The Israeli Astrophysics & Cosmology Student Conference Series (AsCoS) II – 2009

April 7th, 2009 Tel Aviv University

The Israeli Astrophysics & Cosmology Student Conference Series (AsCoS) is the first student conference in the field. Its purpose is to expose the Israeli students to the different research fields done in Israel, to encourage collaboration between students, to create a form where every question is welcome and even to practice lecture presentations. It is also highly recommended for third year undergrad students and for first year master students who consider Astrophysics as their research field

.

Program

Time	Name	Title/Location
09:40-10:00	Registration and morning coffee	Held at Shenkar (chemistry) loby
10:00-10:15	Welcome	
10:15-11:05	Nakar Ehud	The Search for the Origin of Short Gamma-Ray Bursts
11:05-11:30	Budnik Ranny	The structure of Radiation Mediated Shocks and x-ray Supernova Shock Breakouts
11:30-11:55	Sagi Eva	TeVeS as a Substitute for Dark Matter
11:55-12:20	Advertising	
12:20-12:25	Group photo	
12:25-13:50	Lunch Break	
13:50-14:15	Kashi Amit	Galactic vs. Extragalactic Origin of the Peculiar Transient SCP 06F6
14:15-14:40	Kiewe Michael	Type IIn supernovae: How Do They Work and How Do We Get a Handle on Their Progenitor
14:40-15:05	Ofir Aviv	Transiting Circumbinary Planets
15:05-15:25	Coffee break	
15:25-15:50	Goerdt Tobias	The Formation of Ultra-Compact Dwarf Galaxies and Nucleated Dwarf Galaxies
15:50-16:15	Trakhtenbrot Benny	Probing the Evolution of Black Hole Mass and Growth Rate Through Cosmic Time
16:15-16:40	Mor Rivay	Dusty Structure Around Type-I AGN: Clumpy Torus, NLR and Near-Nucleus Hot Dust
16:40-17:00	Summary	

Participants

Name	email	University	Field	Status
Arieli Yinon	yinonari@post.tau.ac.il	Tel-Aviv University	Galaxies and Clusters properties	PhD
Avital Lior	lioravital20@gmail.com	Tel-Aviv University	---	MsC
Balila Ohad	ohad.balila@gmail.com	Tel-Aviv University	---	MsC
Bar-Asher Shalhevet	shalhevet_b@yahoo.com	The Hebrew University	Cosmology	MsC
Bar-Or Ben	benbaror@gmail.com	Weizmann Institute	---	MsC
Bareket Ido	info@bareket-astro.com	Bareket observatory	Automated astronomical surveys	Undergrad
Barzilay Yudith	yudith@bgu.ac.il	Ben-Gurion University	Pulsars	PhD
Birnholtz Ofek	ofek.birnholtz@mail.huji.ac.il	The Hebrew University	---	MsC
Blank Miri	miriam.blank@mail.huji.ac.il	The Hebrew University	---	MsC
Bromberg Omer	omer@wise.tau.ac.il	Tel-Aviv University	High energy astrophysics	PhD
Budnik Ranny	ranny1@gmail.com	Weizmann Institute	High energy astrophysics	PhD
Cohen Alon	aloncohen3@gmail.com	Tel-Aviv University	--	3rd yr undergrad
Dzigan Yifat	yifatdzigan@yahoo.com	Tel-Aviv University	Planetary Science	PhD
Dvorkin Irina	irinadvo@post.tau.ac.il	Tel-Aviv University	Clusters of galaxies	MsC
Finkleman Ido	ido@wise.tau.ac.il	Tel-Aviv University	ISM in elliptical galaxies	PhD
Graur Or	orgraur@wise.tau.ac.il	Tel-Aviv University	Supernovae	MsC
Goerdt Tobias	tgoerdt@phys.huji.ac.il	The Hebrew University	Galaxy formation	Post-doc
Golod Sveta	svetagolod@gmail.com	The Hebrew University	---	MsC

Gorbikov Evgeny	evgenyg1@post.tau.ac.il	Tel-Aviv University	Interstellar dust, H-alpha surveys	PhD
Halatzi Shy	shy.halatzi@gmail.com	Tel Aviv University	Meteor Observing (amateur)	1st year undergrad
Horesh Assaf	assafh@wise.tau.ac.il	Tel-Aviv University	Gravitational Lensing, Supernovae	PhD
Hirshfeld Noga	nogahirsh@gmail.com	The Hebrew University	High-energy astrophysics	MsC
Jacob Uri	uriyada@phys.huji.ac.il	The Hebrew University	High-energy astrophysics	PhD
Karni Renana	rananakarni@gmail.com	Tel-Aviv University	---	1st year undergrad
Kashi Amit	kashia@physics.technion.ac.il	Technion	Eta Carina	PhD
Kaspi Shai	shai@wise.tau.ac.il	Tel-Aviv University	AGNs	Staff member
Kiewe Michael	michaelkiewe@hotmail.com	Weizmann Institute	Astronomy: Type IIn supernovae	MsC
Kupi Gabor	gabor.kupi@weizmann.ac.il	Weizmann Institute	Galactic dynamics	Post-doc
Lemze Doron	doronl@wise.tau.ac.il	Tel-Aviv University	Galaxy Clusters	PhD
Mededinski Elinor	elinor@wise.tau.ac.il	Tel-Aviv University	Galaxy Clusters	PhD
Metuki Ofer	ofer.metuki@mail.huji.ac.il	The Hebrew University	Structure formation	PhD
Michaelis Amir M.	amir-m.michaelis@mail.huji.ac.il	The Hebrew University	Radiation Hydrodynamic	PhD
Mikulizky Ziv	miko1298@gmail.com	Tel-Aviv University	High-energy astrophysics	MsC
Mor Rivay	rivay@wise.tau.ac.il	Tel-Aviv University	Active galactic nuclei	PhD
Nakar Ehud	udini@wise.tau.ac.il	Tel-Aviv University	High-energy astrophysics	Faculty
Naoz Smadar	smadar@wise.tau.ac.il	Tel-Aviv University	21cm cosmology, and the first galaxies	PhD
Ofir Aviv	avivofir@wise.tau.ac.il	Tel-Aviv University	Extrasolar Planets	PhD
Perets Hagai	hagai.perets@weizmann.ac.il	Weizmann Institute	Stellar dynamics near massive black holes	PhD
Radai Yaron	yaron.radai@mail.huji.ac.il	Tel-Aviv University	Star formation in galaxy disks	MsC
Rotstein Dimitry	spectrum@tx.technion.ac.il	Technion	Astrophysics	MsC

Sagi Eva	eva.sagi@mail.huji.ac.il	The Hebrew University	Alternative theories of gravitation	PhD
Sarid Gal	galahead@post.tau.ac.il	Tel-Aviv University	Planetary Sciences - Small Bodies	PhD
Schenkler Nir	schenkler@gmail.com	The Hebrew University	Cosmology	Undergrad
Shaham Alon	alonshah@post.tau.ac.il	Tel-Aviv University	Planetary Sciences	MsC
Shimon Meir	meirs@mamacass.ucsd.edu	UCSD	cosmology	postdoc
Shporer Avi	shporer@wise.tau.ac.il	Tel-Aviv University	Extrasolar Planets	PhD
Shvartzvald Yossi	yossishv@gmail.com	Tel-Aviv University	---	3rd yr undergrad
Spector Oded	odedspec@astro.tau.ac.il	Tel-Aviv University	galaxy evolution	PhD
Stern Jonathan	sternnaty@gmail.com	Technion	AGNs	MsC
Sternberg Assaf	phassaf@tx.technion.ac.il	Weizmann Institute	Galaxy Clusters/Supernovae	Post-doc
Steinberg Elad	elad.steinberg@mail.huji.ac.il	The Hebrew University	YORP and Binary YORP	MsC
Tal-Or Lev	lev.tal-or@mail.huji.ac.il	The Hebrew University	---	MsC
Trakhtenbrot Benny	trakht@wise.tau.ac.il	Tel-Aviv University	AGN, mass assembly	PhD
Tsodikovich Yevgeny	yevgenyt@wise.tau.ac.il	Tel-Aviv University	Binary Stars	MsC
Vazan Allona	allonava@post.tau.ac.il	Tel-Aviv University	structure and evolution of planets	MsC
Wanderman David	david.wanderman@mail.huji.ac.il	The Hebrew University	High-energy astrophysics	MsC
Woo Joanna	joaw@phys.huji.ac.il	The Hebrew University	Galaxy formation	PhD
Yalinewich Almog	almogyal@bgu.ac.il	Ben-Gurion University	Plasma instabilities	MsC
Zeilig-Hess Meir	maorhess@017.net.il	Tel-Aviv University	---	3rd yr undergrad
Zinger Elad	eladzing@phys.huji.ac.il	The Hebrew University	Structure & galaxy formation, cosmology	PhD
Zinger Eldad	eldad.z1@gmail.com	Tel-Aviv University	---	3rd yr undergrad
Zitrin Adi	adiz@wise.tau.ac.il	Tel-Aviv University	Strong Lensing	PhD

The Search for the Origin of Short Gamma-Ray Bursts

Ehud Nakar (invaited)
Tel Aviv University

Two types of Gamma-Ray Bursts (GRBs) are observed: short duration and long duration. While it is known for several years now that long GRBs are the emission of cosmic ultra-relativistic outflows that are launched following the collapse of massive stars, the origin of short GRBs remained a complete mystery until recently. The breakthrough came on the summer of 2005 with the first detection of short GRB afterglows, long wavelength emission that follows the burst of gamma-rays. These observations established that short GRBs are cosmological relativistic explosions as well, but unlike their long relatives, they do not originate from massive stars. Instead, observations suggest that double neutron star mergers may be the progenitors of short GRB, in which case they are the electromagnetic counterparts of a strong gravitational-wave signal. The search for the progenitors of short GRBs, following the recent discoveries, is reviewed.

The structure of Radiation Mediated Shocks and x-ray Supernova Shock Breakouts

Ranny Budnik
Weizmann Institute

We present a simple analytic model for the structure of non-relativistic and relativistic radiation mediated shocks. At shock velocities $v/c > 0.1$ the shock transition region is far from thermal equilibrium, since the transition crossing time is too short for the production of a black-body photon density (by Bremsstrahlung emission). In this region, electrons and photons (and positrons) are in Compton (pair) equilibrium at temperatures T_s significantly exceeding the far downstream temperature, $T_s >> T_d$. T_s> 10keV is reached at shock velocities $v/c\sim 0.2$. At higher velocities, $v/c>0.6$, the plasma is dominated in the transition region by electron positron pairs and $60\text{keV} < T_s < 200\text{keV}$. We argue that the spectrum emitted during the breaking out of supernova shocks from the stellar envelopes (or the surrounding winds) of Blue Super Giants and Wolf-Rayet stars, which reach $v/c>0.1$ for reasonable stellar parameters, may include a hard component with photon energies reaching tens or even hundreds of keV. This may account for the X-ray outburst associated with SN2008D, and possibly for other SN-associated outbursts with spectra not extending beyond few 100keV (e.g. XRF060218/SN2006aj).

TeVeS as a Substitute for Dark Matter

Eva Sagi
The Hebrew University of Jerusalem

I will discuss MOND as a possible substitute for dark matter, and introduce TeVeS as its relativistic implementation. I'll give a short overview of TeVeS, its advantages and shortcomings. After a brief explanation of the PPN limit in GR, I"ll present results on the PPN parameters for TeVeS.

Galactic vs. Extragalactic:
Origin of the Peculiar Transient SCP 06F6

Amit Kashi
The Technion

We study four plausible scenarios for the SCP 06F6 transient event that was announced recently. Some of these were previously briefly discussed as plausible models for SCP 06F6, in particular with the claimed detection of a z=0.143 cosmological redshift of a Swan spectrum of a carbon rich envelope. We cannot rule out any of these models, but can rank them from most to least preferred. For extragalactic scenarios, we adopt z=0.143. Our favorite model is a tidal destruction of a CO white dwarf (WD) by an intermediate-mass black hole (IMBH). To account for the properties of the SCP 06F6 event, we have to assume the presence of a strong disk wind that was not included in previous numerical simulations. If the IMBH is the central BH of a galaxy, then this explains the non detection of a bright galaxy in the direction of SCP 06F6. Our second favorite scenario is a type Ia-like SN that exploded inside the dense wind of a carbon star. The carbon star is the donor star of the exploded WD. Our third favorite models is a Galactic source of an asteroid that collided with a WD. Such a scenario was discussed in the past as the source of dusty disk around WDs, but no predictions exist regarding the appearance of such an event. Our least favorite model is of a core collapse SN. The only way we can account for the properties of the SCP 06F6 transient event with a core collapse SN is if we assume the occurrence of a rare type of binary interaction.

Type IIn Supernovae: How Do They Work and How Do We Get a Handle on Their Progenitor

Michael Kiewe
Weizmann Institute

Type IIn Supernovae are extremely rare members of the type II Supernova family. Due to the small number statistics, the identity of the progenitor remains suggestive at best. However, with a larger sample of type IIn Supernovae this soon could be changed. The interaction between the outer layers of the star (that are ejected during the supernova explosion) and the material the star ejects prior to the explosion results in the unique spectral features that characterize type IIn Supernovae. The analysis of these features should provide us with a more rigorous constrain on the type of progenitor. I will present the type IIn Supernova model and explain how one gets the aforementioned spectral features from this model. Moreover, I will outline the main points of the analysis process - from the initial photometry and spectroscopy images to the two physical quantities that will constrain the progenitor's identity.

Transiting Circumbinary Planets

Aviv Ofir
Tel Aviv University

Already from the initial discoveries of extrasolar planets it was apparent that their population and environments are far more diverse than initially postulated. Discovering circumbinary (CB) planets will have many implications, and in this context it will again substantially diversify the environments that produce and sustain planets. We search for transiting CB planets around eclipsing binaries (EBs). Transiting planets manifest themselves by a periodic dimming of their host star by a fixed amount. On the other hand, light curves of transiting CB planets are expected to be neither periodic nor to have a single depth while in transit. These propertied make the popular transit-finding algorithm Box Least Squares (BLS) almost ineffective so a modified version of BLS for the identification of CB planets was developed – CB-BLS. We show that using this algorithm it is possible to find CB planets in the residuals of light curves of eclipsing binaries that have noise levels of 1 per cent and more – quality that is routinely achieved by current ground-based transit surveys. We also present some blind-tests with simulated planets injected to real CoRoT data. The presented algorithm allows it to detect all the blind tests successfully. Detecting CB planets is expected to have significant impact on our understanding of exoplanets in general, and exoplanet formation in particular. Using CB-BLS will allow to easily harness the massive ground- and space-based photometric surveys in operation to look for these hard-to-find objects.

The Formation of Ultra-Compact Dwarf Galaxies and Nucleated Dwarf Galaxies

Tobias Goerdt
The Hebrew University of Jerusalem

Ultra-compact dwarf galaxies (UCDs) have similar properties as massive globular clusters or the nuclei of nucleated galaxies. Recent observations suggesting high dark matter content and a steep spatial distribution within groups and clusters provide new clues as to their origins. We perform high-resolution N-body/smoothed particle hydrodynamics simulations designed to elucidate two possible formation mechanisms for these systems: the merging of globular clusters in the centre of a dark matter halo, or the massively stripped remnant of a nucleated galaxy. Both models produce density profiles as well as the half-light radii that can fit the observational constraints. However, we show that the first scenario results to UCDs that are underluminous and contain no dark matter. This is because the sinking process ejects most of the dark matter particles from the halo centre. Stripped nuclei give a more promising explanation, especially if the nuclei form via the sinking of gas, funneled down inner galactic bars, since this process enhances the central dark matter content. Even when the entire disc is tidally stripped away, the nucleus stays intact and can remain dark matter dominated even after severe stripping. Total galaxy disruption beyond the nuclei only occurs on certain orbits and depends on the amount of dissipation during nuclei formation. By comparing the total disruption of cold dark matter subhaloes in a cluster potential, we demonstrate that this model also leads to the observed spatial distribution of UCDs which can be tested in more detail with larger data sets.

Probing the Evolution of Black Hole Mass and Growth Rate Through Cosmic Time

Benny Trakhtenbrot
Tel Aviv University, Israel

Black-Hole (BH) mass and accretion rate measurements are presented for several well defined, flux limited samples of type-I AGN in the redshift range 0-4.8. Using SDSS data, a significant evolution of the accretion rate (L/L_{Edd}) for all BHs up to z ~ 2.0 are found. This trend cannot be tested, reliably, with SDSS data at higher redshift, and ground-based IR spectroscopy in three redshift bands is used instead. Two samples, at z ~ 2.3 and z ~ 3.4, clearly show a broad range of L/L_{Edd} values. The findings challenge theoretical expectations which assume that all high-z, large-mass BHs accrete close to their Eddington limit. They also show that the first fast growth phase of some of those objects must have occurred at z > 3.4. A new VLT and Gemini flux limited sample at z ~ 4.8 will also be presented. This is the largest sample of such high redshift AGN, where BH mass and accretion rate were studied systematically. The combination of the three high redshift samples will probe the first cycle of merger-driven nuclear activity and the initial phases of growth of the most massive BHs. This has important implications for galaxy and bulge formation and for understanding AGN duty cycle at all redshifts.

Dusty Structure Around Type-I AGN: Clumpy Torus, NLR and Near-Nucleus Hot Dust

Rivay Mor
Tel Aviv University, Israel

We fitted *Spitzer*-IRS ~2− 35μm spectra of 26 luminous QSOs in attempt to define the properties of the main IR emitting components. Our model has three major components: a clumpy torus, dusty NLR clouds and a black body like hot, optically thick dust. These are the most detailed fitting of their type and the first that allow a consistent check of the clumpy torus model in type-I AGNs. We present torus inclination, clump distribution, covering factor and mass and compare them with bolometric luminosity, black hole mass and accretion rate. The covering factor and the torus mass are found to be correlated with the bolometric luminosity of the source. A substantial amount of the ~2− 7μm radiation originates from the additional hot dust component which likely situated in the innermost part of the torus. The luminosity radiated by this component is comparable to the torus radiation and its covering factor is comparable too. We also estimate the distance from the center to the IR emitting NLR clouds. The distances are ~700 times larger than the dust sublimation radius and are consistent with high resolution imaging of AGN. NLR emission seems to dominate the AGN emission over the spectral range ~15− 35μm.