บทความที่น่าสนใจประจำเดือนพฤศจิกายน 2557
สาขาวิทยาศาสตร์และเทคโนโลยี

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Title:	The Evolution of Galaxy Structure Over Cosmic Time
Author:	Christopher J. Conselice
Journal:	Annual Review of Astronomy and Astrophysics, Volume 52, 2014, Pages 291-337
Abstract:	I present a comprehensive review of the evolution of galaxy structure in the Universe from the first galaxies currently observable at $z \sim 6$ down to galaxies observable in the local Universe. Observed changes in galaxy structures reveal formation processes that only galaxy structural analyses can provide. This pedagogical review provides a detailed discussion of the major methods used to study galaxies morphologically and structurally, including the well-established visual method for morphology; Sérsic fitting to measure galaxy sizes and surface brightness profile shapes; and nonparametric structural methods [such as the concentration (C), asymmetry (A), clumpiness (S) (CAS) method and the Gini/M20 parameters, as well as newer structural indices]. These structural indices measure fundamental properties of galaxies, such as their scale, star-formation rate, and ongoing merger activity. Extensive observational results demonstrate how broad galaxy morphologies and structures change with time up to $z \sim 3$, from small, compact and peculiar systems in the distant Universe to the formation of the Hubble sequence, dominated by spirals and ellipticals. Structural methods accurately identify galaxies in mergers and allow measurements of the merger history out to $z \sim 3$. I depict properties and evolution of internal structures of galaxies, such as bulges, disks, bars, and at $z>1$ large star-forming clumps. I describe the structure and morphologies of host galaxies of active galactic nuclei and starbursts/submillimeter galaxies, along with how morphological galaxy quenching occurs. The role of environment in producing structural changes in galaxies over cosmic time is also discussed. Galaxy sizes can also change with time, with measured sizes up to a factor of 2–5 smaller at high redshift at a given stellar mass. I conclude with a discussion of how the evolving trends, in sizes, structures, and morphologies, reveal the formation mechanisms behind galaxies and provides a new and unique way to test theories of galaxy formation.
Database:	Annual Reviews

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Title:	Numerical Relativity and Astrophysics
Author:	Luis Lehner and Frans Pretorius
Journal:	Annual Review of Astronomy and Astrophysics, Volume 52, 2014, Pages 661-694
Abstract:	Throughout the Universe many powerful events are driven by strong gravitational effects that require general relativity to fully describe them. These include compact binary mergers, black hole accretion, and stellar collapse, where velocities can approach the speed of light and extreme gravitational fields

	(ΦNewt/c2 1) mediate the interactions. Many of these processes trigger emission across a broad range of the electromagnetic spectrum. Compact binaries further source strong gravitational wave emission that could directly be detected in the near future. This feat will open up a gravitational wave window into our Universe and revolutionize our understanding of it. Describing these phenomena requires general relativity, and—where dynamical effects strongly modify gravitational fields—the full Einstein equations coupled to matter sources. Numerical relativity is a field within general relativity concerned with studying such scenarios that cannot be accurately modeled via perturbative or analytical calculations. In this review, we examine results obtained within this discipline, with a focus on its impact in astrophysics.
Database:	Annual Reviews

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Title:	Star formation sustained by gas accretion
Author:	Jorge Sánchez Almeida, Bruce G. Elmegreen, Casiana Muñoz-Tuñón, Debra Meloy Elmegreen
Journal:	The Astronomy and Astrophysics Review, Volume 22, Issue 1, October 2014, Article:71
Abstract:	Numerical simulations predict that metal-poor gas accretion from the cosmic web fuels the formation of disk galaxies. This paper discusses how cosmic gas accretion controls star formation, and summarizes the physical properties expected for the cosmic gas accreted by galaxies. The paper also collects observational evidence for gas accretion sustaining star formation. It reviews evidence inferred from neutral and ionized hydrogen, as well as from stars. A number of properties characterizing large samples of star-forming galaxies can be explained by metal-poor gas accretion, in particular, the relationship among stellar mass, metallicity, and star-formation rate (the so-called fundamental metallicity relationship). They are put forward and analyzed. Theory predicts gas accretion to be particularly important at high redshift, so indications based on distant objects are reviewed, including the global star-formation history of the universe, and the gas around galaxies as inferred from absorption features in the spectra of background sources.
Database:	SpringerLink

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Title:	Giant magnetospheres in our solar system: Jupiter and Saturn compared
Author:	Norbert Krupp
Journal:	The Astronomy and Astrophysics Review, Volume 22, Issue 1, October 2014, Article:75
Abstract:	We review the current knowledge about the two biggest magnetospheres in our solar system based on the significant progress made with data from the Cassini spacecraft in orbit around Saturn since 2004, and based on the last mission to Jupiter by the Galileo spacecraft between 1995 and 2003. In addition we take into account new observations of the Hubble Space Telescope and other telescopes as well as the latest computer simulation efforts.
Database:	SpringerLink

5	Title:	Coronal Loops: Observations and Modeling of Confined Plasma
	Author:	Reale, Fabio
	Journal:	Living Reviews in Solar Physics. 2014, Vol. 11 Issue 4, p1-94. 94p.
	Abstract:	Coronal loops are the building blocks of the X-ray bright solar corona. They owe their brightness to the dense confined plasma, and this review focuses on loops mostly as structures confining plasma. After a brief historical overview, the review is divided into two separate but not independent parts: the first illustrates the observational framework, the second reviews the theoretical knowledge. Quiescent loops and their confined plasma are considered and, therefore, topics such as loop oscillations and flaring loops (except for non-solar ones, which provide information on stellar loops) are not specifically addressed here. The observational section discusses the classification, populations, and the morphology of coronal loops, its relationship with the magnetic field, and the loop stranded structure. The section continues with the thermal properties and diagnostics of the loop plasma, according to the classification into hot, warm, and cool loops. Then, temporal analyses of loops and the observations of plasma dynamics, hot and cool flows, and waves are illustrated. In the modeling section, some basics of loop physics are provided, supplying fundamental scaling laws and timescales, a useful tool for consultation. The concept of loop modeling is introduced and models are divided into those treating loops as monolithic and static, and those resolving loops into thin and dynamic strands. More specific discussions address modeling the loop fine structure and the plasma flowing along the loops. Special attention is devoted to the question of loop heating, with separate discussion of wave (AC) and impulsive (DC) heating. Large-scale models including atmosphere boxes and the magnetic field are also discussed. Finally, a brief discussion about stellar coronal loops is followed by highlights and open questions.
	Database:	Academic Search Complete

6	Title:	How Did Early Earth Become Our Modern World?
	Author:	Richard W. Carlson, Edward Garnero, T. Mark Harrison, Jie Li, Michael Manga, William F. McDonough, Sujoy Mukhopadhyay, Barbara Romanowicz, David Rubie, Quentin Williams, and Shijie Zhong
	Journal:	Annual Review of Earth and Planetary Sciences, Volume 42, 2014, Pages 151-178
	Abstract:	Several features of Earth owe their origin to processes occurring during and shortly following Earth formation. Collisions with planetary embryos caused substantial melting of the growing Earth, leading to prolonged core formation, atmosphere outgassing, and deepening of the magma ocean as Earth grew. Mantle noble gas isotopic compositions and the mantle abundance of elements that partition into the core record this very early Earth differentiation. In contrast, the elements that are not involved in either core or atmosphere formation show surprisingly muted evidence of the fractionation expected during magma ocean crystallization, and even this minimal evidence for early intramantle differentiation appears to have been erased by mantle convection within ~1.5 billion years of Earth formation. By

	4.36 Ga, Earth's surface and shallow interior had reached temperatures similar to those of the present Earth, and mantle melting, and perhaps plate subduction, was producing crustal rock types similar to those seen today. Remnants of early Earth differentiation may still exist in the deep mantle and continue to influence patterns of large-scale mantle convection, sequestration of some trace elements, geomagnetic reversals, vertical motions of continents, and hot-spot volcanism.
Database:	Annual Reviews

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Title:	Short-Lived Climate Pollution
Author:	R.T. Pierrehumbert
Journal:	Annual Review of Earth and Planetary Sciences, Volume 42, 2014, Pages 341-379
Abstract:	Although carbon dioxide emissions are by far the most important mediator of anthropogenic climate disruption, a number of shorter-lived substances with atmospheric lifetimes of under a few decades also contribute significantly to the radiative forcing that drives climate change. In recent years, the argument that early and aggressive mitigation of the emission of these substances or their precursors forms an essential part of any climate protection strategy has gained a considerable following. There is often an implication that such control can in some way make up for the current inaction on carbon dioxide emissions. The prime targets for mitigation, known collectively as short-lived climate pollution (SLCP), are methane, hydrofluo-rocarbons, black carbon, and ozone. A re-examination of the issues shows that the benefits of early SLCP mitigation have been greatly exaggerated, largely because of inadequacies in the methodologies used to compare the climate effects of short-lived substances with those of CO2, which causes nearly irreversible climate change persisting millennia after emissions cease. Eventual mitigation of SLCP can make a useful contribution to climate protection, but there is little to be gained by implementing SLCP mitigation before stringent carbon dioxide controls are in place and have caused annual emissions to approach zero. Any earlier implementation of SLCP mitigation that substitutes to any significant extent for carbon dioxide mitigation will lead to a climate irreversibly warmer than will a strategy with delayed SLCP mitigation. SLCP mitigation does not buy time for implementation of stringent controls on CO2 emissions.
Database:	Annual Reviews

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Title:	Empirical tests of pre-main-sequence stellar evolution models with eclipsing binaries
Author:	Keivan G. Stassun, Gregory A. Feiden, Guillermo Torres
Journal:	New Astronomy Reviews, Volumes 60–61, June–August 2014, Pages 1–28
Abstract:	We examine the performance of standard pre-main-sequence (PMS) stellar evolution models against the accurately measured properties of a benchmark sample of 26 PMS stars in 13 eclipsing binary (EB) systems having masses 0.04–4.0 $M_\odot$ and nominal ages ≈1–20 Myr. We provide a definitive compilation of all fundamental properties for the EBs, with a careful and consistent reassessment of

	observational uncertainties. We also provide a definitive compilation of the various PMS model sets, including physical ingredients and limits of applicability. No set of model isochrones is able to successfully reproduce all of the measured properties of all of the EBs. In the H–R diagram, the masses inferred for the individual stars by the models are accurate to better than 10% at $\gtrsim 1 M_\odot$, but below $1 M_\odot$ they are discrepant by 50–100%. Adjusting the observed radii and temperatures using empirical relations for the effects of magnetic activity helps to resolve the discrepancies in a few cases, but fails as a general solution. We find evidence that the failure of the models to match the data is linked to the triples in the EB sample; at least half of the EBs possess tertiary companions. Excluding the triples, the models reproduce the stellar masses to better than $\sim$10% in the H–R diagram, down to $0.5 M_\odot$, below which the current sample is fully contaminated by tertiaries. We consider several mechanisms by which a tertiary might cause changes in the EB properties and thus corrupt the agreement with stellar model predictions. We show that the energies of the tertiary orbits are comparable to that needed to potentially explain the scatter in the EB properties through injection of heat, perhaps involving tidal interaction. It seems from the evidence at hand that this mechanism, however it operates in detail, has more influence on the surface properties of the stars than on their internal structure, as the lithium abundances are broadly in good agreement with model predictions. The EBs that are members of young clusters appear individually coeval to within 20%, but collectively show an apparent age spread of $\sim$50%, suggesting true age spreads in young clusters. However, this apparent spread in the EB ages may also be the result of scatter in the EB properties induced by tertiaries.
Database:	ScienceDirect

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Title:	Searching for Black Holes in Space
Author:	Ken Pounds
Journal:	Space Science Reviews, September 2014, Volume 183, Issue 1-4, pp 5-19
Abstract:	Although General Relativity had provided the physical basis of black holes, evidence for their existence had to await the Space Era when X-ray observations first directed the attention of astronomers to the unusual binary stars Cygnus X-1 and A0620-00. Subsequently, a number of faint Ariel 5 and Uhuru X-ray sources, mainly at high Galactic latitude, were found to lie close to bright Seyfert galaxies, suggesting the nuclear activity in AGN might also be driven by accretion in the strong gravity of a black hole. Detection of rapid X-ray variability with EXOSAT later confirmed that the accreting object in an AGN is almost certainly a supermassive black hole.
Database:	SpringerLink

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	Title:	Current Status of Simulations
	Author:	P. Chris Fragile
	Journal:	Space Science Reviews, September 2014, Volume 183, Issue 1-4, pp 87-100
	Abstract:	As the title suggests, the purpose of this chapter is to review the current status of numerical simulations of black hole accretion disks. This chapter focuses exclusively on global simulations of the accretion process within a few tens of gravitational radii of the black hole. Most of the simulations discussed are performed using general relativistic magnetohydrodynamic (MHD) schemes, although some mention is made of Newtonian radiation MHD simulations and smoothed particle hydrodynamics. The goal is to convey some of the exciting work that has been going on in the past few years and provide some speculation on future directions.
	Database:	SpringerLink