



# Concluding Remarks to the IWARA 2018

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# Inca Astronomy (Rojas Gamarra & Gullberg)

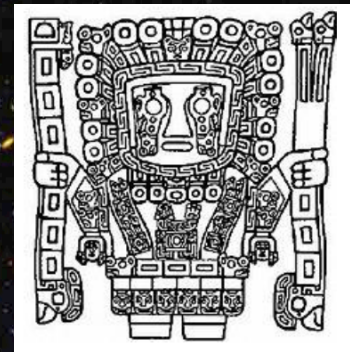
Beware IAU !!! : “Cultural Astronomy” is NOT about what the ancient cultures knew about our present knowledge, but rather to understand how they related to the Cosmos

It is a lot “Cultural” and not so much “Astronomy” (L.C. Jafelice). Incas were immersed in a whole different world, perhaps impossible to imagine within our greco-roman perspective



Not only *huacas* were destroyed, but their entire way of looking at Nature too ...

According to the Incas, Viracocha created the world...  
Possibly only him could be accurate about IWARAs contents





# Black holes

- Mena : non-commutative structure
- Marques : black hole immersed in a fluid of strings (astrophysically relevant?)
- Cuba Quispe : particle motion around a *regular* e.m. BH (Bronnikov)
- Miyamoto : black branes perturbation theory , evolution of horizons etc.

Far from the observations as yet

- Yuan : stellar binaries perturbed by a SMBH . Mergers and Tidal Disruption Events
- Sahu : compact object microlensing with HST (stellar BH targeted)

1996... →

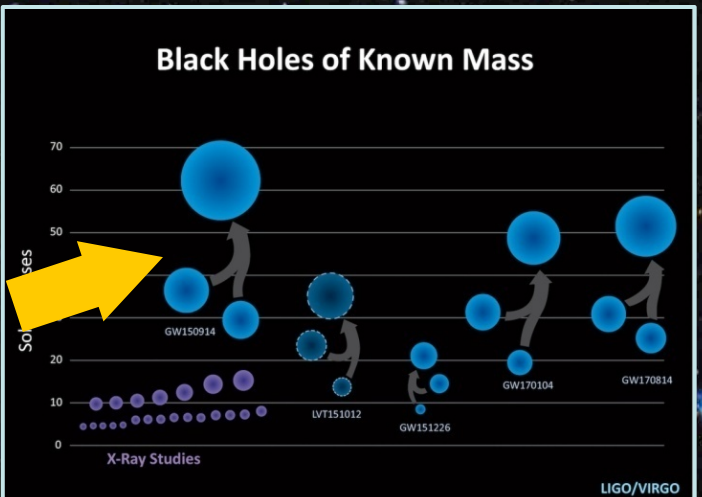
Mon. Not. R. Astron. Soc. 278, L46–L48 (1996)  
**Possible determination of isolated pulsar masses with gravitational microlensing**  
 J. E. Horvath  
*Instituto Astronômico e Geofísico, Universidade de São Paulo, Av. M. Stéfano 4200, Água Funda 04301-904, São Paulo SP, Brasil*

- Kluzniak : QPOs, their nature and potential as NS probes
- Rosinska : binary BH in clusters and GWs
- R-X. Xu : unifying programme 3-flavor quarks

Discovery of an Extraordinary Binary System  
 Todd A. Thompson,<sup>1,2,\*</sup> Christopher S. Kochanek,<sup>1,2</sup> Krzysztof Z. Stanek,<sup>1,2</sup>  
 Carles Badenes,<sup>3,4</sup> Richard S. Post,<sup>5</sup> Tharindu Jayasinghe,<sup>1,2</sup>  
 David W. Latham,<sup>6</sup> Allyson Bieryla,<sup>6</sup> Gilbert A. Esquerdo,<sup>6</sup>  
 Perry Berlind,<sup>6</sup> Michael L. Calkins,<sup>6</sup> Jamie Tayar,<sup>1</sup> Jennifer A. Johnson,<sup>1,2</sup>  
 Thomas W.-S. Holoien,<sup>7</sup> Katie Auchetti,<sup>2,8</sup> Kevin Covey<sup>9</sup>

M ~2.5 – 5.8 M<sub>⊙</sub> is it a “light” BH?

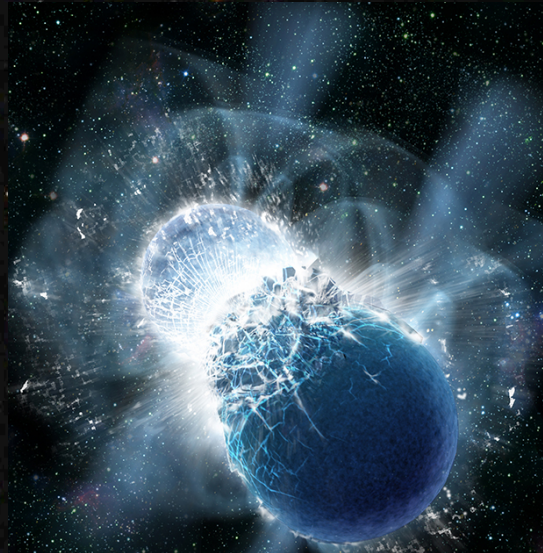
“Pop III”?





# Nuclei, QCD, MHD, Stars

- Stahl : Relativity and Large-Scale structures. Some choices may induce spurious behavior
- Cecilio : effects of primordial magnetic fields on (warm) Inflation (perturbations?)
- Bhuyan : neutron skin thickness  $\rightarrow$  infinite matter (NSs in the Lab ?)
- Scoccola : NJL in a magnetic field
- Gao : boson-fermion stars (which boson, by the way?)
- A. Nielsen : pseudo-complex GR and the real world... perhaps no BHs
- Garrison : the amplification of magnetic field seeds (Biermann) @ the EW scale
- Aichelin : EoS of a PNJL lagrangian  $\rightarrow$  making contact with lattice results
- Bratkovskaya : dilepton probes of the QGP : extracting signals is difficult
- 



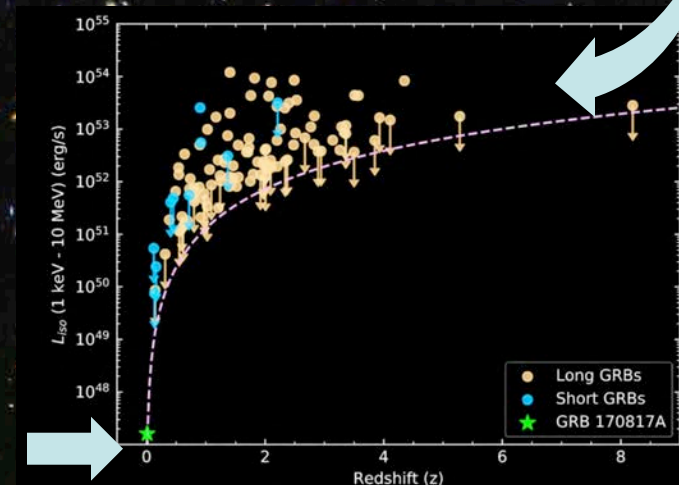
B field is necessary to explain the initial post-merging phase



# Cosmic rays, X-rays, gamma rays

- Matt : ATHENA & IXPE : The near future  
X-ray spectroscopy with  $\sim$  few eV resolution
- Kawata : Telescope Array on UHECR and the composition/calibration problem
- Williams : XARM rebuilding Astro-H (linguistic and scientific contributions)
- Page : LMXRB reveal heating/cooling secrets , Cas A cooling
- Schwartz : X-ray emission beyond radio jets @ high Z
- von Kienlin : “ordinary” short GRB observed by Fermi/GBM for GW170817
- Gutierrez : 4-m robotic telescope on duty (remember HETE ...) !!!  $\sim$  min response
- Vicha : Auger results correlate with LSS
- Mayer : surprises in cosmology by SDSS?  
wild hypothesis (standard candle galaxies)  $\rightarrow$  De Sitter universe

“catastrophic failure” claim is not supported



# Cosmology, CMBR, GR, Stars

- Pinzón : variable test mass orbits in the 3-body problem (keep coming...)
- Giacchini : higher-derivative gravitation signatures: extreme universe physics
- Pagliara : what if NS-NS contain “exotic” matter? The two-family picture
- Columbro : balloon Large-Scale Polarization Explorer (LSPE)
- Liu : anomalies of the CMBR by remote galaxy clusters study
- Wang : multiband monitoring of jets by Tidal Disruption Events around SMBHs
- Escala : accretion rates for quasar growth @  $Z \sim 6-7$
- Piccinelli : B effects on neutral boson decay (and many other reactions...)
- Li : mass and radius of NSs by the expanding photosphere, spectra and redshift



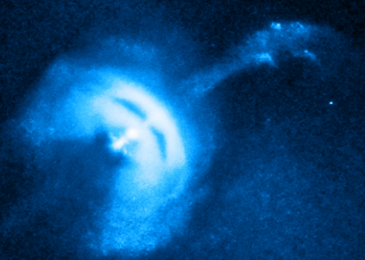
# Compact stars, X-rays



- Yoneyama : evidence that XINS (The Magnificent Seven) descend from magnetars
- Cruces : (Parks-Effelsberg) High Time Resolution Universe widen statistics
- Gao : Ohmic decay of dipole B in a high-braking pulsar ( $\sim 10^6$  yr) Braking indexes evolve and young pulsars must decide where to go...
- Yang : anticorrelation between X-ray emission and pulsed fraction
- Villavicencio : near-condensation pions generate anti-neutrinos (enhanced cooling?)
- Timokhin :  $e^+e^-$  pairs and Pulsar Wind Nebulae: accounting for the energy budget
- Negreiros : cooling of compact massive objects (?) Something is rotten in the NSs
- Blaschke : Hybrid stars merger can be probed by looking w/NICER
- Slane : formation and evolution of PWNe: asymmetries

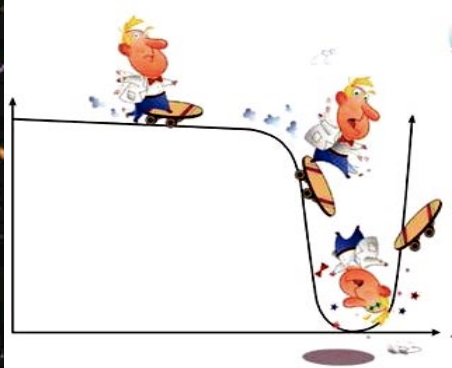



$2 M_{\odot}$  and  $R < 13$  km ?  
Mean Field is suspicious

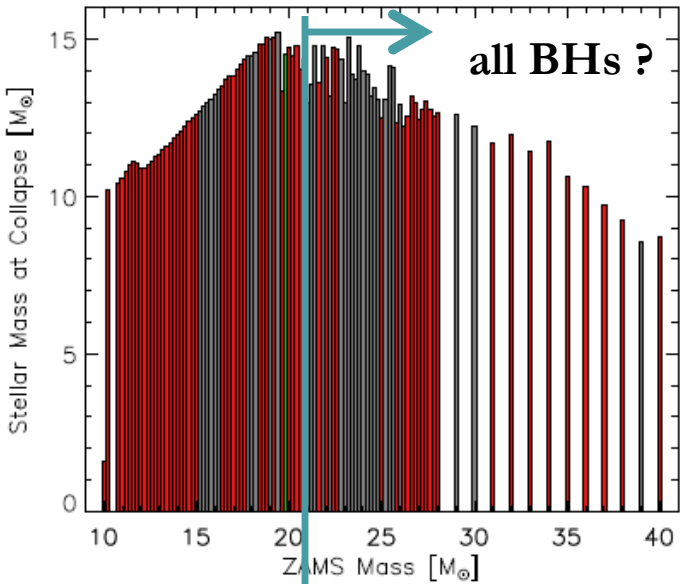




# Supernovae, stars, GRBs (?)



- Bezerra : does Loop Quantum Gravity lead to “natural” Inflation ?  
Inflation still on shaky physical grounds
- Manzano : symmetries → correlations of primordial perturbations, observables
- Dass : neutral pion condensation as the origin of huge magnetic fields in magnetars
- Totani : anthropic reason for a low value of  : lethal supernovae (10-20 pc?)
- Katsuda : core-collapse SN count in the Magellanic Clouds is wrong, massive ones explode



Ugliano et al. 2015

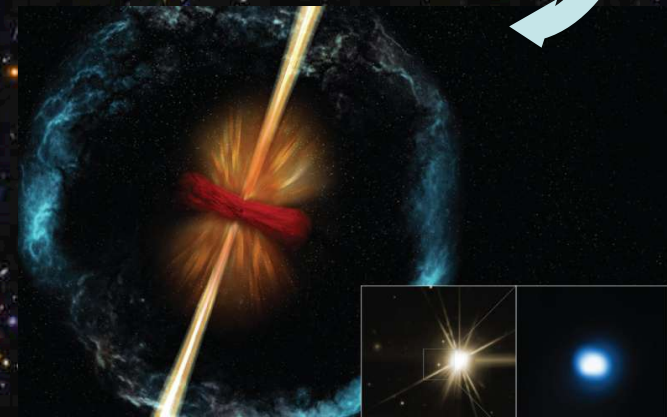


Westerlund 1 (age ~5 Myr) hosts a NS (magnetar) but ~40 M<sub>o</sub> are still in the MS ... the progenitor was VERY massive



# Supernovae, stars, GRBs (cont.)

- Moiseenko : Magneto-rotational instability develops quickly (and helps explosions)
- Piran : disentangling geometry and physics from joint GW-GRB observations: cocoons
- Valentim : SN1987A showed two neutrino bursts, DUNA etc potential catch
- Raaf : searching for baryon number violation  
with neutrino experiments → GUT's feeling



GRB 140903A

DCT

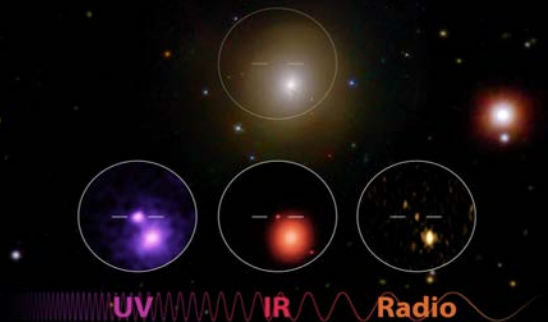
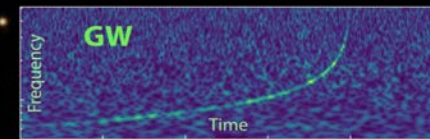
Chandra



# Dark Matter, Dark Energy, GW and GRBs

- Suleiman : Information Relativity is not Special Relativity and tries to reduce gravity to kinematics (!)
- Tan : careful with the clocks... all interactions included
- Shao : Lorentz symmetry tested (again) (Breaking  $\rightarrow$  DM, DE?)
- Garcia : Galileon speed of GW (there is a  $\Delta t$  between GWs and GRB in the merger...)
- Matos : is there an ultra-light boson halo ?
- Ketov : Inflation should ensue from gravitation (curvature?), does supergravity solve "all" problems ?
- Dupac : Euclid 1.2 m space telescope survey probing 10 billion yr history
- Dvoeglazov : generalizing the Lorentz group for (concrete) quantum applications
- Hess : Zerilli 's equation in pseudo-complex gravity
- 

## GW 170817 @ 12:41:04.4 UTC





# GR, GW, Gravity

- Belvedere : a new point of view stating that dipolar pulsar fields are wrong (torques !!)
- Pereira : toroidal fields larger  $\rightarrow$  deformation higher in Born-Infeld magnetars
- Sotani : w and f-modes of cold NS : a real GW target ? g-modes in PNS
- Rosinska : GW look into the (bright) future
- Karas : interplay of gravitation and magnetic fields
- Bisnovatyi-Kogan : GW from core-collapse : high frequency pulse detectable at  $\sim 10$  kpc  
    magneto-rotational models lead in some cases to huge asymmetries



**Thank you and have a pleasant trip !**

