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WEIZMANN UK MAKING CONNECTIONS AWARDS 2009-2017

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2016 – 2017

Prof. Ari Elson (Weizmann Institute of Science), Dr. Lydia Tabernero and Dr. Jean-Marc Schwartz (University of Manchester)
Inhibiting Dual-Specificity Tyrosine Phosphatases (DUSPs) as a Method for Preventing Resistance to Herceptin in Her2-Positive Breast Cancer

The aim of this study to focus on a novel family of molecules (DUSPs) to devise new methods for countering resistance to Herceptin, a major and all too frequent event encountered during state-of-the-art treatment against breast cancer. The approach and results obtained here will impact on the efficacy of cancer treatments and guide future efforts in the design of more efficient and personalized cancer therapies.

Prof. Leeor Kronik (Weizmann Institute of Science) and Prof. Alexander Shluger (UCL)
Exploring polaronic effects in oxides using range-separated hybrid density functional theory

This study, if successful, this will make it possible for researchers to make accurate predictive calculations of polaronic phenomena. This will open the door to understanding, reliably predicting and describing novel polaronic phenomena in technologically relevant materials, notably amorphous ones. This may have a major impact on the understanding and ultimately design of thin-film oxides and the cutting edge of modern electronics.

Prof. Tsvee Lapidot and Dr. Orit Kollet (Weizmann Institute of Science) and Dr. Dominique Bonnet, (The Francis Crick Institute)
Decipher how human leukemic cells modify the bone marrow vasculature permeability for their own support and how this impact on chemo-resistance

The goal of this project is to look at the cross-talk between leukemic cells and their bone marrow microenvironment including bone-forming stem and progenitor cells. The researchers hope to decipher how human leukemic stem cells modify the bone marrow vasculature for their own support and chemo-resistance; and finally see whether modifying or blocking cross-talk could impede leukemic development. The researchers hope the study will shed new light into the role of the bone marrow microenvironment in the maintenance of normal hematopoietic stem and progenitor cells (HSCs) and how this microenvironment might be perturbed during leukemic development. It could also provide some new tools on how to better maintain HSC in their niches and/or how we can intervene to disturb leukemia.

Prof. Gilad Perez (Weizmann Institute of Science) and Dr. Sebastian Jaeger (University of Sussex)
From Flavor & Higgs Precision Physics to LHC Discoveries

This research focuses on the interplay between avor precision measurements, several of which appear in tension with the Standard Model (SM) predictions, and Higgs physics in the context of a new class of natural theoretical models extending the SM. The researchers hope this study will advance understanding of both ends of the luminosity and energy frontiers and that the relationships will pave the path towards dramatic discoveries at the exciting era of the second run of the LHC.

Prof. Talila Volk (Weizmann Institute of Science) and Dr. Andrea Brand (Wellcome Trust/Cancer Research UK Gurdon Institute University of Cambridge)
The link between nuclear biomechanics and transcriptional control

Nuclear morphology and architecture have been suggested to contribute significantly to the epigenetic state of a given cell type. However, the linkage between altered nuclear shape and changes in the DNA occupancy of specific chromatin factors is yet to be elucidated. The collaboration between the groups will be based on combining the application of the TaDa methodology developed by the Brand lab, with the cell biology expertise of the Volk lab. The researchers hope to reveal the contribution of nuclear architecture to the transcriptional output of distinct cell types.

Dr. Nir London (Weizmann Institute of Science) and Pedro Beltrao (European Molecular Biology Laboratory (EMBL-EBI)
A novel chemical genetics approach to investigate essential yeast enzymes

Studies utilizing gene knock-downs have tremendously increased the understanding of cellular biology and protein function. However, the ability to study *essential* genes using such approaches is limited. The researchers expect to generate novel general tools for chemical genomics which should be transferable to investigate signalling in mammalian cells as well.

2014 – 2015

Dr. Jakub Abramson (Weizmann Institute of Science) and Prof. Graham Anderson (University of Birmingham)
Cellular and molecular control of T-Cell tolerance: Regulation of the thymus medulla

In a functional immune system, T cells serve to protect, by attacking foreign invaders (bacteria, viruses etc) whilst tolerating the body's own components. Occasionally, T cells can turn against the body's own organs, which can lead to autoimmune disorders such as type-1 diabetes, IBS, multiple sclerosis and rheumatoid arthritis. These are called self-reactive T-cells. The collaboration will use expertise from both labs to look at the mechanisms which control mTEC/thymus development which represent a challenging but fundamental aspect of the immune system. mTECs (medullary thymic epithelial cells) are a population of cells in the thymus which play a critical role in purging the body of self-reactive T cells during their development. Understanding how these cells develop may give answers for therapeutic treatment of autoimmune diseases.

Prof. Tony Futerman (Weizmann Institute of Science) and Prof. Timothy Cox (University of Cambridge)
Ripk3 as a possible therapeutic target for the devastating infantile disease, Krabbe disease.

Krabbe disease is caused by a defective enzyme called β-galactosylceramidase. Patients normally present in infancy and the disease has a birth frequency of about 1 in 100000. Currently there are no treatments for the disease. The collaboration aims to delinate the precise role of RIPK1 and RIPK2 in Krabbe disease pathology. RipK is a signalling pathway which is involved in the pathology of both Krabbe and Gaucher disease. The joint

research will give further understanding about the mechanism that causes the diseases, leading to a new therapeutic target and the development of new drugs to treat the devastating disease.

Dr Yardena Samuels (Weizmann Institute of Science) and Dr Xin Lu (Ludwig Institute of Cancer Research, University of Oxford)
A systematic genetic and functional analysis to characterize MAGEC1 as a novel melanoma oncogene

The collaboration will initiate a new collaborative project between cancer genetics and cancer biology researchers to comprehensively understand the functional effects of a novel melanoma gene. Using a multidisciplinary approach, the researchers aim to reveal the underlying mechanism for the tumorigenic effects of MAGEC1, a cancer/testis antigen which is known to be re-expressed in a number of human tumours and is significantly mutated in several cancer types, most highly in melanoma.

Prof. Jacob Sagiv (Weizmann Institute of Science) and Prof. Graham Leggett (University of Sheffield)
Nanofabrication by combined contact electrochemical and photochemical patterning of self-assembled monolayers

This collaboration will allow both researchers to utilize each other's knowledge in electo- and photo-chemistry to develop the best way of organizing molecules at the nanometer level. This grant enables them to study the way these molecules arrange, which will enable future nanoscale systems to be developed. For example, Prof Leggett's research focuses on studying bacteria and its ability to create and store energy from sunlight – the physical pathway for which is what he hopes to recreate with the technology developed as part of this collaborative project.

Dr. Eran Ofek (Weizmann Institute of Science) and Dr Mark Sullivan (University of Southampton)
Opening a window onto the final stages of massive star evolution

The researchers are studying data from the Palomar Transient factory which shows that some very massive stars have "mass ejection" episodes on time scales of a few months prior to their terminal supernova. The aim of the collaboration is to strengthen a fledging partnership where the researchers will quantify the frequency and properties of mass-ejection events among all types of supernovae, and to search for the progenitor stars of the supernova explosions themselves. The ultimate goal is to better understand the physics underpinning the supernova explosions themselves.

Prof. Avishay Gal-Yam (Weizmann Institute of Science) and Prof. Julian Osborne and Prof. Paul O'Brien (University of Leicester)
Infrastructure and instrumentation for discovery of UV and X-ray light from cosmic explosions

The researchers will be looking at how the explosion of massive stars gives birth to black holes. These emit high energy γ-ray, X-ray and ultraviolet photons which encode critical information about what drives these events – these can only be studied by space missions which carry sensitive detectors above the blocking effect provided by Earth's atmosphere. The collaboration will draw upon expertise from both Institutions and by building up preliminary results the research partners will develop new techniques and instruments to study future data sets.

2013-14

Prof. Gary Hodes & Prof. David Cahen (WIS) & Dr Henry J. Snaith (University of Oxford)
Organic-Inorganic Perovskite Semiconductors for Photovoltaic Cells
A novel class of perovskite semiconductors has shown exciting results as the light absorbing semiconductor in nanoporous photovoltaic cells. This collaboration aims to use their combined knowledge of photovoltaic science to understand what determines this exciting behaviour exhibited by these materials with the hope to use this knowledge to create cells with higher open circuit voltages by exploiting their findings.

Prof. Brian Berkowitz (WIS) & Prof. Sebastian Geiger (Heriot-Watt University, Edinburgh)
Probabilistic and Continuum Approaches to Modelling Chemical Transport with Reactions in Geological Formations
Many of society's challenges today, such as the supply of clean drinking water and sustainable energy, require the understanding of the flow of fluids and the transport of chemicals and their reaction products underground. Measuring and modelling the system is very difficult as many different things contribute to the system and therefore standard modelling is not sufficient. This collaboration aims to combining parallel activities from both groups to develop a probabilistic quantification of hierarchical flow and reactive transport in different geological formations.

Prof. Yadin Dudai (WIS) & Dr Tali Sharot (University College London)
The Relationship between Optimism and Probabilistic Decision-Making – A Computational Neuroscience Approach
Humans tend to overestimate the likelihood that positive events will occur in the future and underestimate those of negative events. This 'optimism bias' is maintained by asymmetrical learning in which positive information has more impact on our learning than negative information. The collaboration will investigate possible link between this learning asymmetry and risk preferences at behavioural, pharmacological and neurobiological levels.

Prof. Yoram Groner (WIS) & Dr Marella de Bruijn (MRC Molecular Haematology Unit, Oxford University)
Long-range Regulation of Tissue Specific Runx1 Expression
Runx1 is a critical regulator of important developmental processes, including blood cell development and peripheral nerve growth. The collaboration proposes to use a multipronged approach to identify the distant elements (such as *cis*-regulatory elements) that mediate *Runx1* expression in development. The research will also analyse the *in vivo* function of these regulatory elements.

Prof. Ben-Zion Shilo & Dr Eyal Schejter (WIS) & Dr Elisabeth Ehler (King's College London)
Roles of Actin Nucleation Factors in Sarcomere Organization and Function
The collaborators propose to study the contribution of the actin-based cytoskeleton to two of the major machineries that govern muscle cell function – the membrane systems that couple neural stimulation with the contraction of the sarcomere in the muscle cell and the filament arrays that cause contraction to happen. The research will focus on the forming FHOD/Fhos – a single nucleator which has been identified as a critical element in muscle cell function.

2012-13

Prof. Ehud Ahissar (WIS) & Prof. Tony Prescott & Prof. Peter Redgrave (University of Sheffield)
Development of Motor-Sensory Strategies for Vibrissal Active Touch
The project aims to provide a comprehensive description of the development and maturation of whisking behaviour by investigating the motor-sensory strategies step-by-step of vibrissal active touch, by tracking and analysing the development of such strategies in newborn rodents. They also hope to reveal basic principles of brain control of active touch and factors affecting their development.

Ass. Prof. Igor Lubomirsky (WIS) & Dr Peter Slater (University of Birmingham)
Monitoring of Charge Diffusion in Solids by Null-Point Ellipsometry with Lock-In Detection
The space charge layer (SCL) is a fundamental property of many devices including lithium ion batteries and oxygen sensors. The SCL is responsible for the dependence of electrical properties. The group propose to develop of a technique based on null-ellipsometry to complement impedance spectroscopy and allow real time monitoring of the SCL. The technique will distinguish the contributions of ions, electrons and protons to the overall conductivity.

Prof. Dan Tawfik (WIS) & Prof. Jane Clarke (University of Cambridge)
The Evolution of Protein Foldability
Studying the evolution of foldability in proteins that emerged by duplication and fusion of an elementary sequence unit resulting in a highly symmetrical protein. The group will examine the thermodynamic and kinetic stability effects of the mutations that occur and their effect on the sequence's repetitiveness. They hope to provide unique insights into the evolution of protein folding pathways.

Prof. Daniel Wager (WIS), Prof. Milo Shaffer (Imperial College London) & Prof. Alan Windle (University of Cambridge)
Hierarchical Composites Based on Carbon Nanotube Fibres
This project will measure the mechanical interaction between micron-size fibres made from a large number of carbon nanotubes (CNT) and polymers, to determine the mechanical properties of CNT fibres and their composites, especially the efficiency of stress transfer between CNT fibres and polymers.

Prof. Aldo Shemesh (WIS) & Dr Gavin Foster (University of Southampton)
Ocean Acidification: Decoupling the Anthropogenic Acidification from the Natural Variability during the Last Millennial in the Eastern Mediterranean
Ocean Acidification, changes in the acidity of the ocean through carbon dioxide absorption, has significant impacts on marine biogeochemical cycles. The project will measure the composition of marine biogenic carbonates in well-dated vermetid reefs to obtain the first, high-resolution pH record of the past millennium in the Eastern Mediterranean and therefore, providing data to evaluate the anthropogenic impact on the region.

2011-12

Prof. Mike Fainzilber (WIS) & Prof. Giampietro Schiavo (Cancer Research UK, London Research Institute)
Motor-Driven Transcription Factors In Injured Nerve – How Fast Can They Go?
Retrograde axonal injury signals stimulate regenerative responses by the cell body in lesioned peripheral neurons. The involvement of importins in retrograde transport suggests that transcription factors might be directly involved in axonal injury signaling. This collaboration has previously shown that the transcription factor STAT3 associates with dynein in injured sensory axons. This project will address related questions by monitoring dynein-mediated transport of STAT3 and/or STAT3-derived reporter proteins *in vivo* and *in vitro* in both sensory and motor neurons. The project will provide new insights on fundamental cell biology mechanisms of motor-driven transport, with implications for nerve regeneration and neurodegeneration.

Prof. Michael Elbaum (WIS) & Dr Kay Grunewald (University of Oxford)
Nuclear Movements and Nuclear Egress of Herpesvirus: Kinetics and Structures
Virus-host-interactions must be tightly regulated such that the virus will not drive its host into premature cell death. This project will investigate the role of novel intranuclear structures in more detail by an integrated combination of kinetic and structural imaging approaches. Regarding the virus as a probe, the findings are expected to be of broad relevance to the understanding of basic physiological processes of structure, transport, and communication within the cell nucleus.

Dr Alon Chen (WIS) & Prof. Jonathan Seckl (University of Edinburgh)
Stress-Related Neuropeptides and 'Programming' of the Brain
Early life environmental factors affect developing systems and may permanently alter organ structure and function throughout life - 'developmental programming'. This proposal aims to explore the involvement of recently identified members of the CRF/Urocortin family of peptides and receptors, in mediating the neurendocrine and behavioral effects of early life stress. Understanding brain 'programming' by focusing on the brain circuits and genes which are associated with, or altered by, prenatal stress will provide important insights into the brain mechanisms by which early life stress affects psychological and neuroendocrine disorders and may improve our ability to design therapeutic interventions for, and thus manage, stress-related disorders.

Dr Rafal Klajn (WIS) & Dr Oren Scherman (University of Cambridge)
Switchable Nanomaterials for Catalysis and Sensing
Metal nanoparticles (NPs) have attracted tremendous interest in the last decade for their superior optical, electronic, and catalytic properties. Although a number of methods to assemble NPs into macroscopic materials have been developed, these procedures lead to *static* materials – that is, materials whose structure cannot be altered once they have been prepared. We aim to demonstrate how this spectacular behavior can lead to some immediate and important applications in the detection of oxidizing and reducing agents, as well as be applied to systems in which catalysis can be turned on and off using light. Our long-term objective is to integrate our new materials with biological systems for applications such as photoactivated drug release.

Dr Nir Friedman (WIS) & Prof. Benjamin Chain (UCL)
Population Dynamics of T Cell Responses Analysed Using High throughput Sequencing of TCR Repertoire
Adaptive immunity depends on selective expansion of individual clones of antigen specific lymphocytes, each characterized by an antigen-specific receptor of unique and specific sequence. The rules which determine the selection, expansion and dynamics of the repertoire of clones responding to a particular antigen remain poorly understood. Revealing the TCR repertoire and its dynamics following infection is of basic importance for our understanding of T cell immunity, and has a great applicative potential, for example for better vaccine design and providing new diagnostic markers.

Prof. Atan Gross (WIS) & Prof. Stephen Jackson (Cancer Research UK, University of Cambridge)
Establishing the Role of Bid in the DNA Damage Response
Many cancers of lymphoid origin bear oncogenic chromosomal rearrangements that have arisen as a consequence of defective DNA damage repair. In particular, 10-15% of patients with the genomic instability syndrome ataxia-telangiectasia (A-T), in which the ataxia-telangiectasia mutated (ATM) kinase is absent or inactivated will present a lymphoid malignancy in childhood or early adulthood. Our studies are likely to have important implications for tumor development in the lymphoid lineage, as well as implications for genomic instability syndromes.

2010-11

Prof. Rony Paz (WIS) & Prof. Marjan Jahanshahi (UCL)
The Impact of Emotion on Time Perception
Emotions often affect the precision of our time estimations. However, little is known about the neuronal mechanisms that underlie the interactions between time-estimation and emotions. Using behavioral, neurophysiological and transcranial magnetic stimulation, scientists are exploring the mechanisms that underlie the effect of emotions on time perception in humans

Prof. Jacob Klein (WIS) & Prof. Susan Perkin (UCL)
The 'Electrical Double Layer' in Pure Ionic Liquid Next to an Electrified Metal Surface
Ionic liquids (IL) are a novel class of fluids which are used in applications such as eco-friendly solvents, lubricants, solar cells and even as electrolytes in batteries. Combining techniques by British and Israeli scientists will provide researchers with deep insight of IL at the molecular Level. This is likely to have great implications for the design of batteries, solar cells and other electrochemical applications.

Prof. Nir Davidson (WIS) & Prof. Charles Adams (Durham University)
Electromagnetic Induced Transparency with Optically Trapped Atoms
Electromagnetic induced transparency (EIT) is an intriguing quantum optics effect where a strongly absorptive media becomes transparent over an extremely narrow frequency range due to quantum interference between two or more absorption pathways. By combining techniques developed by both Professors, the two institutions hope to yield unprecedented strong nonlinear effects that may lead to new applications in precision metrology and quantum information science.

Prof. Uriel Feige & Prof. Robert Krauthgamer (WIS) & Prof. Amin Coja-Oghlan, Prof. Artur Czumaj & Prof. Harald Räcke (University of Warwick)
The Interplay between Algorithms and Randomness
Randomness plays a central role in the modern design and analysis of algorithms, a topic that stands in the forefront of research in modern computer science. The scientists' ultimate goal is to advance the theory of algorithm design and analysis as a whole, with a desired long-term impact which is broad and includes developing algorithms that are successful in practice. While the work will focus on basic research and theoretical aspects, its motivation involves, and the results may be relevant to, several application areas, such as databases, computer vision and networking.

Prof. Eli Pollak (WIS) & Dr William Allison (University of Cambridge)
A Combined Experimental and Theoretical Study of Dynamics on Surfaces
The study of surface phenomena is in the forefront of present day research in condensed matter physics. Any real progress in the field has implications for processes ranging from catalysis, to asymmetric synthesis, atmospheric and astrophysical reactions, nanoelectronics and more. The research aims to combine theoretical skills at the Weizmann Institute with new experimental work, performed at the University of Cambridge, in order to understand two major problems in surface dynamics.

2009-10

Prof. Yadin Dudai (WIS) & Prof. Raymond Dolan & Dr. Tali Sharot (UCL)
Brain Substrates of Memory Conformity
Our memories are often inaccurate and social pressure is one reason for false recollection. This leads individuals to change their report of past events to match that reported by others. Scientists are combining a novel behavioral protocol that taxes multiple facets of memory conformity with functional neuroimaging. They hope to understand the brain mechanisms mediating socially-induced memory errors.

Prof. Avishay Gal-Yam (WIS) & Dr Mark Sullivan (University of Oxford)
Foundations of Dark Energy Research
Most of the contents of our Universe are invisible. Understanding the nature of these dark energy components is one of the greatest challenges of contemporary physics. Through critical analysis of supernovae, researchers hope to identify what stellar systems give rise to these explosions and unravel some of the mysteries of our Universe

Prof. Irit Sagi (WIS) & Dr Robert Visse (Imperial College)
Probing the Mechanism of Collagen Degradation
Collagen turnover is intimately linked with healing of wounds, embryo development and tissue regeneration. By combining biochemical and biophysical tools, scientists will reveal new molecular insights into the complex and important mechanism of collagen degradation.

Dr Nir Gov & Prof. Ben-Zion Shilo (WIS) & Dr Buzz Baum (UCL)
Cdc42 and the Regulation of Actin Polymerization Dynamics at Cell Membranes: Theoretical Models, Molecular Mechanisms and Developmental Roles
Actin cytoskeletal dynamics play a central role in the control of several fundamental cell biological processes in animal cells including cell motility, vesicular trafficking, adhesion and differentiation. Scientists are using a combination of modeling and experiments to reveal the cellular and physiological consequences of activation of the enzyme CDC42 on actin-membrane dynamics.

Prof. Milko Erik van der Boom (WIS) & Dr Jonathan R. Nitschke (University of Cambridge)
Self-Assembly of Surface-Confined Functional Materials
The formation of the assembly of metal-organic systems in solution and their associated studies have had a tremendous impact on many aspects of chemistry, whereas similar well-defined systems on surfaces are relatively rare. Research is being conducted to synthesize a new class of conductive metal-containing self-assembled polymers. Scientists have been developing the techniques that underpin polymer formation in solution, and are continuing to investigate the properties of our products, seeking to optimise their usefulness as surface-confined conductive materials.

For further information about these grants please contact post@weizmann.org.uk

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