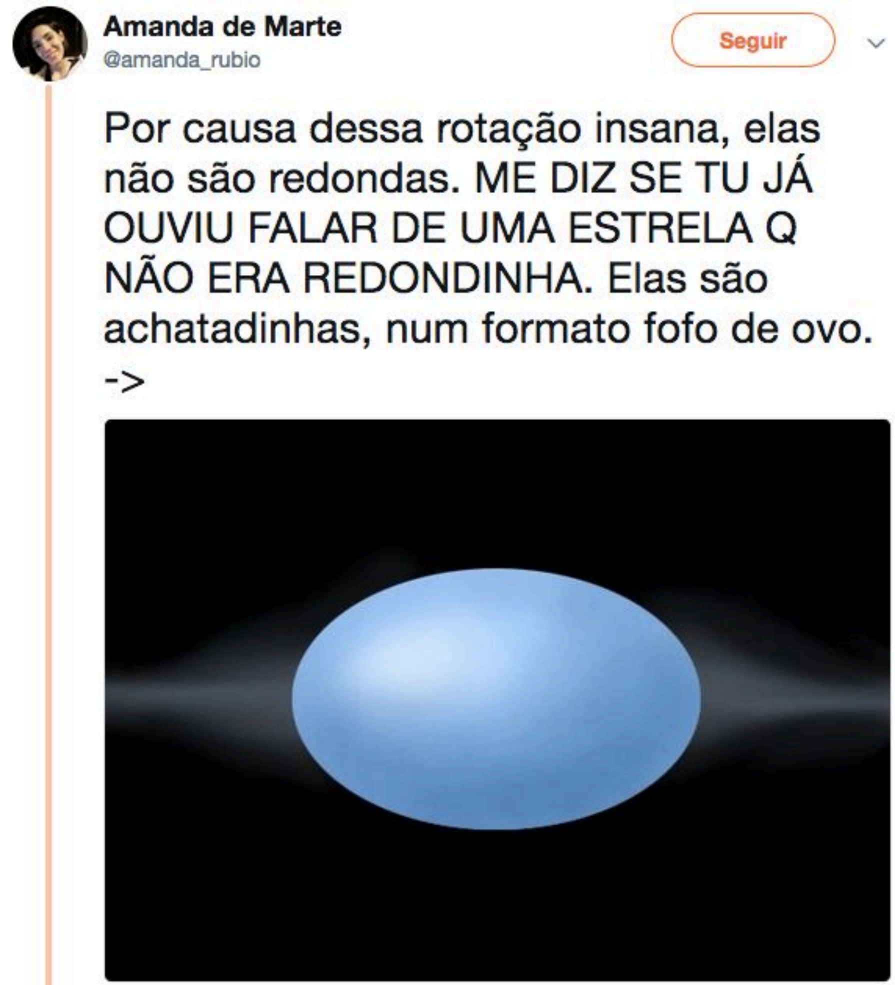
AGA0421
Divulgação em Astronomia

Astronomia na mídia (tradicional): temas de interesse

Jorge Meléndez

* Importante *

- Existem temas gerais de interesse da mídia (tradicional)
- Porem, a princípio outros temas também podem ser feitos de interesse da mídia (depende de nós!)

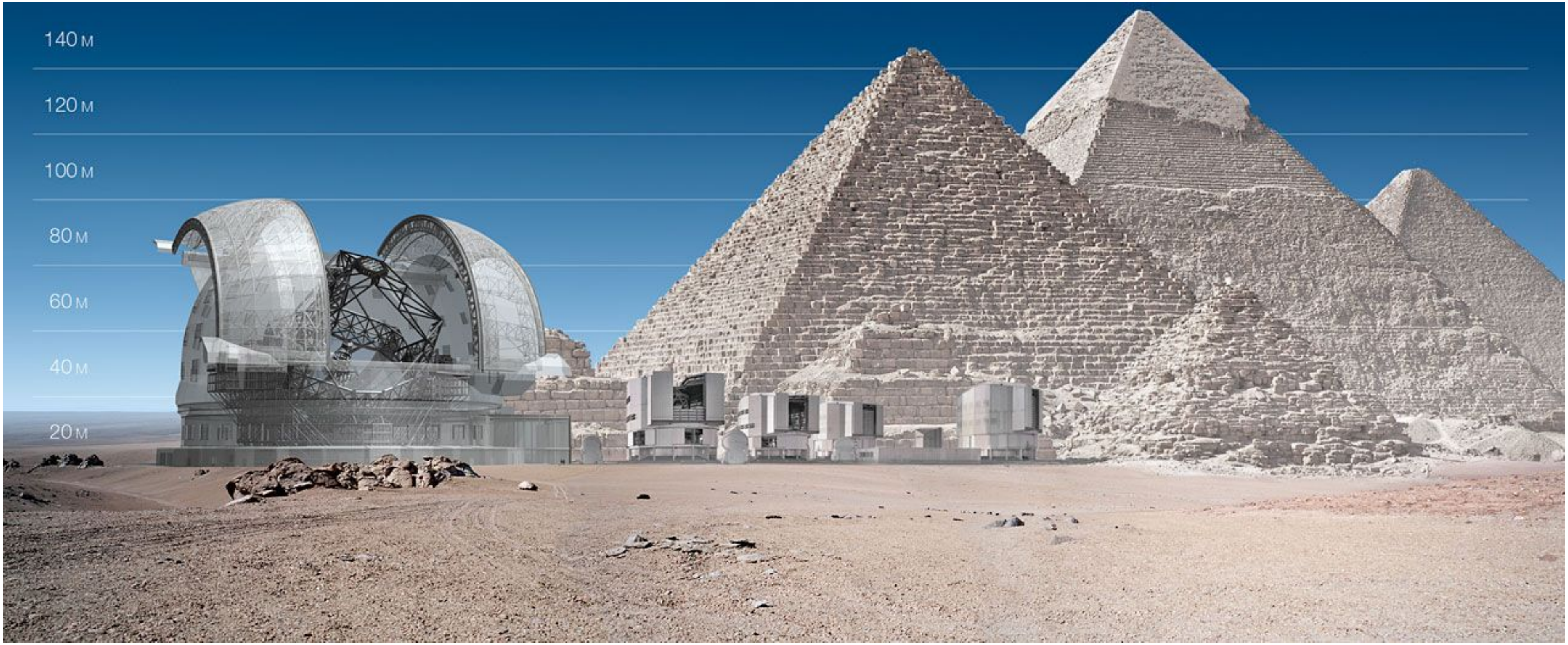


The Big questions in Astronomy

- São relevantes para a divulgação ao grande público pois tem potencial de resultarem em grandes descobertas
- Not every astronomer work on these areas
- Other areas are also important
- Even if you don't work directly on a "big question", it is important to know how your work fits into the "big picture"

The Big Questions in Astronomy

- **Science is the main driver for new major facilities in astronomy**



Comparison of the ELT (ESO) to the VLT telescopes (ESO) and the Giza pyramids

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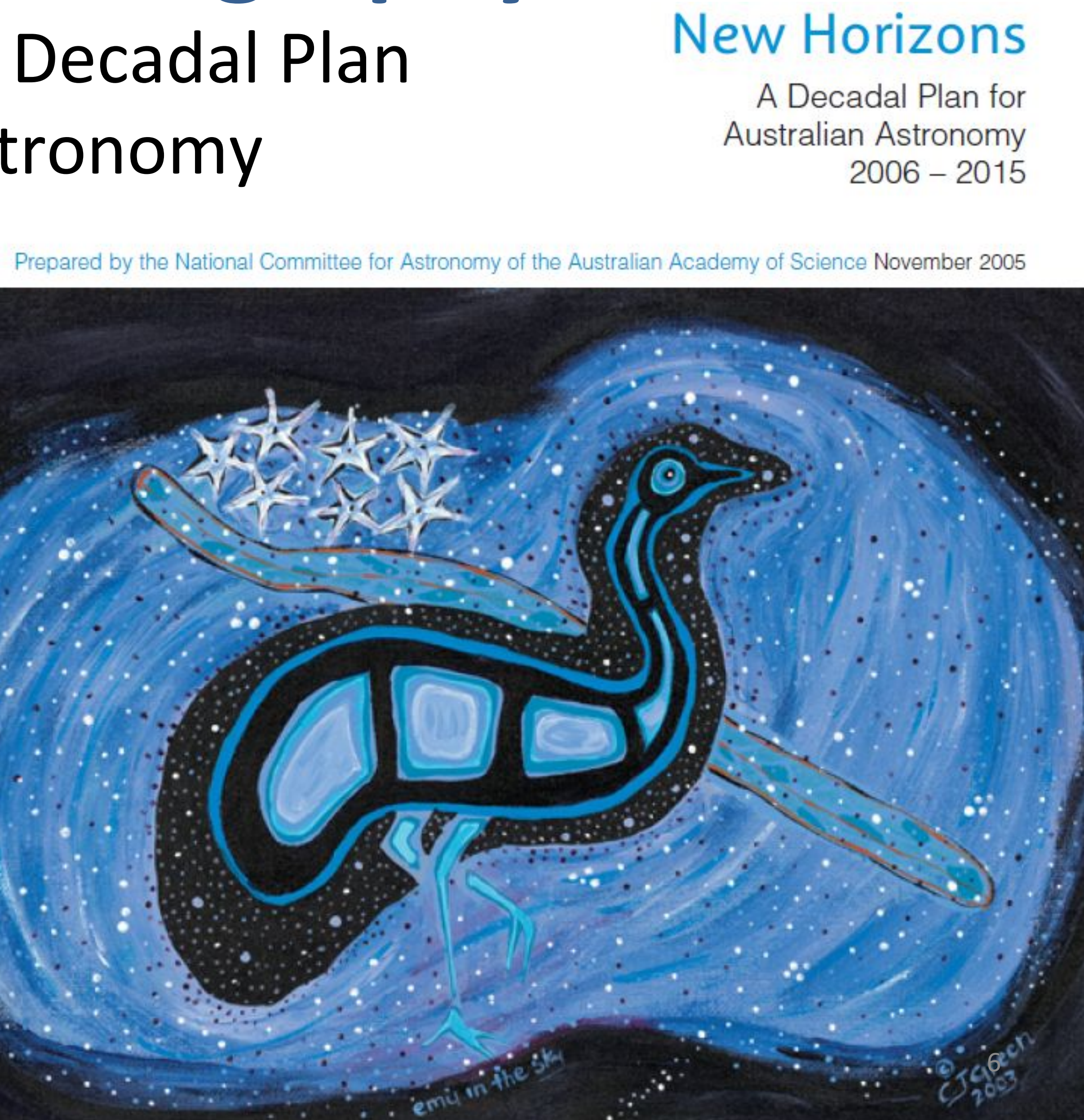

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Brian Schmidt receiving his Nobel Prize diploma and medal from His Majesty the King of Sweden in 2011 © THE NOBEL FOUNDATION 2011 CREDIT: FRIDA WESTHOLM

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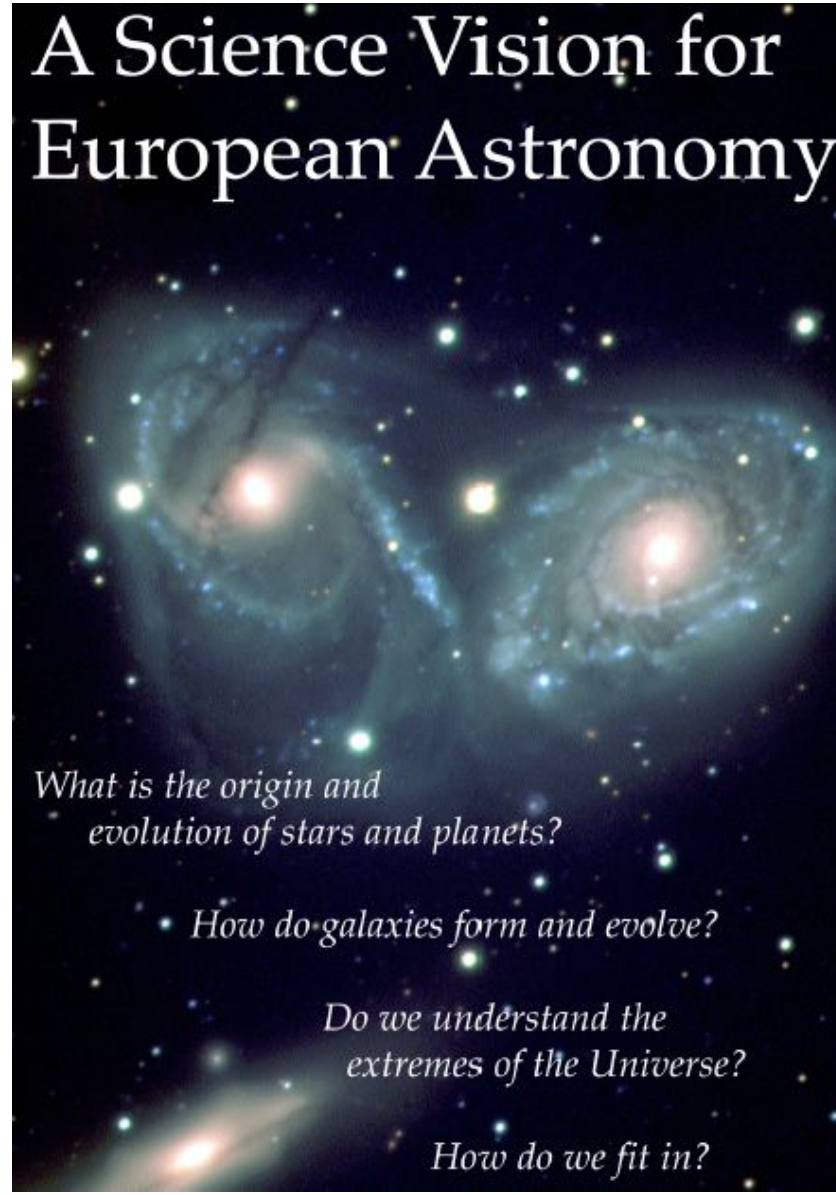

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Plano Nacional de Astronomia

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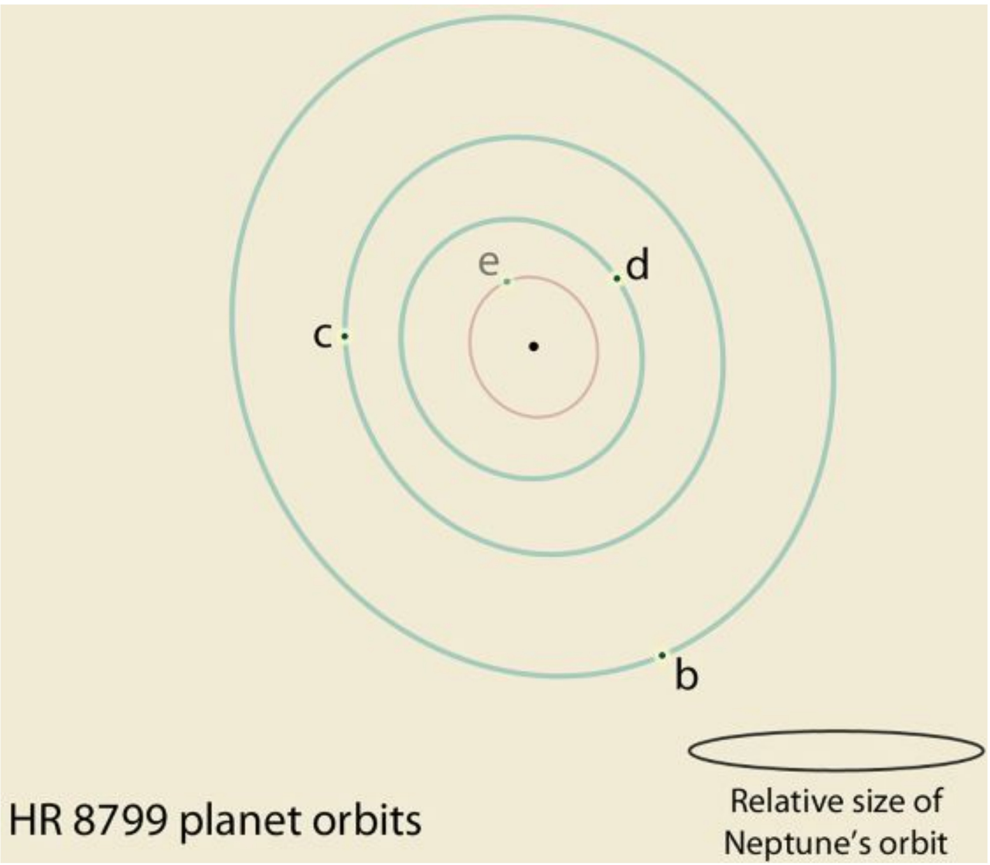
Proposta

Comissão Especial de Astronomia

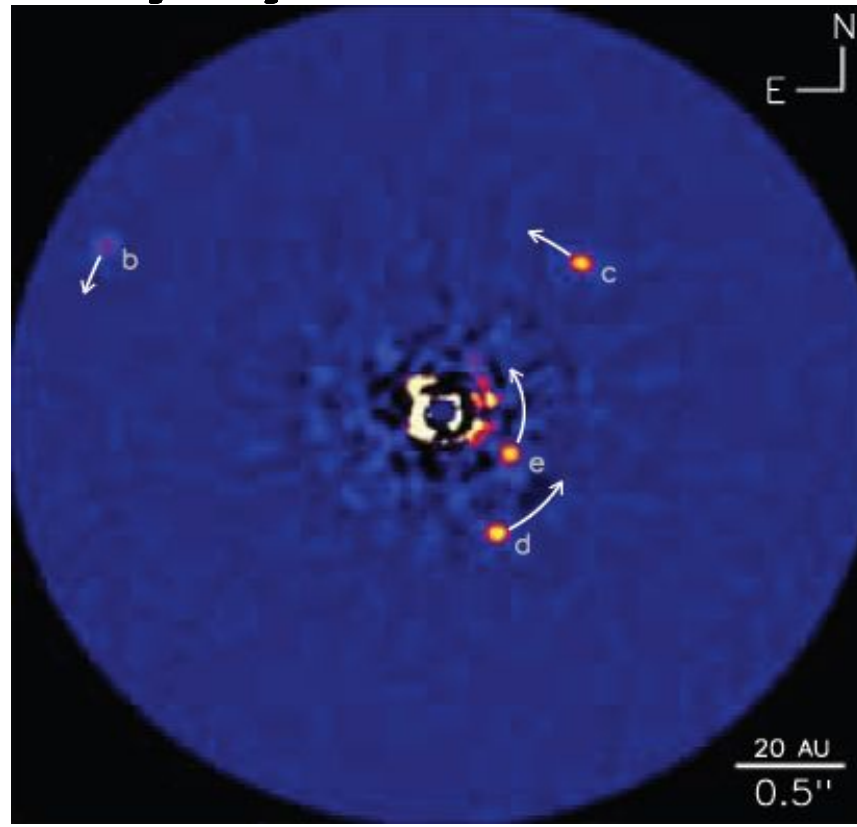
Outubro de 2010

The Big Questions in Astronomy: USA+EU

What Are Other Planetary Systems Like?



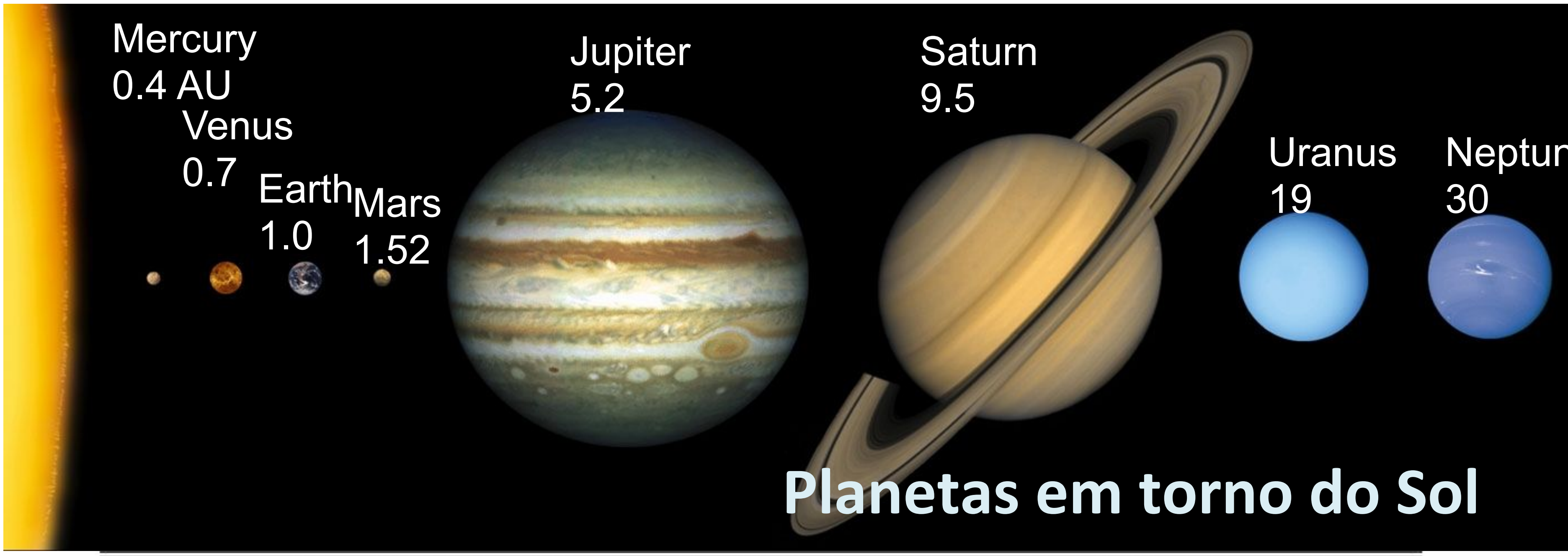
Neptune : 30 AU



An Exoplanet Family surrounding the star HR8799. Light from the central star has been blocked mechanically and further reduced electronically from the image. The four exoplanets are circled in red. *Keck data*. Marois et al. 2010, Nature, 468, 1080

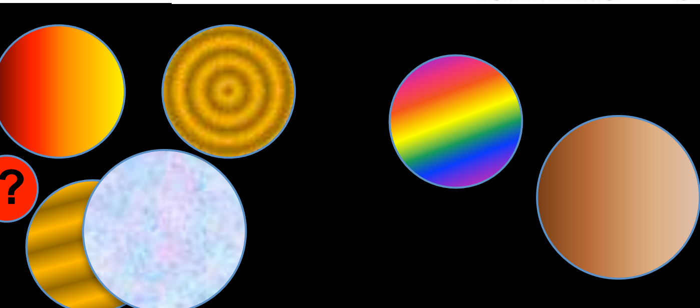
The Big Questions in Astronomy: USA+EU

What Are Other Planetary Systems Like?



Parameter	[unit]	HD 10180 b	HD 10180 c	HD 10180 d	HD 10180 e	HD 10180 f	HD 10180 g	HD 10180 h
$m \sin i$	$[M_\oplus]$	1.40 (±0.25)	13.16 (±0.59)	11.91 (±0.75)	25.3 (±1.4)	23.5 (±1.7)	21.3 (±3.2)	65.2 (±4.6)
a	[AU]	0.02226 (±0.00038)	0.0641 (±0.0010)	0.1286 (±0.0021)	0.2695 (±0.0048)	0.4924 (±0.0083)	1.422 (±0.030)	3.40 (±0.12)

Lovis et al. 2010



Planetas em torno de HD 10180

Large Programme: **88 nights at La Silla**
3.6m telescope + HARPS spectrograph

"Brazilian" planets!

Planets around solar twins

PI: Jorge Meléndez (IAG/USP)

Collaborators:

Brasil: T. Monroe, M. Tucci Maia, F. Freitas (IAG),
Alan Alves Brito (UFRGS)

Australia: M. Asplund, L. Casagrande

USA: I. Ramírez, J. Bean

Germany: S. Dreizler; **Sweden**: K. Lind

2011-2016

http://saude.estadao.com.br/noticias/geral,brasil-participa-de-novo-satelite-caca-planetas-imp-,1132650

ESTADÃO

Brasil participa de novo satélite 'caça-planetas'

HERTON ESCOBAR - O ESTADO DE S.PAULO
21 Fevereiro 2014 | 03h 16

More planets …

A Agência Espacial Europeia (ESA) deu luz verde para a construção de um novo satélite "caça-planetas", chamado Plato, previsto para ser lançado até 2024. Cientistas de 23 países estão envolvidos no projeto, incluindo brasileiros.

O custo total estimado da missão é de US$ 1 bilhão, segundo Eduardo Janot Pacheco, pesquisador do Instituto de Astronomia da Universidade de São Paulo (USP) e representante do Brasil no comitê internacional do projeto.

O objetivo principal do Plato, segundo ele, será encontrar planetas semelhantes à Terra (pequenos e rochosos) e que estejam na zona habitável de estrelas (numa distância que permita haver água líquida na superfície). "Será uma espécie de Corot, só que mais especializado em descobrir exoplanetas terrestres", disse Janot ao Estado, referindo-se ao outro projeto caça-planetas do qual o Brasil participa,

What Are Planetary Systems Like?

Since Copernicus first described the structure of our solar system nearly 500 years ago, ours has been the only planetary system known to astronomers until quite recently. In 1995 astronomers discovered the first planet orbiting a star other than our Sun. Astronomers have since discove
more extrasolar planets, called exoplanets, with
ing from a few times the mass of Earth to sever
mass of Jupiter. Many such systems contain sev
and almost all have structures very different fro
This diversity challenges theories of the formati
etary systems and is producing great intellectua

The Big Questions - New Worlds

Among the major scientific objectives for the coming decade are discovering new exoplanets, learning more about the hundreds already known, and determining whether any of them may harbor life. Astronomers are poised to make great strides in understanding these new worlds—learning about their physical and chemical properties, improving theories of their structure and formation, directly imaging some exoplanets, identifying Earth-like ones, and perhaps even discovering telltale signs of life on one or more. The next 10 years would also see preparatory technology development for future missions. Just as the discovery of other planetary systems is revolutionizing our understanding of planet formation, so too would the discovery of even one other world that exhibits conditions suitable for life as we know it. The discovery of life itself—in our solar system or elsewhere—transform our understanding of biology and the origin and evolution of life. It would rank among the most important discoveries of all time.

The Big Questions in Astronomy: USA+AU+EU

How Do Stars and Planets Form?

Newborn stars, initially known as *protostars*, form as gravity causes dense clouds of gas and dust within galaxies to contract. Studies of these clouds have characterized their physical and chemical properties, yielding valuable information about the nurseries in which stars spring to life. High temperatures and pressures in the centers of the young stars eventually ignites nuclear fusion, an energetic process that powers stellar luminosity and, in the case of our own Sun, supports life on Earth.

Astronomers have also learned that new planets can form in the dusty, rotating disks that surround protostars and very young stars. Such *circumstellar disks* have been detected around more than 80 percent of stars in nearby stellar nurseries, strongly implying that planets are a frequent outcome of star formation. However, we do not yet know how many of these disks form planetary systems. Images from the optical Hubble Space Telescope, the infrared Spitzer Space Telescope, and the largest ground-based millimeter and optical telescopes, together with theoretical studies and computer modeling, are helping to elucidate the process of star and planet formation.

Because of great uncertainties about the details of stellar and planetary formation, we currently have only the most rudimentary ideas about the conditions necessary for, and conducive to, the formation of life. We possess even less knowledge about the extent of change in those conditions throughout the lifetime of our Milky Way Galaxy. Resolving such uncertainties would do much to help us understand the origins and frequency of occurrence of life in the universe.

A Stellar Nursery (left) Stars a hundred times as massive as our Sun forming in dense clouds of gas and dust in the nebula NGC 6357. At lower center, a very blue, massive, young star is ionizing and dispersing the surrounding cloud, creating a void.

What Happens When Stars Die?

Stars are powered by nuclear fusion in their cores. Light elements, like hydrogen and helium, fuse to form heavier elements like carbon, oxygen, and iron, releasing great amounts of energy in the process. In low-mass stars, these reactions occur slowly, allowing the stars to exist quietly for billions of years.

Stars a bit more massive than our Sun end their lives as dense white dwarf stars, which fade and cool over billions of years. Some white dwarfs occur in binary systems, and when sufficient matter from the companion star falls onto the surface of the white dwarf, it is compressed and heated, igniting a violent thermonuclear explosion in the dense carbon-and-oxygen interior, producing a *Type Ia supernova* and completely disrupting the white dwarf. Searches for such luminous events would help to map the geometry of the universe.

Stars containing more than about 10 times the mass of our Sun, however, burn hot and fast, ending their lives as *Type II supernovae* when the fuel for nuclear fusion is exhausted in their deep interiors. Within fractions of a second, this energy crisis triggers the core to collapse. If the core contains no more than a few times the mass of our Sun, it becomes a stable *neutron star*—an object with a density as enormous as those found in atomic nuclei. Otherwise, the collapsing material overwhelms the young neutron star, causing a further collapse to a *black hole*. The core collapse powerfully ejects the outer layers of the star, carrying heavy-element-enriched material back into space, where it can be incorporated into subsequent generations of stars and planets.

Over the next 10 years, planned wide-field sky surveys are expected to reveal tens of thousands of core-collapse supernovae every year. Detection of speedy but weakly interacting neutrinos and gravitational waves, both emitted during a core collapse, would enable astronomers to probe interactions between the collapsing inner cores and the exploding outer layers. If conditions are right, as happens in a minority of supernovae, intense *gamma-ray bursts* are emitted, providing further information about the explosion. Supercomputer simulations will further improve our understanding of both types of supernovae.

What Are Black Holes?

The strength of gravity on an object's surface depends on its mass and its size. The more dense and massive an object, the stronger its gravitational field is, making it harder for particles ejected from its surface to escape. When an object's gravity is so strong that even light cannot escape, it becomes a black hole.

Black holes form as the largest stars die. Once formed, a black hole can grow as matter—gas and dust, planets, stars—falls into it. Matter falling toward a black hole flattens into an orbiting disk. As it spirals inward through the disk toward the central object, the matter is heated to extremely high temperatures, producing x-rays, ultrahigh-energy cosmic rays, and powerful jets of plasma traveling at close to the speed of light. In fact, a significant amount of the matter is converted directly into energy!

The immense gravitational fields around black holes provide opportunities for perhaps the most challenging tests of Einstein's theory of gravitation, the *general theory of relativity*. This theory is not yet well understood in environments as extreme as those around a black hole. Understanding how jets of plasma are ejected at velocities close to the speed of light by massive, spinning black holes in *active galactic nuclei* may also lead to better understanding of gravity around a black hole. Over the next decade, x-ray observations will probe the nature of *space-time* very close to a black hole, and proposed space-borne observatories would use observations of infrared and perhaps gravitational radiation to provide additional insights into black holes.

The Black Hole in Cygnus X-1 (below). Artist's concept of matter drawn from a companion star and spiraling through a disk onto the black hole in the Cygnus constellation.

The Big Questions in Astronomy: USA+AU

The Creation of Gravitational Waves (background). Artist's concept of gravitational waves emitted by two orbiting black holes.

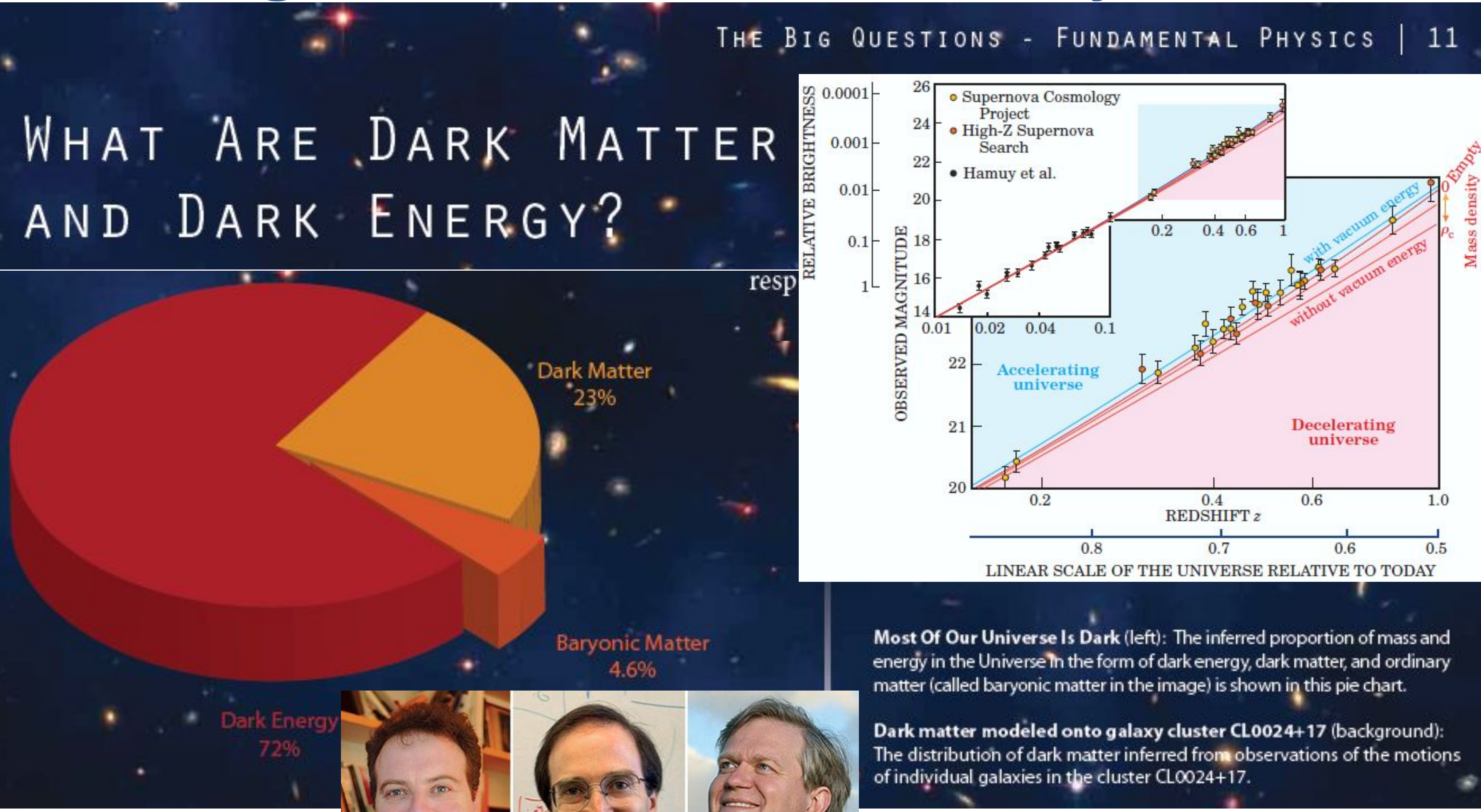
How Can We Detect Gravitational Waves? What Can They Tell Us?

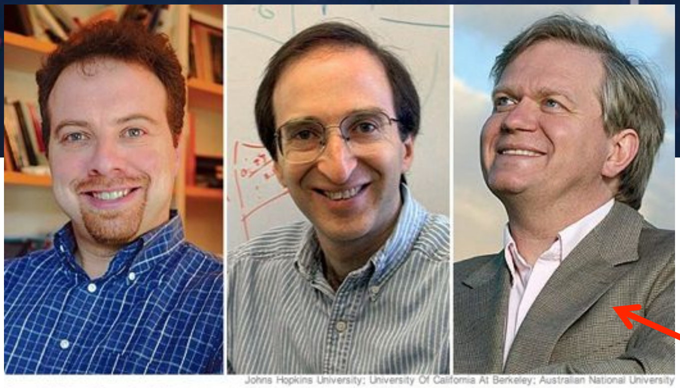
Formed in the catastrophic core collapse of a dying star, a neutron star contains a mass larger than the Sun's packed into a volume with the diameter of a city. Neutron stars contain the densest matter in the Universe, have the largest magnetic fields, and spin more rapidly than any other stars—some as fast as 700 times per second. Some rotating neutron stars, called *pulsars*, emit periodic beams of radiation directed towards Earth. The spin rates of millisecond pulsars may actually be regulated by the emission of *gravitational waves* (aka *gravitational radiation*).

As two pulsars in a binary system orbit each other, they lose energy and their separation distance grows smaller. The energy lost is released in the form of gravitational waves. The discovery and observation of just such a binary pulsar system provided the first evidence for the existence of gravitational waves.

Although this discovery provides strong evidence that gravitational radiation exists, it is not a direct detection of gravitational waves. Produced by interactions or mergers of black holes or neutron stars, gravitational waves may soon be observable with advanced instruments, such as the ground-based Laser Interferometer Gravitational-wave Observatory (LIGO). And the construction of an exquisitely sensitive detector in space during the next decade promises to open an entirely new window on the Universe.

The Big Questions in Astronomy: USA+AU





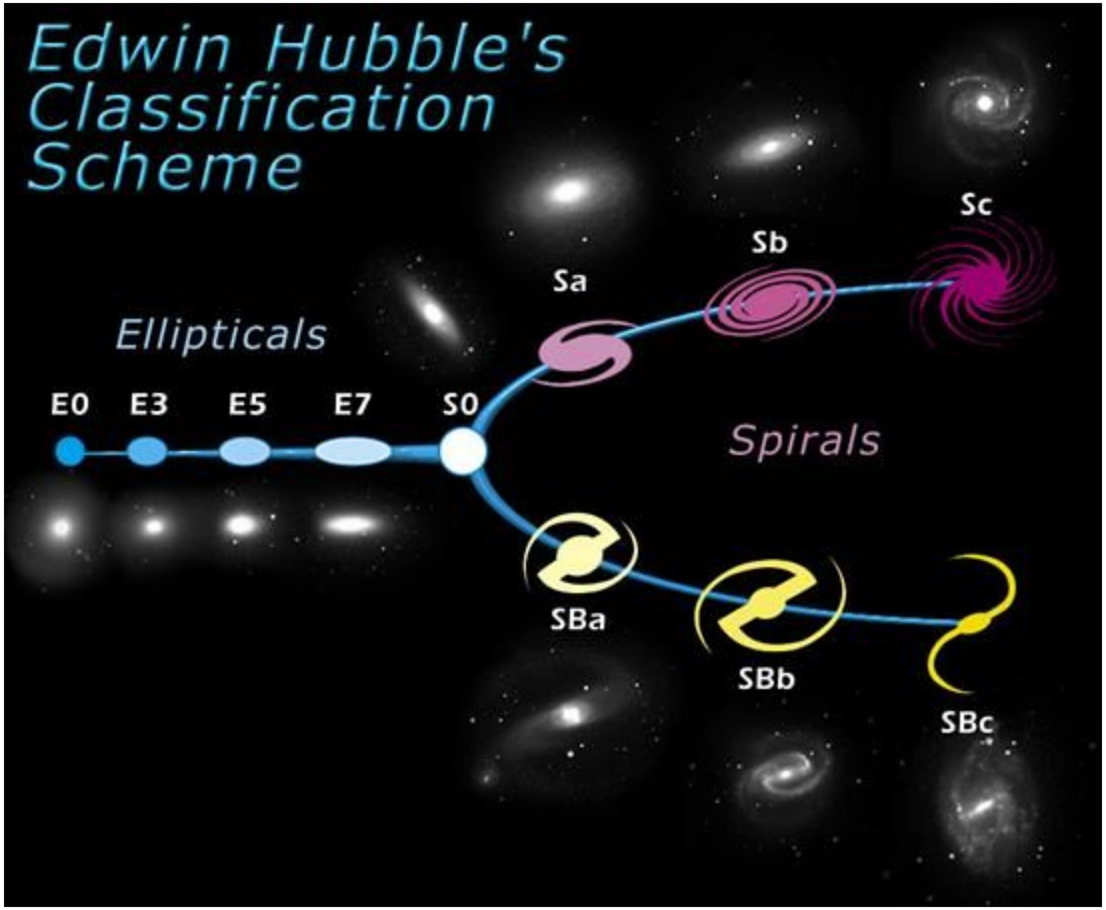
From left, Adam Riess, Saul Perlmutter and Brian Schmidt shared the Nobel Prize in physics awarded Tuesday.

Nobel Prize in Physics 2011

Brian P. Schmidt, Australia

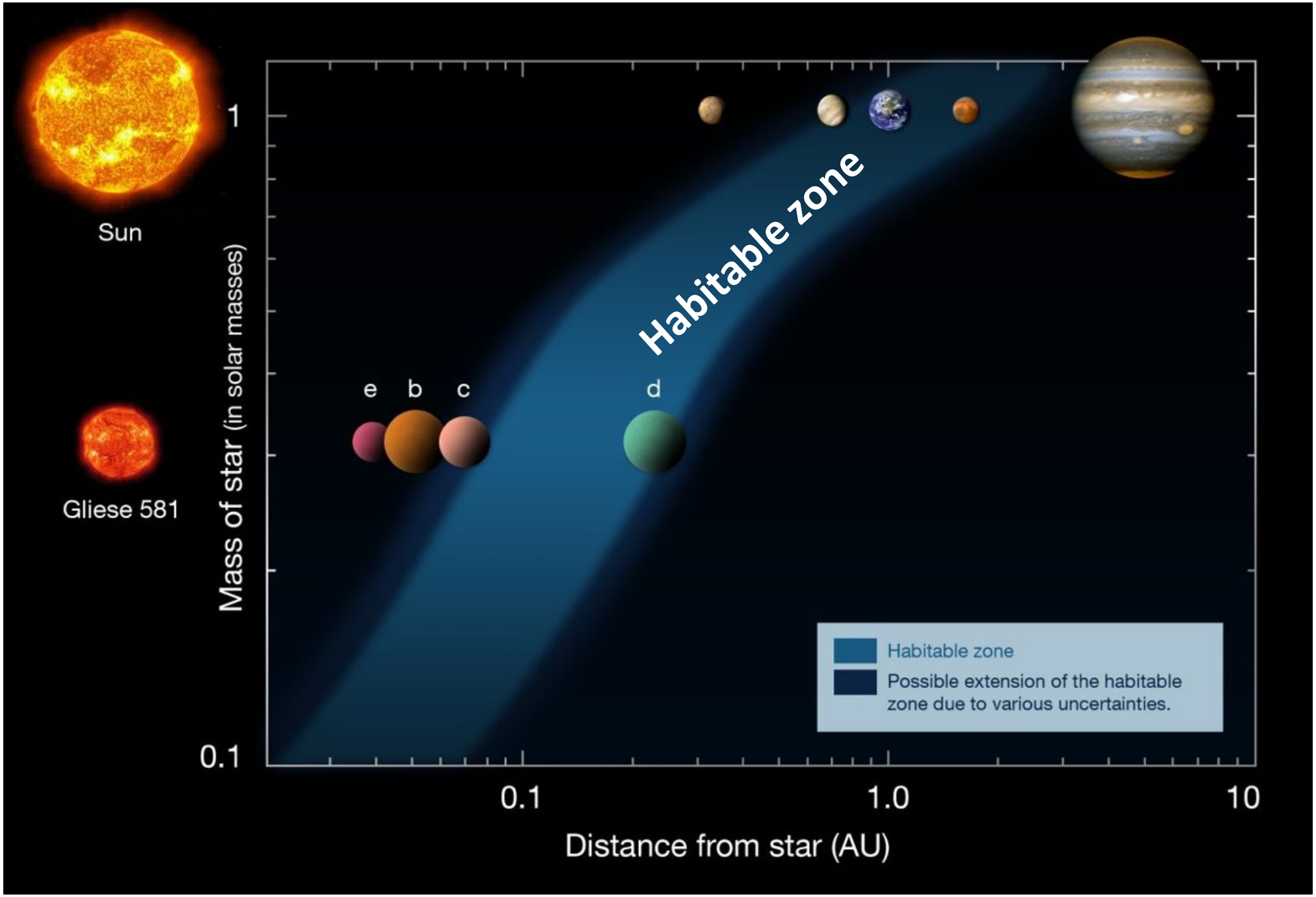
The Big Questions in Astronomy: AU + USA + EU

How are galaxies assembled and how do they evolve?



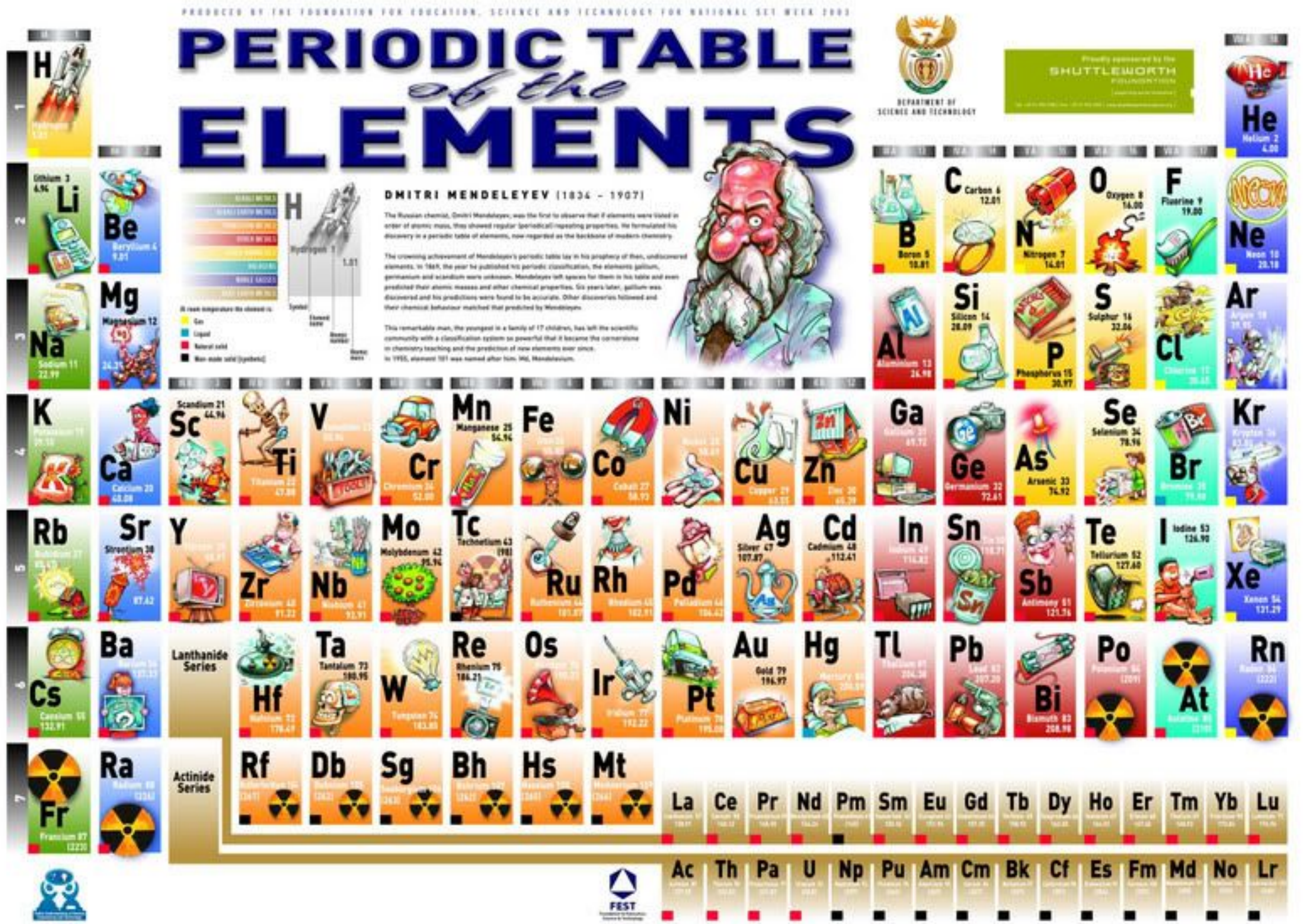
The Big Questions in Astronomy: AU+EU

How common are (habitable) planetary systems and conditions suitable for life?



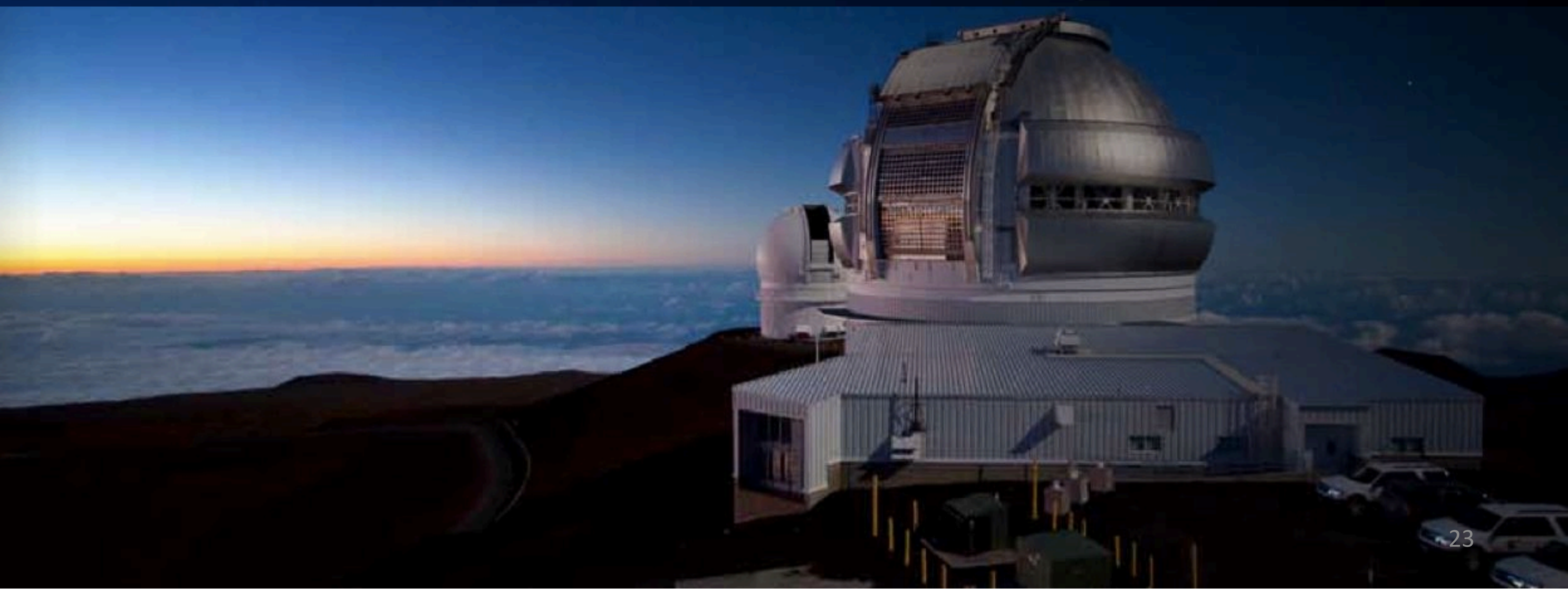
The Big Questions in Astronomy: Australia

How do stars produce and recycle the elemental building-blocks of life? C-H-O-N-P-S



Telescopes, Instruments, and Programs

The Astro2010 decadal survey committee used input from the U.S. astronomy and astrophysics community, science priorities identified by its five Science Frontier Panels, the conclusions of its four Program Prioritization Panels, and independent evaluations of cost and technical readiness to develop the ranked priorities for large ground- and space-based activities for U.S. astronomy for the coming decade (2012-2021). The committee also ranked medium-size projects for both space and ground and identified a number of smaller projects that were deemed equally worthy and therefore left unranked. Below: The Gemini North Observatory atop Mauna Kea in Hawaii.



Astronomy and the Public

Astronomy is an immensely popular science that helps to attract talented young people into careers in the sciences and engineering, provide new technologies, and develop the skills necessary to address the nation's technological challenges.

A Popular Science

Astronomy stirs the public imagination like no other science. A single astronomical image—like the Apollo 8 image of Earth-rise from the Moon or the Hubble Space Telescope image of the Eagle Nebula—can have a visceral and long-lasting impact. Astronomical themes appear in many of our most popular movies, and many terms from the field—such as quasar, pulsar, and black hole—have entered the common lexicon. Astronomy's broad public appeal helps to promote science literacy for the population as a whole, and the public reach is impressive: in 2008, 349 science centers and museums and 1,401 planetariums served 60.3 million people through onsite and online visits. An enthusiastic and vibrant amateur community helps to provide direct hands-on access to the wonders of the night sky and aids in advancing certain subfields of astronomy.

Young Discovery (above). In 2008, 14-year-old Caroline Moore became the youngest amateur astronomer to discover a supernova.

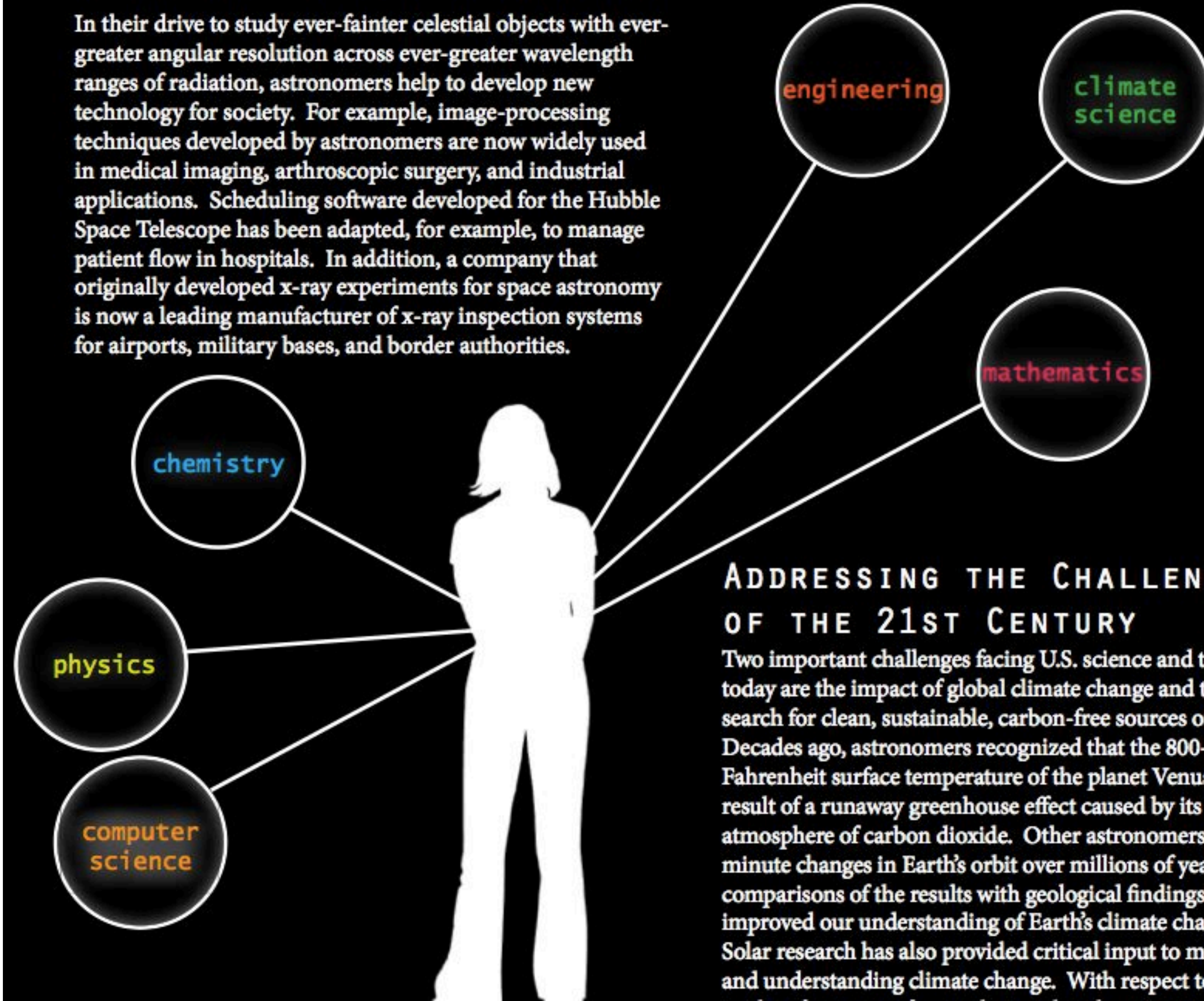
Astronomy and the Public

A Vibrant Training Ground

At the pre-college level, exposure to astronomy is largely through informal education and public outreach—for example, through astronomy summer camps, after-school science activities, online astronomy projects, and community K-12 programs. Because of its appeal, astronomy plays a significant role in shaping K-12 science and in postsecondary education in technology, engineering, and mathematics. In colleges and universities, astronomy courses serve 250,000 students annually, about 10 percent of all undergraduates nationwide. Introductory astronomy is often the only science course for some 15 percent of future K-12 teachers. Astronomy may also be effective in helping to attract more minorities and women into science or technology careers.

A Gateway to New Technology

In their drive to study ever-fainter celestial objects with ever-greater angular resolution across ever-greater wavelength ranges of radiation, astronomers help to develop new technology for society. For example, image-processing techniques developed by astronomers are now widely used in medical imaging, arthroscopic surgery, and industrial applications. Scheduling software developed for the Hubble Space Telescope has been adapted, for example, to manage patient flow in hospitals. In addition, a company that originally developed x-ray experiments for space astronomy is now a leading manufacturer of x-ray inspection systems for airports, military bases, and border authorities.



Addressing the Challenges of the 21st Century

Two important challenges facing U.S. science and technology today are the impact of global climate change and the search for clean, sustainable, carbon-free sources of energy. Decades ago, astronomers recognized that the 800-degree-Fahrenheit surface temperature of the planet Venus was the result of a runaway greenhouse effect caused by its thick atmosphere of carbon dioxide. Other astronomers computed minute changes in Earth's orbit over millions of years, and comparisons of the results with geological findings have improved our understanding of Earth's climate changes. Solar research has also provided critical input to modeling and understanding climate change. With respect to energy,

The Scientific Enterprise

Astronomy is a truly international science. Maintaining the success of our nation's contributions to this field depends critically on continuing to attract talented young scientists, sustaining the support necessary for their research, and developing new, forefront technologies. Background: Earth as seen from the International Space Station illustrates the international character of science and the importance of forefront technology.

A Truly International Effort

For much of the 20th century, astronomical research was dominated by the United States. However, Europe has now achieved parity with the United States in astronomical research, and Australia and South America are gaining rapidly. And the expansion underway in Asia will influence the field for the foreseeable future. In addition, because ground-based observatories view the skies through Earth's turbulent and obscuring atmosphere, large, new facilities must be built wherever in the world the best sites may be. It is thus imperative that planning for U.S. astronomy be done within the international context. All astronomers share the same sky, and significant gains can be made through international coordination and cooperation. One of many such advantages is the opportunity to construct and operate facilities that would otherwise be prohibitively expensive for any nation alone.

People Of Astronomy (below). A group of professional astronomers at work in an obervatory control room.

Keeping Science Strong

Research grants to individuals and groups are key to realizing the scientific potential of existing facilities, identifying and developing new research opportunities, and training the nation's workforce. The competitive research grants programs funded by federal funding agencies provide the primary support for these activities. However, funding for these critical programs has recently flattened or declined despite increases in, for example, the overall NSF budget. To keep astronomy and astrophysics vibrant, it is essential to increase support for individual investigators. Such support would maintain robust theory and observing programs, respond to challenges for data archiving, and sustain essential laboratory astrophysics. In addition, training the critical next generation of instrumentalists requires a steady-state hierarchy of project sizes, so that scientists and engineers can progress from relatively smaller, simpler, and faster projects to responsibilities in larger and more complex activities.

nature International weekly journal of science

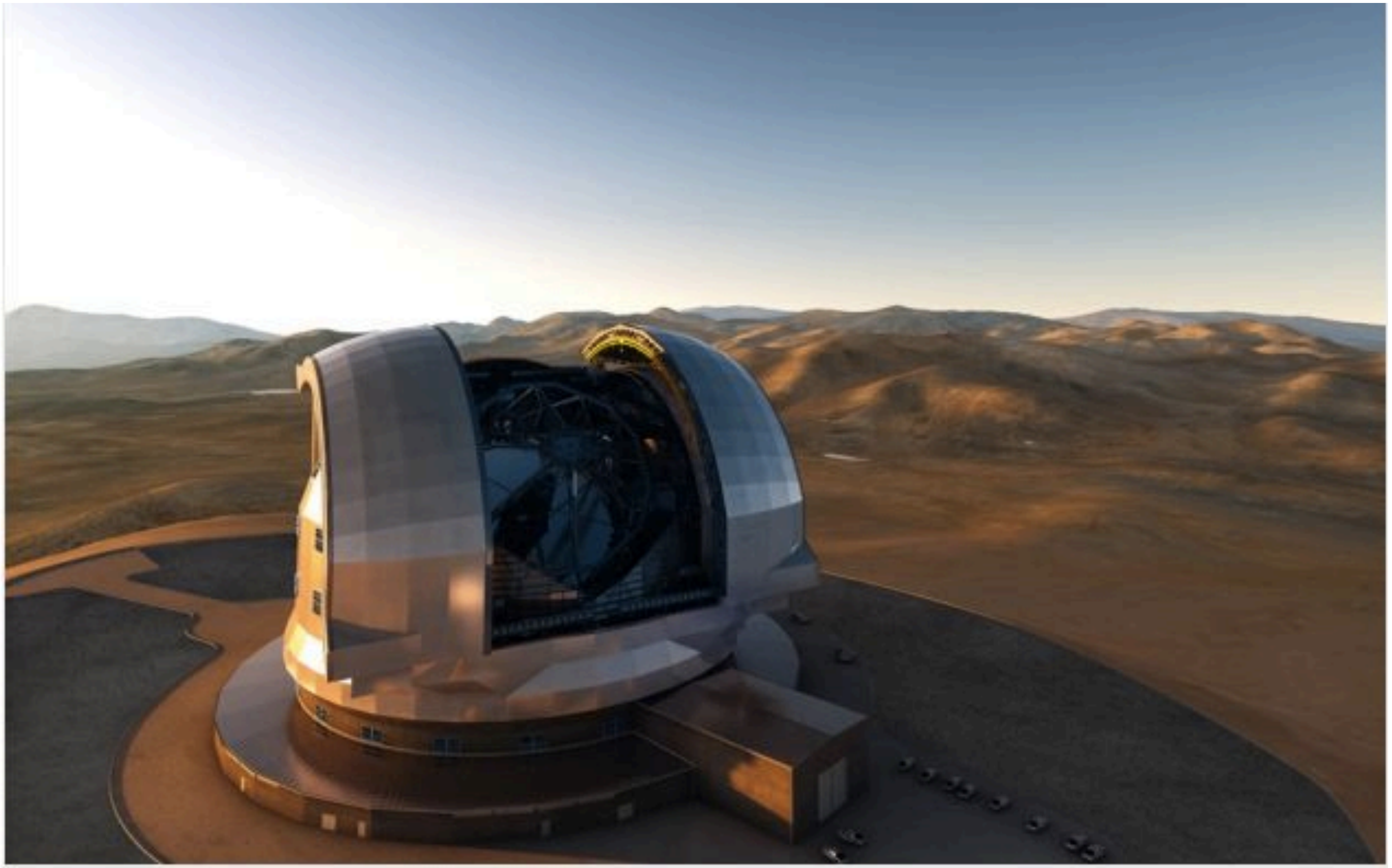
Brazil delays stargazing pact

Reluctance to pay entrance fees stalls European Southern Observatory's giant telescope

Rafael Garcia

03 September 2013

Além da ciência, os jornalistas também podem se interessar em Política Científica



ESO

The 39-metre Extremely Large Telescope in Chile (artist's impression) will suffer setbacks without Brazilian money.

On 28 August, Jorge Meléndez stepped into a room full of journalists to announce a remarkable discovery: an 8.2-billion-year-old star that was depleted in elements such as iron and aluminium in almost exactly the same way as the Sun — a hint that the older star could host terrestrial planets. In an age when astronomers are obsessed with finding another Earth, Meléndez had found something nearly as exciting: a solar twin.

Even more significant than the discovery were its circumstances. Meléndez, an astronomer at the University of São Paulo, Brazil, had found the star using an elite telescope that belongs to the European Southern Observatory (ESO) — a sign of a functioning, if fragile, transatlantic co-dependency.

In 2010, Brazil signed an agreement with ESO, becoming the organization's first non-European member. Brazil's membership fees would allow ESO to begin construction of its €1.1-billion (US$1.5-billion), 39-metre Extremely Large Telescope (ELT). In return, Brazil's small but growing cadre of astronomers would get access to ESO's existing telescopes in Chile. Meléndez's discovery came after just two nights of observation at the Very Large Telescope, ESO's premier observatory, in the Atacama Desert. He has been granted a further 88 nights at ESO's La Silla Observatory, where he is looking for planets that orbit solar twins. "Before the ESO agreement, it would have been impossible for me to do this," he says.

Related stories

- European groups go global
- Megatelescopes look for support
- Brazil ignites telescope race

More related stories

But the relationship has started to fray. Nearly three years after the agreement was signed, Brazil's Congress still has not ratified it. The country has made nominal membership payments of €4 million a

Mensageiro Sideral

De onde viemos, onde estamos e para onde vamos

Perfil

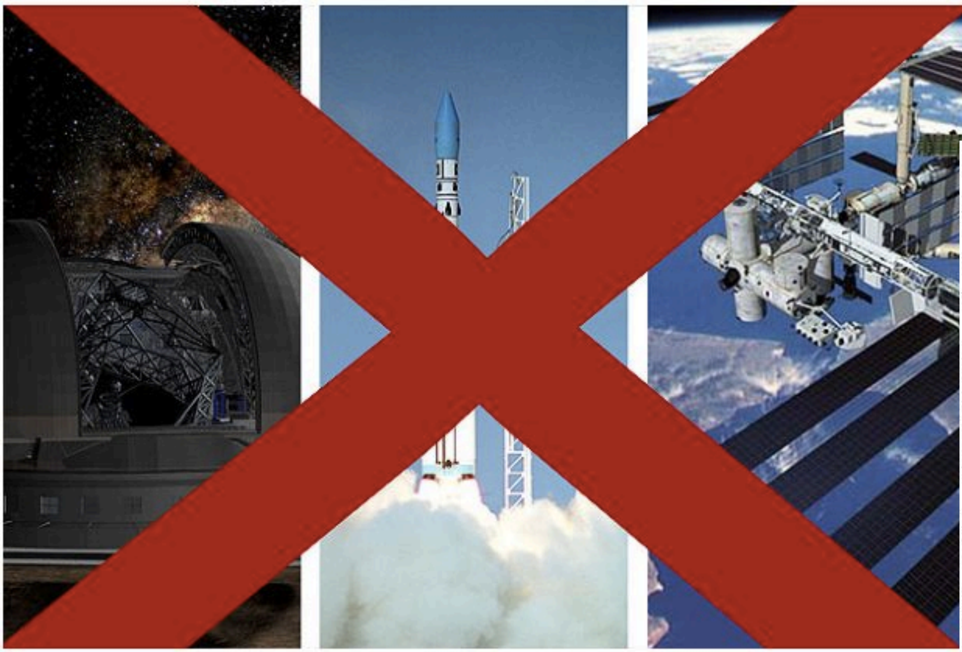
Salvador Nogueira é jornalista de ciência e autor de oito livros

PERFIL COMPLETO

Vivemos no país do Plunct-Plact-Zum

POR SALVADOR NOGUEIRA

23/07/14 06:07



Em 28 de dezembro de 2010, o então ministro da Ciência, Tecnologia e Inovação, Sergio Rezende, assinou, em nome do governo brasileiro, o acordo para que o país fizesse parte do ESO (Observatório Europeu do Sul), a maior organização de pesquisa astronômica do mundo.

Além da ciência, os jornalistas também podem se interessar em Política Científica

Para que o Brasil pudesse cumprir sua parte no acerto, contudo, era preciso que o Congresso Nacional aprovasse o acordo assinado pelo Executivo. Passou 2011. 2012. 2013. Estamos às vésperas da eleição em 2014. E o documento ainda não recebeu o selo do Legislativo para poder entrar em vigor.

Os europeus contavam com esses recursos para dar continuidade a seu plano de construir um telescópio de próxima geração, o E-ELT, de 38 metros de diâmetro. O plano está se atrasando por conta da clássica inércia do Brasil, o país do Plunct-Plact-Zum: aquele que nunca vai a lugar nenhum.

Durante esse período, Dilma Rousseff teve três ministros da Ciência, Tecnologia e Inovação: Aloizio Mercadante (só esquentando a cadeira até ser alçado à mais prestigiosa pasta da Educação), Marco Antônio Raupp e Clelio Campolina Diniz. Nenhum deles fez força para buscar apoio no Congresso para o acordo. Os europeus esperam pacientemente, mas cada vez menos pacientemente. Já discutem internamente excluir o Brasil, que recebeu tudo a que tinha direito até agora, mas propiciou um calote camuflado, escondido sob a clássica (e conveniente) morosidade do Congresso ("sabe como é, teve o carnaval, depois veio a Copa e agora já estamos em ritmo de eleição, etc.").

Is the media interested in science?

Programas de maior audiência da TV (IBOPE, 2014):

- Globo: Novela imperio
- Rede Tv!: Te peguei na TV
- Band: Futebol / Pânico
- Record: Domingo espectacular / Programa da Sabrina
- TV Gazeta: Gazeta esportiva
- SBT: Chiquititas / Programa Silvio Santos
- Cultura: Viola minha Viola

Programação da Globo

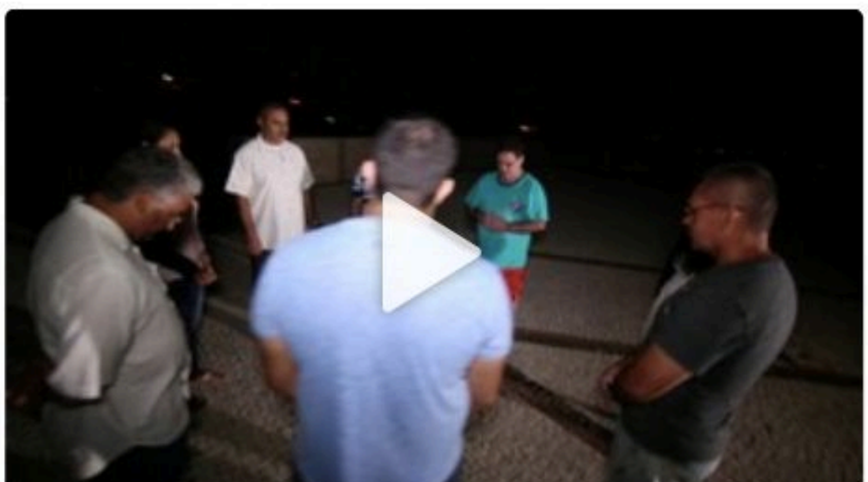
10:40	**Encontro com Fátima Bernardes**
12:00	**SPTV 1ª Edição**
12:45	**Globo Esporte**
13:20	**Jornal Hoje**
13:50	**Vídeo Show**
14:40	**HDTV - A Última Música** The Last Song | Ano: 2010 | País: EUA **Diretor:** Julie Anne Robinson **Elenco:** Miley Cyrus, Greg Kinnear, Bobby (Hallock Beals, Kelly Preston, Nick Lashaway Em uma pequena cidade praiana, um pai afa verão com sua filha, que preferia estar em c reaproximar dela por meio da única coisa qu música.
16:20	**Cobras & Lagartos**

17:45	**Malhação**
18:25	**Boogie Oogie**
19:15	**SPTV 2ª Edição**
19:35	**G3R4ÇÃO BR4S1L**
20:30	**Jornal Nacional**
21:10	**Império**
22:20	**O Rebu**
22:45	**Cowboys & Aliens** Cowboys & Aliens | Ano: 2011 | País: EUA **Diretor:** Jon Favreau **Elenco:** Daniel Craig, Harrison Ford, Olivia Wilde, Sam Rockwell, Adam Beach, Paul Dano

PARA ASSINANTES

Globo Repórter: Espaço, 10/07/2015

Astronomia e Abdução alienígena no Globo Reporter!



Moradores de Quixadá (CE) afirmam ter feito contatos com extraterrestres

- Leia a reportagem

Jorge Melendez @intiwatay · Jul 10

Estamos perto de Plutão, robô no cometa, galáxias com BuracosNegros, novos exoplanetas, e @GloboReporter prefere falar em abdução alienígena

Jorge Melendez @intiwatay · Jul 10

O @GloboReporter de hoje dando muito mais espaço a abdução alienígena do que a nossa premiada astrônoma brasileira ...

Jorge Melendez retweeted

Flávio Gonçalves @ofcgoncalves · Jul 10

Retiro o que eu disse sobre o Globo Repórter. É horrível ver um programa de TV aberta falando muito mais em abduções do que de ciência.

CANAL LIVRE domingo à meia-noite

BAND.com.br

Programa mais sério sobre tema de atualidade na astronomia

Busca por vida fora da Terra - Parte 1

Segunda-Feira, 1 de Dezembro de 2014

Programa com participação do Prof. Roberto Costa

http://noticias.band.uol.com.br/canallivre/entrevista.asp?id=15295400&t=busca-por-vida-fora-da-terra---parte-1

Canal Livre BAND: Vida fora da Terra, Prof. Jorge Meléndez, 23/8/2015

Exploração da Lua. Viagens a Marte. Vida no primo da Terra? Composição química. Núcleo de Júpiter é rochoso. Kepler-452b é super-Terra? Análogo do Sol. Religião e Ciência. Os primeiros instantes do Universo. Os limites da Ciência. A busca pelo conhecimento. Candidatos a planetas.

Astronomia na mídia (tradicional): temas de interesse

- Fenômenos Astronômicos (Eclipse, etc)
- Black holes
- Planets & Extrasolar planets
- Life in the universe
- The fate of the Earth
- The fate of the Sun (and stars)
- Cosmology
- Cosmic impacts
- Space missions, new telescopes/instruments

nature International weekly journal of science

NATURE | NEWS

Exemplo sobre interesse em evolução estelar

Binary star to spill celestial secrets

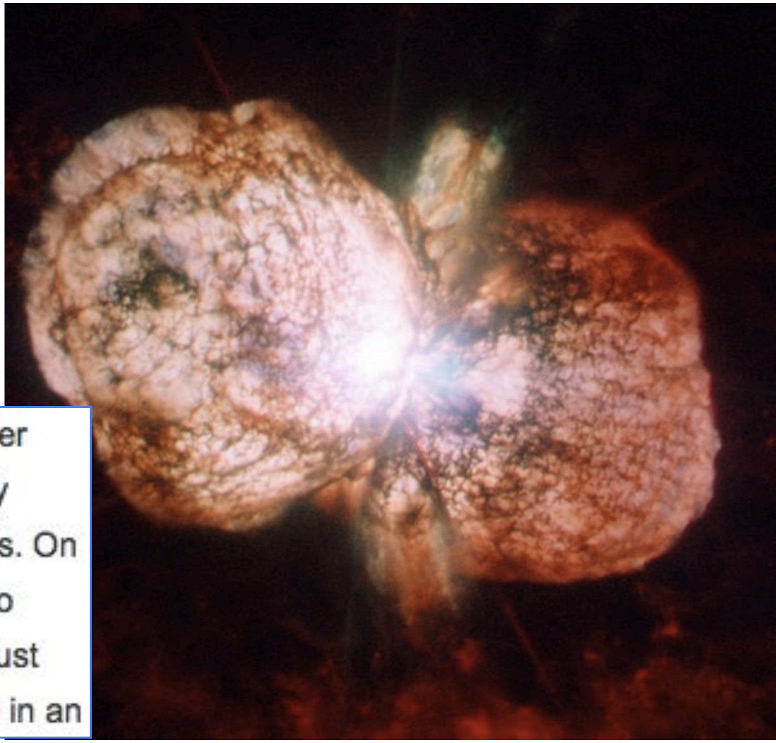
Close approach and violent interaction of stars in η Carinae system will provide rare insight into stellar enigma.

Alexandra Witze

After centuries of perplexing scientists with its wildly erratic behaviour, a nearby star may give up some of its secrets in the next couple of weeks.

A binary system, η Carinae has two stars that swing past one another every 5.5 years. The bigger star — some 90 times the mass of the Sun — is incredibly unstable, always seemingly on the verge of blowing up. When the sma
primary star, a
triggers violen
system.

At the Pico dos Dias Observatory in southern Brazil, astronomer Augusto Damineli has been spending every night since 25 July trying to catch a glimpse of η Carinae through the winter clouds. On 29 July, his team finally caught a brief opening and managed to gather data showing that a helium spectral line is dropping in just the pattern that Damineli expected. “TOUCHDOWN!” he wrote in an



Podemos atrair o interesse da mídia em outros temas de astronomia?

- If you cannot relate your research to a "sexy" topic, you can try to use a **"record"**:

- First
- Largest
- Most distant
- Fastest
- Oldest
- etc

The Astrophysical Journal Letters, 774:L32 (6pp), 2013 September 10 doi:10.1088/2041-8205/774/2/L3

HIGH PRECISION ABUNDANCES OF THE OLD SOLAR TWIN HIP 102152: INSIGHTS ON Li DEPLETION FROM THE OLDEST SUN*

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ABSTRACT

We present the first detailed chemical abundance analysis of the old 8.2 Gyr solar twin, HIP 102152. We derive differential abundances of 21 elements relative to the Sun with precisions as high as 0.004 dex ($\lesssim$1%), using ultra high-resolution (R = 110,000), high S/N UVES spectra obtained on the 8.2 m Very Large Telescope. Our determined metallicity of HIP 102152 is [Fe/H] $= -0.013 \pm 0.004$. The atmospheric parameters of the star were determined to be 54 K cooler than the Sun, 0.09 dex lower in surface gravity, and a microturbulence identical to our derived solar value. Elemental abundance ratios examined versus dust condensation temperature reveal a solar abundance pattern for this star, in contrast to most solar twins. The abundance pattern of HIP 102152 appears to be the most similar to solar of any known solar twin. Abundances of the younger, 2.9 Gyr solar twin, 18 Sco, were also determined from UVES spectra to serve as a comparison for HIP 102152. The solar chemical pattern of HIP 102152 makes it a potential candidate to host terrestrial planets, which is reinforced by the lack of giant planets in its terrestrial planet region. The following non-local thermodynamic equilibrium Li abundances were obtained for HIP 102152, 18 Sco, and the Sun: log ϵ (Li) $= 0.48 \pm 0.07$, 1.62 ± 0.02, and 1.07 ± 0.02, respectively. The Li abundance of HIP 102152 is the lowest reported to date for a solar twin, and allows us to consider an emerging, tightly constrained Li-age trend for solar twin stars.

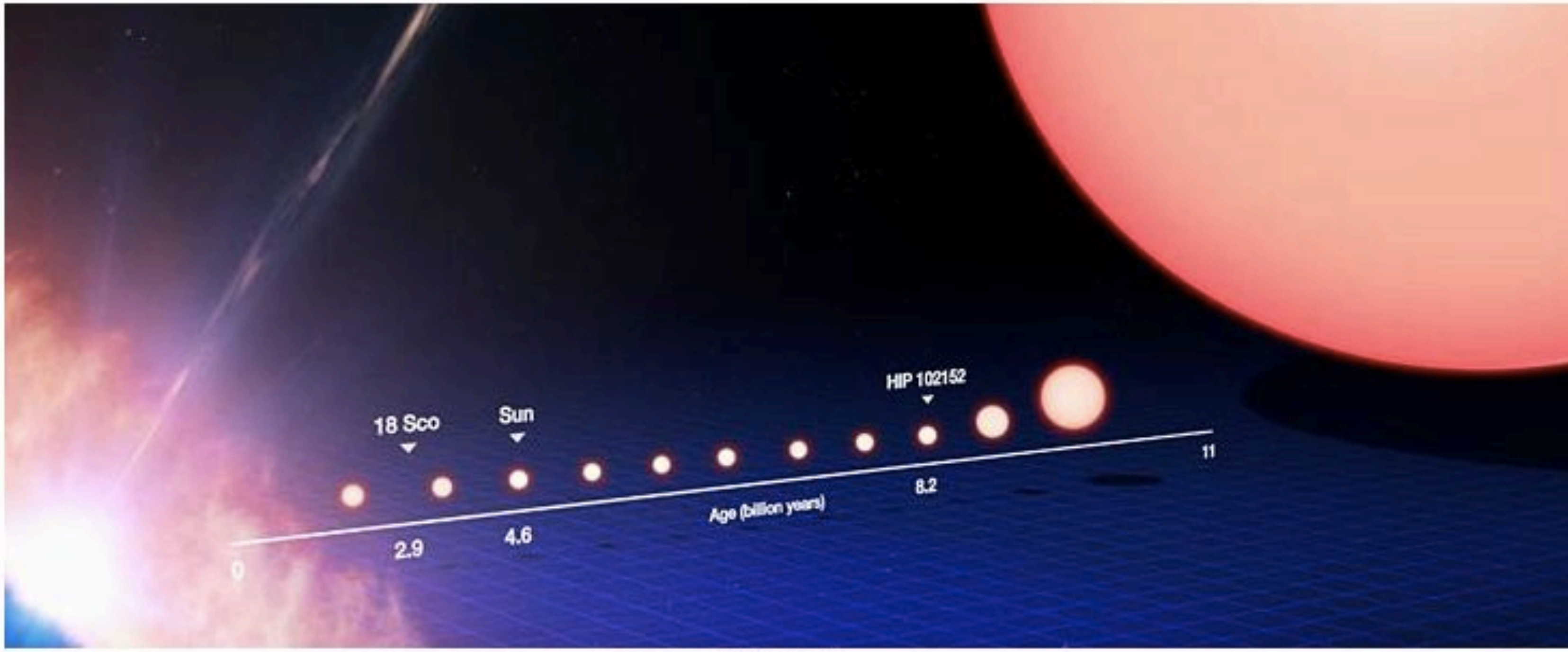
Oldest Solar Twin Identified

ESO press release

ESO's VLT provides new clues to help solve lithium mystery

http://www.eso.org/public/news/eso1337/

28 August 2013



Click to Enlarge

An international team led by astronomers in Brazil has used ESO's Very Large Telescope to identify and study the oldest solar twin known to date. Located 250 light-years from Earth, the star HIP 102152 is more like the Sun than any other solar twin — except that it is nearly four billion years older. This older, but almost identical, twin gives us an unprecedented chance to see how the Sun will look when it ages. The new observations also provide an important first clear link between a star's age and its lithium content, and in addition suggest that HIP 102152 may be host to rocky terrestrial planets.

Astronomers have only been observing the Sun with telescopes for 400 years — a tiny fraction of the Sun's age of 4.6 billion years. It is very hard to study the history and future evolution of our star, but we can do this by hunting for rare stars that are almost exactly like our own, but at different stages of their lives. Now astronomers have identified a star that is essentially an identical twin to our Sun, but 4 billion years older — almost like seeing a real version of the twin paradox in action [1].

Jorge Melendez (Universidade de São Paulo, Brazil), the leader of the team and co-author of the new paper explains: "*For decades, astronomers have been searching for solar twins in order to know our own life-giving Sun better. But very few have been found since the first one was discovered in 1997. We have now obtained superb-quality spectra from the VLT and can scrutinise solar twins with extreme precision, to answer the question of whether the Sun is special.*"

A&A 564, A133 (2014)
DOI: 10.1051/0004-6361/201322440

Astronomy & Astrophysics

Gaia FGK benchmark stars: Metallicity⋆,⋆⋆

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Context. To calibrate automatic pipelines that determine atmospheric parameters of stars, one needs a sample of stars, or "benchmark stars", with well-defined parameters to be used as a reference.

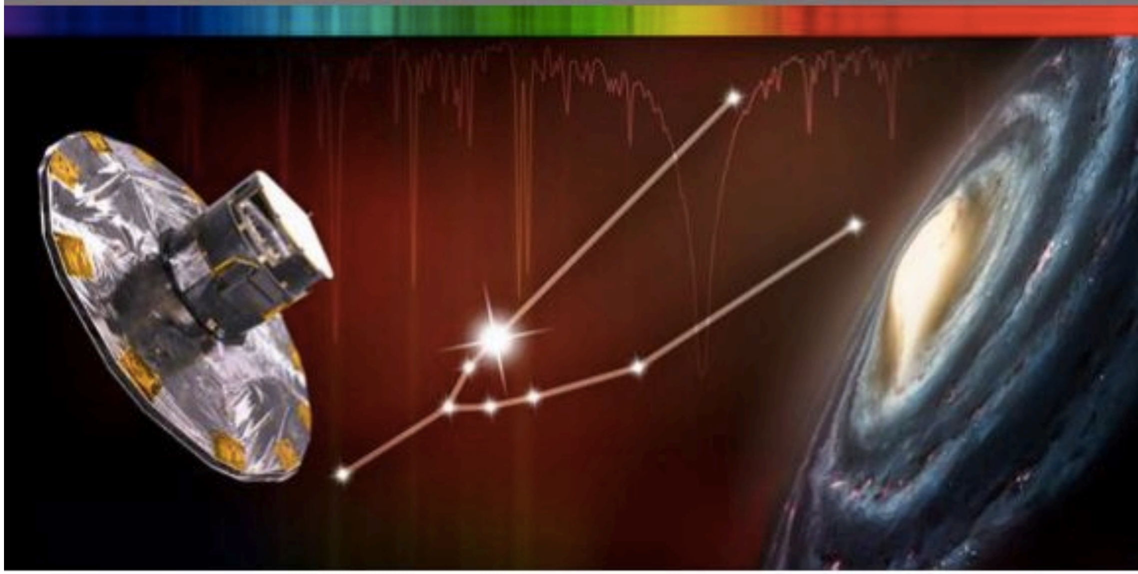
Aims. We provide detailed documentation of the iron abundance determination of the 34 FGK-type benchmark stars that are selected to be the pillars for calibration of the one billion *Gaia* stars. They cover a wide range of temperatures, surface gravities, and metallicities.

Methods. Up to seven different methods were used to analyze an observed spectral library of high resolutions and high signal-to-noise ratios. The metallicity was determined by assuming a value of effective temperature and surface gravity obtained from fundamental relations; that is, these parameters were known a priori and independently from the spectra.

Results. We present a set of metallicity values obtained in a homogeneous way for our sample of benchmark stars. In addition to this value, we provide detailed documentation of the associated uncertainties. Finally, we report a value of the metallicity of the cool giant ψ Phe for the first time.

http://www.cam.ac.uk/research/news/spectral-ruler-is-first-standardised-way-to-measure-stars

Spectral 'ruler' is first standardised way to measure stars



Published

24 Jun 2014

Image

The first standardised way to measure stars has been developed for Gaia mission

Credit: Amanda Smith/Institute of Astronomy

A team of astronomers have created the first standardised set of measurement guidelines for analysing and cataloguing stars.

Previously, as with the longitude problem 300 years earlier for fixing locations on Earth, there was no unified system of reference for calibrating the heavens.

But now, when investigating the atmospheric structure and chemical make-up of stars, astronomers can use a new stellar scale as a 'ruler' – making it much easier for them to classify and compare data on star discoveries.

> *"This is the first attempt to cover a wide range of stellar classifications, and do everything from the beginning – methodically and homogenously"*
>
> — *Paula Jofre*

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Gaia-ESO data show Milky Way may have formed 'inside-out', and provide new insight into Galactic evolution

Stellar stuff: outreach programme

Homework#2. Deadline: 23/ago/2018

Analise de matéria baseada no artigo "GAIA FGK benchmark stars: metallicity" (disponível no site de AGA0421)

- Mencionar 1 aspecto positivo e negativo da matéria a seguir
- Escrever 1 parágrafo sobre o artigo em até **10 linhas** usando uma linguagem para o público. DICA: responder algumas das "**6 golden questions**": What? When? Where? Who? Why? and How?

http://www.em.com.br/app/noticia/tecnologia/2014/07/18/interna_tecnologia,549422/catalogo-estelar-ajuda-a-desvendar-a-via-lactea.shtml

Catálogo estelar ajuda a desvendar a Via Láctea

Análise detalhada de 34 estrelas ajuda cientistas a classificarem os astros da Via Láctea e, assim, compreender melhor a origem da galáxia e do Universo

Roberta Machado -
Publicação: 18/07/2014 00:12 Atualização: 18/07/2014 10:22

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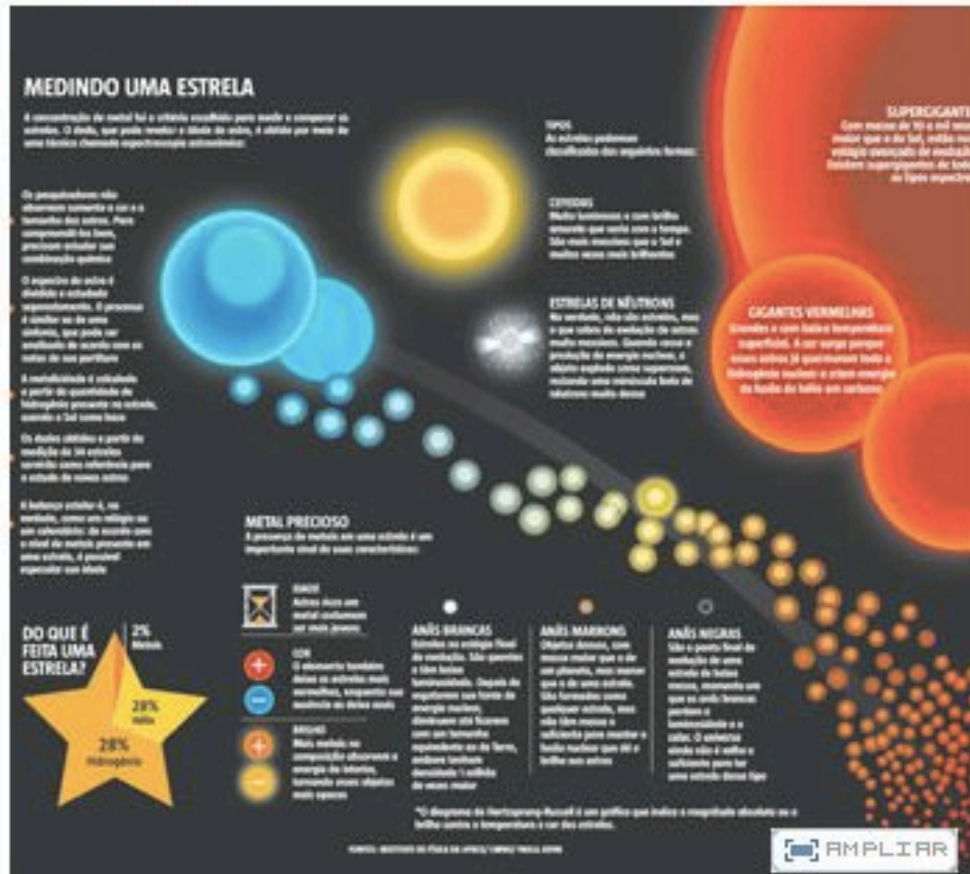


Brasília - O grande e amarelo Sol é apenas um ponto no mar de 300 bilhões de estrelas que compõem a Via Láctea, a casa de uma variada coleção estelar: anãs, gigantes, quentes e frias, com espectros que variam do pálido azul ao vermelho-fogo. O belo conjunto natural esconde segredos da origem do Universo, e, para desvendar esse emaranhado de luzes, pesquisadores precisam estudar cada aspecto dos corpos celestes, compreender como eles se relacionam e usar as pistas que encontram no estudo de outras esferas luminosas. Um novo e detalhado catálogo deve ajudar os astrônomos nessa tarefa, servindo como a referência mais completa já produzida para o grupo de estrelas da galáxia que abriga a Terra.

O trabalho, que tomou como base 34 astros de características variadas, já foi adotado por diversas pesquisas, incluindo o ambicioso projeto Gaia, que pretende mapear as estrelas da Via Láctea. A arte de descrever os pontos luminosos sofria com a falta de padronização das pesquisas, que usavam diferentes pontos de referência para descrever os astros. Na grande parte das vezes, o Sol era escolhido como modelo para os astrônomos, mas a sutileza da formação e do desenvolvimento desses corpos muitas vezes não correspondia ao processo pelo qual o Astro-Rei passou em sua curta existência.

"Na galáxia, há várias estrelas diferentes. Gigantes-vermelhas como Aldebarã, têm uma atmosfera totalmente diferente. É vermelha, fria e muito grande, se comparada ao Sol", diz Paula Jofre, pesquisadora do Instituto de Astronomia da Universidade de Cambridge e principal autora do catálogo estelar.

Essa foi a primeira vez que um grupo de pesquisadores se dedicou exclusivamente a estudar uma grande variedade de classificações estelares e produzir um trabalho padronizado desde o princípio. "Embora algumas das estrelas sejam conhecidas, as incertezas quanto às suas propriedades são grandes. Isso é astronomia", ressalta Paula . "Nossa biblioteca tem dados muito, muito bons, então nossas incertezas vêm principalmente de modelos e métodos considerados na análise das estrelas. Tentamos quantificar isso."

Mensurar uma estrela não é como pesar um objeto ou medi-lo com uma régua. Dependendo do tamanho, da cor, da composição química, da estrutura atmosférica e da gravidade, ele pode ter uma diferente história e interagir com seus arredores de forma distinta. A medida mais significativa usada pela astrônoma de Cambridge e sua equipe para descrever os astros galácticos foi a metalicidade, isto é, a quantidade de metal presente na composição das esferas formadas principalmente por hélio e hidrogênio.

Concentração O nível de metal presente na estrela é como um relógio cósmico, que permite calcular a idade estimada do astro. "No caso das estrelas, a gente não pode medi-las diretamente. Então, a gente observa a composição química, o que é feito por meio da análise de um modelo", ressalta Jorge Mendez, professor do Departamento de Astronomia do Instituto de Astronomia, Geofísica e Ciências Atmosféricas da Universidade de São Paulo (IAG/USP).

Para descobrir que tipos de elementos estão presentes nos objetos, os cientistas usam a técnica da espectroscopia (veja infografia). "A informação da estrela é gravada usando detectores que conseguem desdobrar a luz das estrelas nos seus componentes mais básicos. Assim, conseguimos enxergar linhas escuras num espectro, e essas linhas são relacionadas com a composição química da estrela", ensina Mendez. Quanto mais intensa for essa marca escurecida, maior tende a ser a concentração de metais no objeto. E, quanto mais metal, mais jovem ele é.

Os cientistas usaram sete métodos para analisar as observações de alta resolução colhidas das estrelas usadas como modelo e criaram descrições detalhadas, que incluíram características como tamanho, distância, temperatura e a gravidade superficial do astro. Em conjunto, esses principais aspectos podem revelar mais informações sobre a história do objeto estudado e, por consequência, da formação da galáxia.

Referência

O trabalho, descrito recentemente na publicação especializada Astronomy & Astrophysics, pode melhorar os métodos usados hoje para estudar estrelas e já é referência em diversas pesquisas em andamento. O projeto Gaia é definitivamente a maior delas e vai usar os dados colhidos pelos pesquisadores para produzir o maior mapeamento tridimensional da Via Láctea já feito. O satélite vai registrar o brilho, a cor e a posição de todo objeto celestial que estiver ao seu alcance - devem ser mais de 1 bilhão. O plano de cinco anos é tão ambicioso que deve resultar em uma quantidade de dados equivalente a toda a informação existente atualmente no planeta Terra.

A série de observações deve fornecer uma perspectiva inédita de distância, velocidade e direção do movimento de algumas estrelas familiares e outras ainda desconhecidas. "Avanços na compreensão da história e da estrutura da nossa galáxia por meio de projetos ambiciosos são possíveis porque, como Newton, nós enxergamos mais longe do alto dos ombros de gigantes", ressalta, em uma nota, Gerry Gilmore, líder do Gaia no Reino Unido.

"Para determinar com segurança que elementos químicos formam as estrelas, esses gigantes são as estrelas de referência. Todo o nosso conhecimento que se expande vastamente depende do quanto realmente compreendemos sobre alguns poucos astros", explica Gilmore.

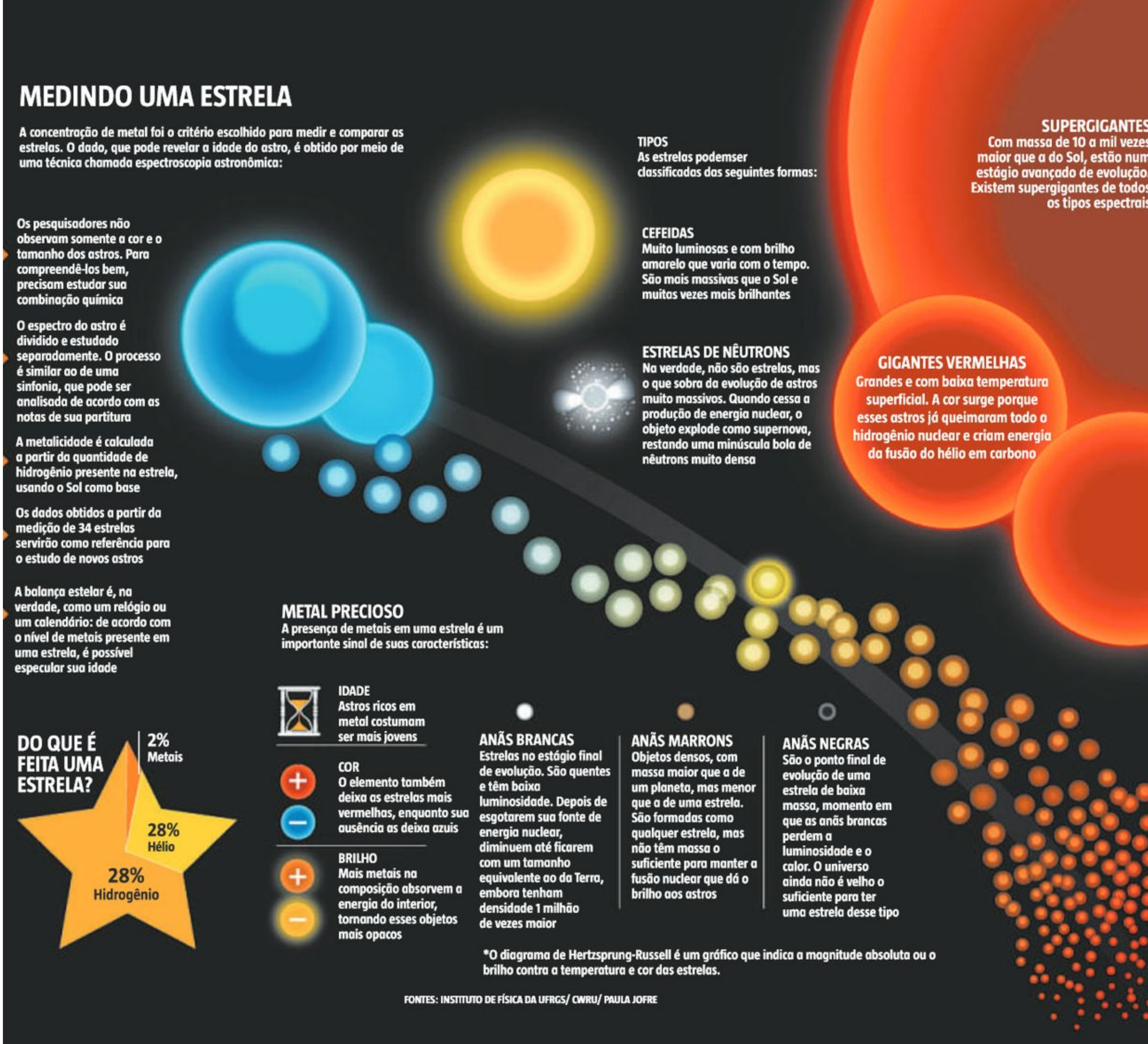
Para os pesquisadores, o banco de dados estelar deve fornecer pistas sobre alguns aspectos difíceis de medir mesmo com os aparelhos mais potentes. Ao saber que determinado objeto tem cor ou metalicidade semelhante a outro, os astrônomos poderão trabalhar em suposições sobre sua história com base no que já se sabe sobre a estrela mais conhecida.

"Essas características não são triviais e são obtidas (por cálculos) porque existem fatores que a gente não conhece", aponta Silvia Cristina Fernandes Rossi, professora do IAG/USP. "Se tiver uma base de estrelas muito bem estudadas e trabalhadas, suas estimativas serão muito boas", acredita.

O catálogo estelar foi utilizado ainda em uma pesquisa europeia e em outra australiana, que também são dedicadas a coletar grandes volumes de dados do espectro estelar da Via Láctea. Grupos de astronomia que trabalham com astrofísica teórica mostraram igual interesse em usar esses parâmetros para aperfeiçoar os modelos de medição e transmissão dos perfis dos astros.

Elementos

A galáxia em que se encontra o planeta Terra tem uma estrutura semelhante à de uma cidade. Algumas áreas principais são rodeadas por localidades secundárias, que se formaram ali ou foram atraídas por astros maiores. Em cada estrela, uma combinação de gás e outros elementos químicos é uma prova ativa da composição que deu origem à galáxia e ao Universo.


MEDINDO UMA ESTRELA
A concentração de metal foi o critério escolhido para medir e comparar as estrelas. O dado, que pode revelar a idade do astro, é obtido por meio de uma técnica chamada espectroscopia astronômica:
Os pesquisadores não observam somente a cor e o tamanho dos astros. Para compreendê-los bem, precisam estudar sua combinação química
O espectro do astro é dividido e estudado separadamente. O processo é similar ao de uma sinfonia, que pode ser analisada de acordo com as notas de sua partitura
A metalicidade é calculada a partir da quantidade de hidrogênio presente na estrela, usando o Sol como base
Os dados obtidos a partir da medição de 34 estrelas servirão como referência para o estudo de novos astros
A balança estelar é, na verdade, como um relógio ou um calendário: de acordo com o nível de metais presente em uma estrela, é possível especular sua idade
TIPOS
As estrelas podemser classificadas das seguintes formas:
SUPERGIGANTES
Com massa de 10 a mil vezes maior que a do Sol, estão num estágio avançado de evolução. Existem supergigantes de todos os tipos espectrais
CEFEIDAS
Muito luminosas e com brilho amarelo que varia com o tempo. São mais massivas que o Sol e muitas vezes mais brilhantes
ESTRELAS DE NÊUTRONS
Na verdade, não são estrelas, mas o que sobra da evolução de astros muito massivos. Quando cessa a produção de energia nuclear, o objeto explode como supernova, restando uma minúscula bola de nêutrons muito densa
GIGANTES VERMELHAS
Grandes e com baixa temperatura superficial. A cor surge porque esses astros já queimaram todo o hidrogênio nuclear e criam energia da fusão do hélio em carbono
METAL PRECIOSO
A presença de metais em uma estrela é um importante sinal de suas características:
IDADE
Astros ricos em metal costumam ser mais jovens
COR
O elemento também deixa as estrelas mais vermelhas, enquanto sua ausência as deixa azuis
BRILHO
Mais metais na composição absorvem a energia do interior, tornando esses objetos mais opacos
DO QUE É FEITA UMA ESTRELA?
2% Metais
28% Hélio
28% Hidrogênio
ANÃS BRANCAS
Estrelas no estágio final de evolução. São quentes e têm baixa luminosidade. Depois de esgotarem sua fonte de energia nuclear, diminuem até ficarem com um tamanho equivalente ao da Terra, embora tenham densidade 1 milhão de vezes maior
ANÃS MARRONS
Objetos densos, com massa maior que a de um planeta, mas menor que a de uma estrela. São formadas como qualquer estrela, mas não têm massa o suficiente para manter a fusão nuclear que dá o brilho aos astros
ANÃS NEGRAS
São o ponto final de evolução de uma estrela de baixa massa, momento em que as anãs brancas perdem a luminosidade e o calor. O universo ainda não é velho o suficiente para ter uma estrela desse tipo
*O diagrama de Hertzsprung-Russell é um gráfico que indica a magnitude absoluta ou o brilho contra a temperatura e cor das estrelas.
FONTES: INSTITUTO DE FÍSICA DA UFRGS/ CWRU/ PAULA JOFRE