido Horn d'Arturo is taken from original photos.

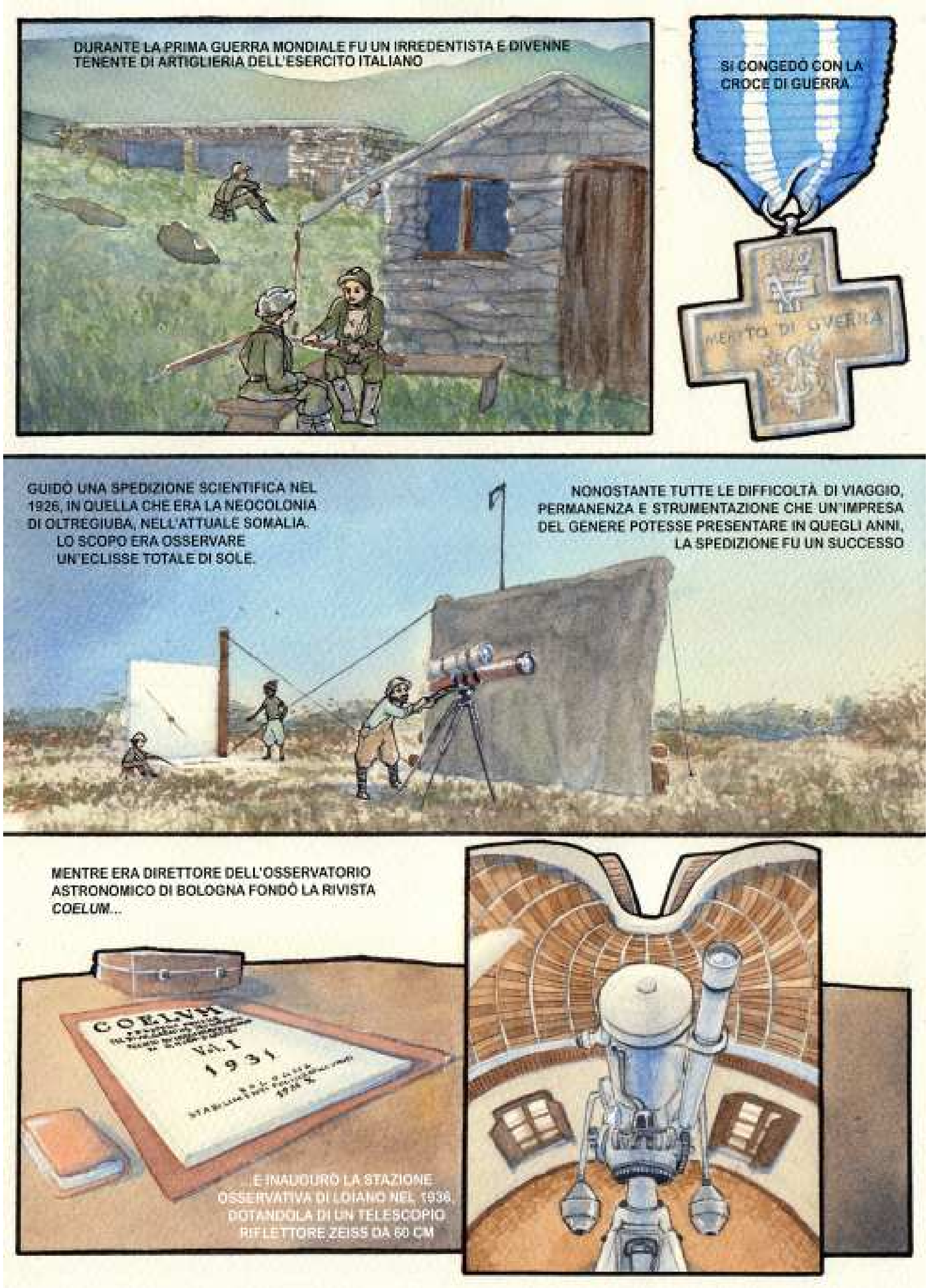

Fig. 5.
This table sumarizes the participation of Guido Horn d'Arturo in WWI, his decoration, the expedition to Oltregiuba (Somalia), his activity as founder of the astronomical journal *Coelum*, and the inauguration of the 60 cm telescope in Loiano.

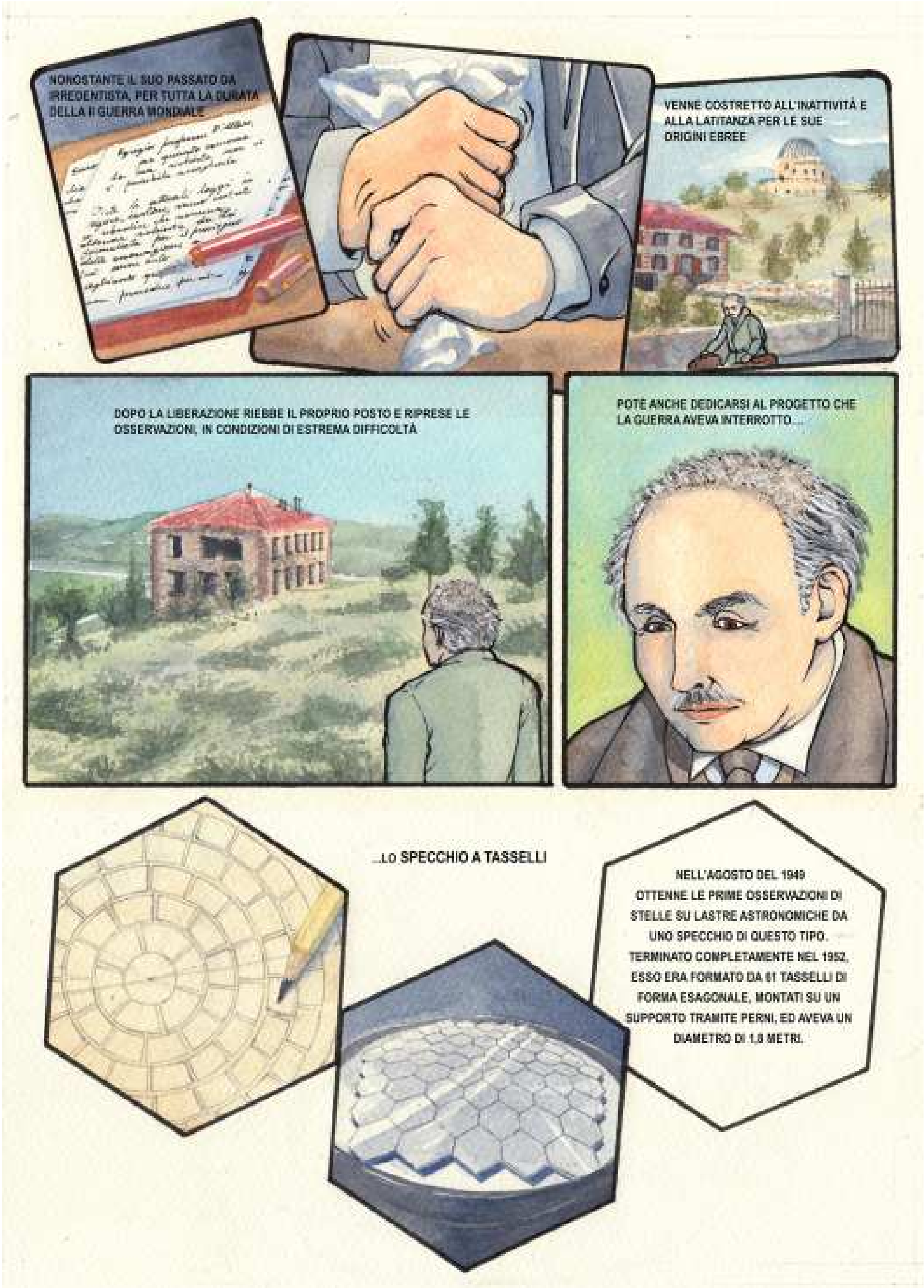

Fig. 6.
The table presents one of the toughest moments in Guido Horn d'Arturo's life: his removal from the positions of Director of La Specola of Bologna and Chair of Astronomy at the University Alma Mater of Bologna. The bottom panel sketches the *telescopio a tasselli* after his reinstatement at the Astronomical Observatory of Bologna at the end of World War II.

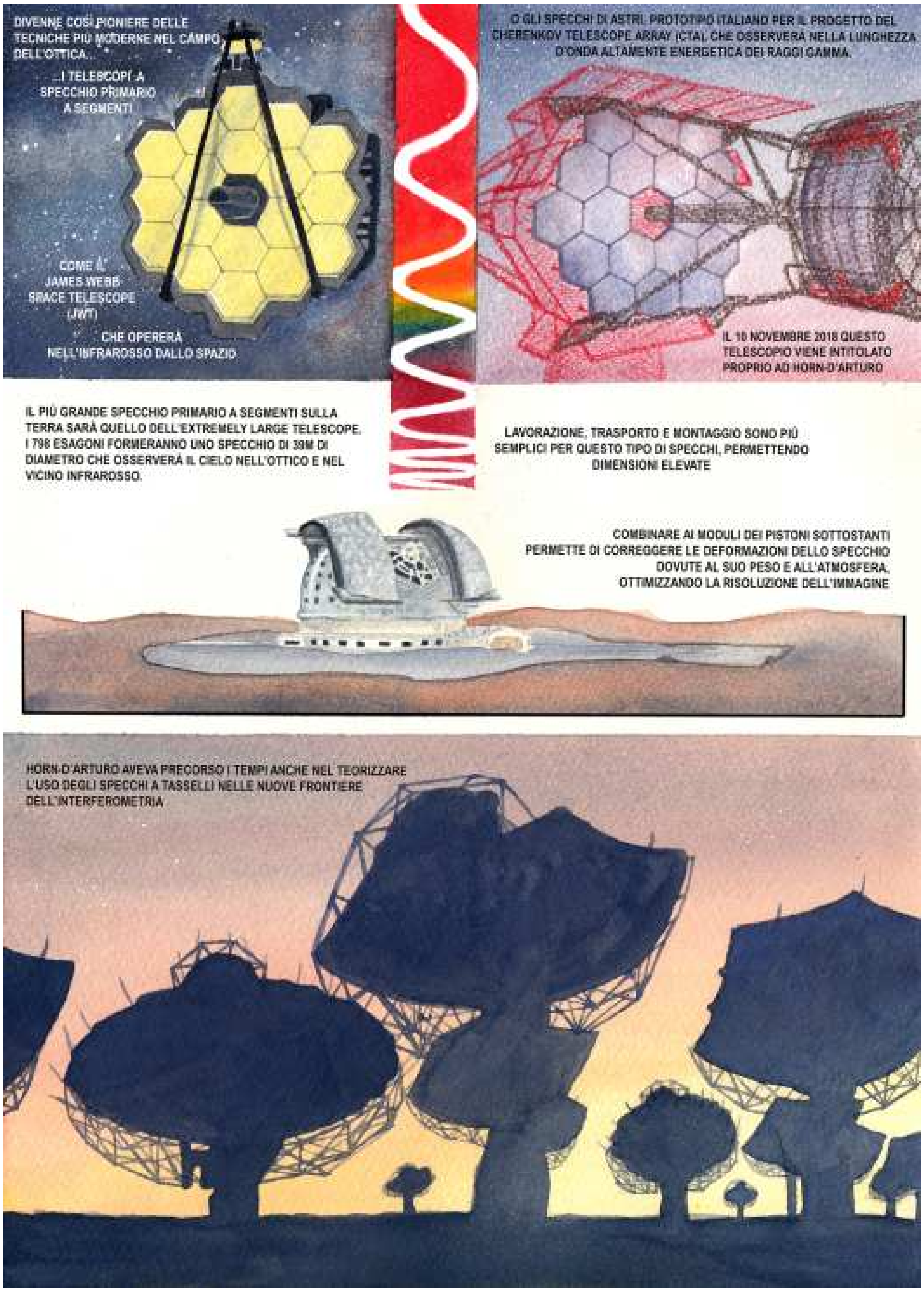

Fig. 7.
The pannels in this table refer to both existing (ASTRI) and future telescopes (JWST and ESO-ELT) that use the multi-mirrror technology. In the last part of his life, Guido Horn d'Arturo also thought to use mirrors in his telescope in interferometry. This panel recalls this point, showing a sketch of a large interferometric array of radio telescopes.

2. Preparatory studies for the comic book

2.1. Storyboard and Screenplay

The storyboard presents four scenes about the life of Guido Horn d'Arturo and a final one dedicated to the new telescopes based on multi-mirror technology.

The first set illustrates the youth of Guido Horn d'Arturo and his education in Austrian universities until he served in the Italian WWI theatre of operation. The second scene is dedicated to Horn's participation in the Italian mission in Oltregiuba to observe a solar eclipse. The third and fourth scenes describe the*periodo bolognese*; after WWI and WWII, Guido Horn d'Arturo contributed to the revival of the Observatory with his studies, the invention of the *telescopio a tasselli* and the foundation of Loiano observing site.

The second scene depicts the Italian astronomer expedition to observe the solar eclipse on January 26th, 1926, which was visible from the Somali region Oltregiuba. This region just became an Italian colony because of the Italo-British protocol of July 15th, 1924, and the subsequent annexation of Italian Somalia in the following year.

Horn was especially interested in the shadow bands, thin light and dark wavy bands, caused by turbulence in the Earths atmosphere, which appears on flat ground surfaces immediately before and after the totality of the eclipse. The expedition was financed by the Italian Government, and astronomers Luigi Taffara (1881-1961), Senator Guglielmo Mengarini (1856-1927) and seismologist and meteorologist Luigi Palazzo (1861-1933) were on Horn d'Arturo's team. In 1926, Taffara was Assistant Astronomer at the Teramo Astronomical Observatory *Collurania*, and he was an expert observer during solar eclipses. In Somalia, he obtained the spectrum of the Suns corona by using a prismatic chamber and several photos of the eclipse. Electrical engineering professor Mengarini had invented and designed the *quadruple camera*, a special camera used during eclipses to obtain color photographs of totality.

Additionally, Palazzo was director of the Central Office of Meteorology and Geodynamics, and he built the isodynamic and isocline magnetic maps for Italy and its colonies. During the Somali expedition, he set up a meteorological station in situ and continued his campaign of magnetic measures started in 1909. The Governorship of Oltregiuba also assigned Eugenio Podestà, Marshal Major of the Royal Carabinieri Corps, the machinist Sergeant Major Galasso and the radiotelegraphist Corporal Major Monesi to the expedition with one mason and thirty natives. During the eclipse, Podest joined Palazzo in the meteorological observations, and Galasso joined Guido Horn d'Arturo in the shadow band observations (see Horn D'Arturo & Taffara 1926; Ianniello 2009; Argentieri 2014). Figure 1 shows an example of the comic strip sketches developed to tell the story of this mission. We report below, as an example, the dialogue between members of the scientific expedition, *in Italian*, as prepared for TABLE III of the Comic Book.

Dialogue are between the members of this scientific expedition. The identity of each member is indicated the following acronyms in the comic sketches: H=Guido Horn d'Arturo, Pal=Palazzo, TAFF=Taffara, G=Galasso, Podestà. S indicates the scene, and D indicates the dialog.

PANEL 1

S: Particolare della mappa del campo.

D: "Io e Galasso alla Camera di Dietzler e al telaio delle Ombre Volanti"

PANEL 2

S: Campo medio sul gruppo degli astronomi.

D: Taffara: "A me la camera di Cooke e quella prismatica"

PANEL 3

S: Primo piano di Palazzo.

PANEL 4

S: Campo lungo sulla parte delle tende e degli strumenti meteorologici. Senza persone.

D: Horn: "Ottimo. Quindi tu, Mengarini, sarai alla quadruplice camera di Mailhat".

PANEL 5

S: Primo piano di Palazzo e Taffara; Horn di quinta.

D: Taffara: "Bene. Andiamo?"

PANEL 6

S:Campo lungo sulla scorta tranquilla.

D: Galasso: "Horn, come pensi reagiranno?"

D: Horn: "Non possiamo saperlo, Galasso..."

PANEL 7

S: Mezzo busto (sarebbe meglio piano americano) di Horn.

D: Horn: "..per questo li abbiamo mandati quasi tutti alla spiaggia.."

PANEL 8

S: Potestà a mezzo busto in primo piano, Horn in secondo piano.

D: Potestà: "E se ci dovessero essere problemi.."

PANEL 9

S: Particolare del dito di Potestà che indica un punto sulla mappa.

D: Potestà: "..ricordate che dovrete riunirvi qui."

2.2. The study of the Guido Horn d'Arturo face and of the historical context

The purpose of building the comic book is to study both the figure of Guido Horn d'Arturo and its historical context in detail. His scientific research can only be well understood within its historical context. Thus, a variety of different sources were used to construct this context.

In particular, the website *The Luci di Horn*[4] provides a rich source of information about the life and research of Guido Horn d'Arturo. Particularly, its gallery of photos makes it possible to study the figure of Guido Horn d'Arturo beside his life and the historical context.

We dedicated special attention to the Guido Horn d'Arturo face from different angles and at different ages. Examples of this are shown in Figure 2.

Figure 3 shows some watercolor paintings of Italian troops' equipment during WWI. Both the color and the shape are taken from original pieces used in the WWI. While normal troops use green helmets, Model Farina grey helmets are used by shock troops during assaults or during the cuting of enemy barbed wire. The military leather chaps in the top of the figure were used by officers such as Horn d'Arturo. The top left panel shows the scene of an Italian military camp (Figure 5), which was adadpted from original images of WWI.

3. The tables for the ASTRI exhibition

In order to present our work we decided to produce a set of demonstrative tables shown in Figures 4, 5, 6.

These are examples of scenes in the life of Guido Horn d'Arturo, which we plan to put together into a screenplay; this is discussed further in § 1. Additionally, Figure7 presents the telescopes that either currently use or will use multi-mirror technology in the future. The table (top right panel) includes a sketch of the ASTRI (*Astrofisica con Specchi a Tecnologia Replicante Italiana*) telescope recently dedicated to Guido Horn d'Arturo and the prototype for the INAF collaboration to the Cherenkov Telescope Array (CTA) project.

This figure refers to the space telescope James Webb Space Telescope (JWST) and to Extremely Large Telescope (ESO-ELT). Overall, INAF is participating in these projects at different levels.

In the bottom panel of Figure 7, an array of radio telescopes is shown. Guido Horn d'Arturo predicted the use of multiple-mirrors in interferometry in the future, but he never tested such technologies himself (Picazzi 2016). We recall this idea because INAF is currently deeply involved in the Square Kilometer Array SKA project.

4. Conclusions

On September 28th, 2018, these tables were shown for the first time during *Researchers'*

[4] http://www.lelucidihorn.it/hex/guido-horn-d-arturo/

Night inside Padova's first room in the Museum La Specola (the Observatory's museum). The presentation aimed to demonstrate the close relationship between historical research and modern astronomy, which is extremely important for bringing people into the world of astronomical researchers. During this event, we had the opportunity to receive direct commentary from University of Padova students, Erasmus students, adults, families and children. They enjoyed the way we told the life story of a great astronomer and an even better Italian. On November 10th, 2018, the tables were shown at the ASTRI telescope and CTA prototype dedication to Guido Horn d'Arturo in Catania.

In order to complete the comic book project, we are actively searching for a private editor.

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