

# Holograv Workshop 2012 Swansea (UK, April 15-20, 2012)

Organizers: Dr. Adi Armoni, Dr. Sebastian Franco, Prof. Tim Hollowood, Dr. S. Prem Kumar, Prof. Biagio Lucini, Prof. Carlos Nunez, Dr. Maurizio Piai.

## 1 The Holograv Workshop 2012.

### 1.1 Summary

This is the final report of the activity partially funded by ESF under the title of **HOLOGRAV Workshop 2012**. The meeting took place at Swansea University between the days April 15th and April 20th, 2012. 57 physicists from Europe, USA and Asia participated in this activity.

Starting on Monday April 16th at 8:00 am and finishing on Friday April 20th at 1pm, the workshop developed via 32 plenary talks. Various aspects of Holography, dealing with problems in Quantum Gravity and Quantum Field theory were presented and discussed.

Funding towards local expenses was provided to the invited participants. This included: housing, internet access, breakfast, lunch, dinner, morning-afternoon refreshments and a conference pack. In addition, an excursion to the Gower peninsula, an area considered to be of outstanding natural beauty, was conducted during the workshop (paid with non-ESF funds).

The workshop received smaller, partial support from other Funding Institutions, besides the ESF, which was the main source of support. We acknowledge financial and logistical support from: WIMCS (Wales Institute of Mathematical and Computational Sciences), IPPP-Durham and the Physics Department of Swansea University. The final list of participants (Table 4) includes 57 scientists, 49 from ESF member countries and 8 from non-member countries (USA, Canada, Taiwan, Korea and Israel). Four of the eight non-ESF members have been supported with non-ESF funds, in fulfillment of ESF regulations.

### 1.2 Scientific content and discussions at the event.

As stated above, there were 32 plenary presentations. These were divided into review talks lasting a full hour (see Table 1 for full list of speakers and titles) and research talks limited to thirty minutes (see Fig. 2). The complete program, inclusive of the .pdf files of the presentations, can be found at the Workshop web page:

<http://www.ippp.dur.ac.uk/franco/HoloGrav2012/index.htm>

The review presentations were aimed at presenting a summary of the state of the art of an already mature topic. These were each given by a renowned physicist with notable contributions in a particular area of research. The research presentations were focussed on specific conceptual and technical advances in different topics.

A large number of open discussions took place during the seminars, with the participation of many members of the audience. The review presentations raised questions and answers of a more conceptual kind, while the research presentations generated more technically oriented exchanges. The discussions and the exchanges continued over coffee breaks and lunches, dinners and social activities, including the free time after the end of presentations.

### 1.3 Assessment of the results. Impact of the event on future directions

The scientific activity at the Workshop confirmed that the field of Holography and its applications has grown into a mature field. The breadth of physical problems that were presented and discussed was impressive, with many new avenues of future exploration opening up, and many longstanding problems in theoretical physics becoming accessible. The list of plenary talks shows that holography and its methods are finding multi-disciplinary applications in problems in Condensed Matter Physics, Beyond-the-Standard Model Physics, Cosmology, Black Hole Physics and also more formal problems in Quantum Field Theories and Gravity.

Most of the active researchers in the field use these ideas to learn about non-perturbative aspects of a large variety of quantum field theories, the interest of which resides in their almost immediate application to concrete physical systems. It remains to be seen how these ideas will contribute to the understanding of quantum gravity — at the moment, it is in the area of black hole physics where this line of study is most promising.

It became clear during all the talks that the complexity of the problems and questions dealt with has reached a stage of development wherein symmetry and conceptual arguments alone are insufficient to make progress. Indeed, all presentations were backed up by a host of demanding analytical or numerical calculations. This is, in our opinion, a clear signature of the maturity that the topic of holography as a whole has reached. It is precisely this maturity which motivates and makes necessary future editions of the Holograv Workshop.

During the Workshop, scientists with very different backgrounds, from distant Institutions, engaged in discussions and exchanges about the most advanced topics covered by the Workshop, and this is the first important step towards the establishment of new International Collaborations, which is one of the aims of this activity. The abundant number of new ideas proposed during the Workshop supports the fact that a meeting of this kind helps the community as a whole to focus attention on those topics which hold out the most promise for future development. We expect that the activity in such specific areas will increase, as a consequence of the Swansea Holograv Workshop and its future editions.

## 2 ANNEXES

Table 1: Review presentations.

Speaker	Institution	Title
Massimo Bianchi	Rome	Higher Spins, Strings and Holography
Miguel Costa	Porto	Pomeron physics in the Gauge/Gravity Duality

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Aldo Cotrone	Torino	Unbalanced Holographic Superconductors and Spintronics
Johanna Erdmenger	Munich	Universality or non-universality in holographic superconductors
Joshua Erlich	W&M	Lessons from Bottom-Up Holographic QCD.
Jerome Gauntlett	Imperial	Spatially Modulated Phases in AdS/CFT
Elias Kiritsis	Crete	Holographic Bottom-up models for QCD
Joseph Minahan	Uppsala	Semiclassical 3-point functions for stringy states
Andrew O'Bannon	Cambridge	Gauge-Gravity Duality and Condensed Matter Physics
Piljin Yi	KIAS, Korea	D4-D8 Holographic QCD Mesons/Baryons/Nuclei
Alberto Zafaroni	Milano	Holography for 3d Theories

Table 2: Research presentations.

Speaker	Institution	Title
Wolfgang Mueck	Napoli	D5-Branes and Quantum Impurity Models,
Anatoly Dymarsky	IAS	Non-supersymmetric conifold,
Alfonso Ramallo	Santiago	Fermionic impurities and dimers in AdS/CFT,
Kimmo Tuominen	Jyvaskyla	Thermodynamics of quasi-conformal gauge theories and gauge/gravity duality,
Stefano Cremonesi	Imperial	$AdS_4/CFT_3$ and (wrapped) D6-branes,
David Lin	Hsinchu	Phase structure of the Higgs-Yukawa model at large Yukawa coupling,
Koenraad Schalm	Leiden	Aspects of strongly coupled fermions from AdS/CFT,
Riccardo Argurio	Brussels	Holographic correlators and SUSY breaking,
Andrei Parnachev	Leiden	Holography of the tachyon,
Ben Hoare	Imperial	q-Deformation of the $AdS_5 \times S^5$ Superstring S-matrix ,
Loannis Papadimitriou	Madrid	Field redefinitions, conformally coupled scalars and the $SO(6) \times SO(2)$ invariant sector of $N = 8$ gauged supergravity in four dimensions,
Benjamin Withers	Durham	Avatars of Solitons,
Giacomo Cacciapaglia	Lyon	Vectorlike and composite fermions at the LHC,
Deog-Ki Hong	Korea	Holography and Walking Technicolor,
Lilia Anguelova	Perimeter	Walking Technicolor from Gauge/Gravity Duality,
Umut Gursoy	CERN	Applied holography from heavy ions to cold atoms,
Jacob Sonnenschein	Tel Aviv	On Holographic nuclear interaction and nuclear matter,
Carlos Hoyos	Technion	Equivalence of chemical potentials in holography,
Javier Mas	Santiago	Probes on D3/D7 Quark Gluon Plasma,
Matty Jarvinen	Crete	Holographic models for QCD in the Veneziano limit,
Anton F. Faedo	Swansea	Towards a superpotential for the Papadopoulos-Tseytlin ansatz,
Francesco Nitti	Paris VI	Holography and the Generalized Langevin Process,

Table 3: Program of the meeting.

	16-04	17-04	18-04	19-04	20-04
08:00-09:00	Registration	-	-	-	-
09:00-10:00	Costa	Bianchi	Erlich	O' Bannon	Minahan
10:00-10:30	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break
10:30-11:30	Yi	Zaffaroni	Kiritsis	Erdmenger	Cotrone
11.30-12:00	Mueck	Schalm	Cacciapaglia	Gursoy	Nitti
12:00-14:00	Lunch	Lunch	Lunch	Lunch	Lunch
14.00-14.30	Dymarsky	Argurio	Hong	Sonnenschein	
14.30-15.00	Tuominen	Parnachev	Anguelova	Hoyos	
15.00-15.30	Coffee Break	Coffee break	Coffee break	Coffee break	
15.30-16.00	Ramallo	Hoare	Gauntlett	Mas	
16.00-16.30	Cremonesi	Papadimitriou	Gauntlett	Jarvinen	
16.30-17.00	Lin	Withers	Excursion	Faedo	
17.00-19.00	Discussion	Discussion	Excursion	Discussion	
19.00-20.00	Dinner	Dinner	Excursion	Dinner	

Table 4: Full List of Participants.

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