

Emanuel Mumpuni

35 years old, born in Jakarta, Indonesia

Place of work: Indonesian Institute of Aeronautics and Space (LAPAN)

Website: http://cosmicdiary.org/blogs/emanuel_sungging_mumpuni/



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Emanuel grew up in impoverished area of Jakarta. He went on to study at the Bandung Institute of Technology, majoring astronomy and then work for the Indonesian Institute of Aeronautics. Due to his background he cares deeply about poverty, and public awareness of science in the country.

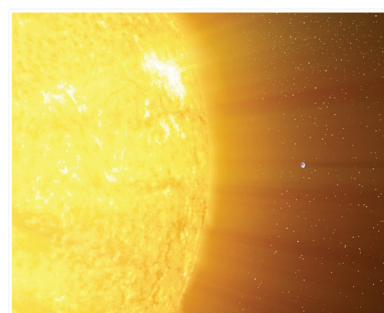
The important things are always simple; the simple things are always hard. Take this question: "what is the Sun?" Different people over the ages have answered this in many ways. Is it a source of life? Ethereal light? A giant fireball? God? This article takes a look at our nearest star, from a cultural as well as scientific perspective, along the way discussing topics as varied as ancient Sun worshippers and global warming. Perhaps by the end you'll be able to answer "what is the Sun?" for yourself.

Sol Lucet Omnibus: The Sun Shines to All

The important things are always simple; the simple things are always hard. Sometimes when a trivial question pops-up, the answer cannot be immediate nor trivial. Like this question: "What is the Sun?"

The Sun is... A humongous fireball which is at the centre of the Solar System? Our closest star? Ethereal light? A source of life? God?

Let us start with the simplest thing: the Sun is a marker of the day. If there is Sun it should be day, and vice versa for night. From ancient times, when the Sun started to brighten the land people did their activities, like hunting and harvesting. When the Sun was gone, it was time to rest. The separation of day and night sets the pattern of behaviour for life. From that variation humans gained knowledge of time, and from that understanding came the almanac calendar and along with that came the worshipping of supreme-beings.



The Sun is at the centre of our Solar System. The Earth is tiny compared to it, as shown in this artist's impression. Image credit: NASA/JPL-Caltech/R. Hurt (SSC).



The first photo shows a sunset as our eyes naturally perceive, and the second if we could see the near-infrared part of the electromagnetic spectrum. Image credit: Emanuel Sungging Mumpuni.

The Sun can be comprehended as the primordial manifestation of faith. It is energy, the essence, the bringer of life, name any virtue that you like. The Sun has played a major role in most ancient belief systems throughout the world. But humanity evolved. Worshipping the Sun is no longer a central theme for most current faith systems, but one thing is still the same: the dynamics and variations of the Sun are vitally important for humankind.

Let us continue with something we call "global warming". There is a debate on whether the Sun is responsible for this warming on a global level. There is at least some truth to the premise. It is an inevitable fact that the Sun is affecting the Earth, because if there were no Sun neither our atmosphere nor life could exist.

Around the middle ages, there was what is known as a "tiny ice age". This phenomenon might relate to the Sun. During that period the Solar activity was on the lowest level. How can we know? Sun activity is defined by the appearance of dark patches on the surface, called sunspots. For many years there were no records of sunspot numbers because none were present. This period is known as the Maunder Minimum.

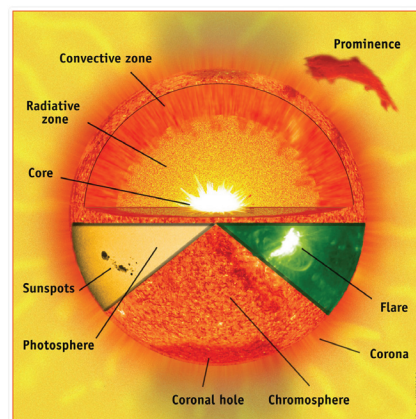
So we know that the Sun has dynamics, and the dynamics are felt on the Earth through climate, seasons, day and night. If the Sun is changing, the effect will be felt on Earth.



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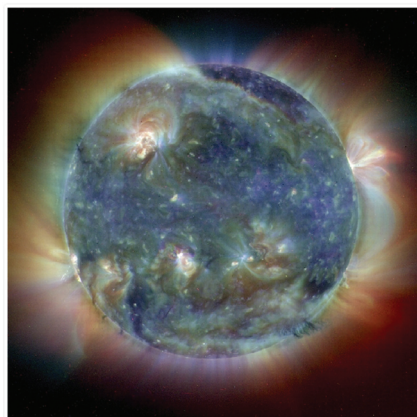
The Sun is the centre of a system which contains the Earth, some other planets and minor bodies such as asteroids, meteorites and comets. The planets and minor bodies are moving around the Sun. This system is well known as the Solar System. Another fact, the Sun is the largest object and contains approximately 98% of the total mass of the Solar System. If we compare the size of the Sun and the Earth, it would take 109 Earths to fit across the Sun's disc, and you would need more than one million Earths to fill the Sun. Wow.

Unlike the Earth the Sun is not a solid body. It is, in fact, a ball of dense, hot gas. Deep down in the core there is a reaction occurring called nuclear fusion. During this process atoms of hydrogen are fused to form a bigger atom, helium. Together with this process energy is given off as heat and light. We cannot peer directly into this core so we have to wait until the light can be observed on a "boundary" in which the Sun is sufficiently transparent. This area is known as the photosphere. The photosphere is a "surface" that is constantly changing with sunspots and huge storms called prominences. These can be larger than the size of Earth!



The Sun is a complex world but most of what we see comes from one layer, called the photosphere.
Image credit: Steele Hill / NASA.

As a machine that needs fuel to run its engine, the Sun needs hydrogen converted into helium as fuel to shine continuously. Physically the Sun consists of 75% hydrogen, 24% helium and traces of many other elements such as iron, oxygen and calcium. The Sun has enough fuel left to shine for five billion years.



This picture is from the SOHO Extreme Imaging Telescope which is in space. It is a result of combining images taken at three different wavelengths into one that reveals hidden solar features.
Image credit: SOHO/MDI consortium. SOHO is a project of international cooperation between ESA and NASA.

This picture was taken by a satellite telescope. We cannot see it directly as the wavelengths are outside our physical ability to see. But this is the same Sun that brightens our lives on a regular basis; it just looks different.

We can learn from pictures that there are many facets of the Sun hidden from our perception. Somehow, the Sun consists of multiple colours. Does that picture make you feel awe and wonder? What is the colour of the Sun?

The question "what is the colour?" can be complex. Is the colour perceived psychological? Physiological? Physical?

Physiologically and psychologically, it is fair to say that the Sun is white, a little bit yellow, and sometimes orangish. Find the answer by stepping outside and looking for yourself! Make sure you do not look directly at the Sun though, as this is very dangerous for your eyes.

Surely, the Sun has aroused awe and inspired humanity from spiritual stimulation into scientific methodology. This is not only for astronomers but in any aspect of our lives. The thought, the idea, the emotion of the heavens has contrived paintings, poems, folklore and many many other forms of human creation and at the same time increased the human capability to make life better.

This feature article was written as part of the Cosmic Diary Cornerstone project for the International Year of Astronomy 2009. To find out more, check out www.cosmicdiary.org and www.astronomy2009.org.