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16. Flat Earth and the Planet Sun

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With this paper I want to stress the key role of misconceptions removal in science teaching and public outreach. This consideration rises from a more than ten years' experience with classrooms all over Italy within the framework of several national public outreach programmes funded by the Italian Ministry of Research. I want to stress this point because the importance of misconceptions removal is frequently underestimated.

The data we present here refer to Italy [1] but for the purpose of this paper, we can honestly assume that they are quite similar in many other developed countries.

Numbers, in our case, are relevant: in a survey 52% of interviewees believe that antibiotics can eradicate both microbes and viruses, 45.6% have a significantly wrong idea of the size of an atom and, as the title of this paper claims, 52.5% of the sample thinks that the Sun is a planet. The even more worrying figure is that the percentage of people who respond correctly to all three questions is only 20%, one in five!

We could ask ourselves how this bad situation can exist: television, magazines, manuals, etc. continuously explain the correct use of antibiotics and that using them, for example, when we have a flu is useless. So, why we get a so high percentage of citizens taking this drug without any prescription, need or utility?

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Discussing astronomy we can consider that the figure for “the Sun as planet”, just as high, is not only due to a bad knowledge of this science. While studying at school that the Sun is a ball of “burning gas”, as is often incorrectly written in the books, our senses suggest to us that is actually the Sun that revolves around the Earth. We have to frankly dwell on this statement, because we see it rising to the east to get to a point of maximum height above the horizon and then decrease until it disappears after sunset each day. It is certainly true that in our cities it is more and more difficult to have this experience but the difference in the height of the Sun above the horizon at midday between December 20 and June 20 is generally correct in our common cognitive background.

Coming to “flat Earth”, this idea is a really very old; we know that different cultures have imagined a flat Earth resting on four turtles, four elephants and so on. Do not forget that the fact that the Earth is essentially flat is also the basis of Aristotelian cosmology, accepted with various modifications for a couple of centuries.

It would be a mistake to assume that this absurd misconception is confined to the past. There is more than one website that talks about this, in particular that of the Flat Earth Society, very well organized and structured in substantial material that claims to show the earth is really flat. Seeing is believing. [2]

Misconceptions are wrong ideas we have or we form of natural phenomena, mainly due to our sensory experience. In the simplest way we can say that for many phenomena we face in life we need to develop a “working model”, based on our experience. A misconception it is unintentional but is very dangerous: to remove it is mandatory in order to give new information or concepts. Otherwise it is like building a house on the sand, groundless: it will be fragile.

Astronomy, thanks to several projects in Europe and USA, is a discipline that in the past has been able to catalogue various misconceptions. For example in one site [3], linked with a well-known book, are listed up to 1,700 items sorted by type and topic with a briefing session. It is an important asset with an extensive bibliography on misconceptions in astronomy and science.

Just to quote the most common: the moon phases are due to the Earth's shadow, eclipses of the Moon are a particular lunar phase, the Moon emits light by itself etc. Other misconceptions are created nowadays by the media: think of an astronaut "floating without weight" on the International Space Station (no gravity in space!?!?).

This is the key point we have to confront: how can we teach or speak on gravity if a boy or a girl has in his mind this misconception, that is: gravity is not present in the open space outside our Earth? We have to remove this misconception before to allow a correct understanding of physical phenomena. School and media should join, whenever possible, to use this method when they speak science.

[1] M. Bucchi and G. Pellegrini (eds.) *Annuario Scienza e Società 2011*, Edizioni il Mulino

[2] <http://theflatearthsociety.org/>

[3] <http://www.physics.umaine.edu/ncomins/> and references contained in the related book

