The nanoscale world and a new view of the human mass social exception

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For nearly all its existence humanity has had minimal knowledge and conscious contact with the nano scale world so humanity's greatest thinkers could not learn from its great richness discovered in the last century and decades. In 1917 even Einstein did not know of the existence of galaxies, had no knowledge of DNA and had hardly any knowledge of what is now called neuroscience. In the 20th century mathematical knowledge increased by more than thousandfold and much the same is true for most major sciences. This talk is about a long-standing project really beginning in the 1960's after Desmond Morris's The Naked Ape and Tinbergen's Animal Behavior, but in 1973 the latter shared a Nobel Prize in Physiology or Medicine with Konrad Lorenz and Karl von Frisch for their research in the Biology of Behavior or Ethology. There was still no talk of nanoscale actors working within complex societies of proteins within biological cells, no species were parts of others, so in spite of much interest in analogies, there was no talk yet of self-similarity. The work presented here can be seen as the continuation of a BA thesis, Magnusson MS (1975) "Communication and Social organization in Social Insects and Primates (Humans Included)" strongly motivated by a wish to understand modern human mass social behaviour and the stunning human exception among all animals and life.

Biography

Magnus S. Magnusson, PhD, Emeritus Research Professor, founder, and director of the Human Behavior Laboratory (hbl.hi.is), School of Health Sciences, University of Iceland. Author of the T-system, detection algorithms and software THEMETM (PatternVision.com), initially focusing on real-time organization of behavior. Co-directed a two-year project "DNA analysis with Theme". Keynotes notably in biology, neuroscience, mathematics, science of religion, proteomics, A.I., robotics and nanoscience. Associate Professor and Deputy Director 1983-1988 in the Museum of Mankind of the French National Museum of Natural History in Paris. Repeatedly, invited Professor at the University of Paris V, VIII & XIII. Now works in formal collaboration between 38 European and American universities initiated 1995 at the University Rene Descartes of Paris V, Sorbonne, based on "Magnusson's analytical model"

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Microfluidic droplets and materials

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Droplets of nanoliter and subnanoliter are useful in a wide range of applications, particularly when their size is uniform and controllable. Examples include biochemistry, biomedical engineering, food industry, pharmaceuticals, and material sciences. One example of their many fundamental medical applications is the therapeutic delivery system for delivering site-specific therapy to targeted organs in the body and as the carriers for newer therapeutic options. The size, the size distribution, the generation rate and the effective manipulation of droplets at a scale of nano and subnano liters are critical in all these applications. This lecture first makes an overview of microfluidic generation and manipulation of such droplets. The review of passive approaches for droplet generation focuses on the characteristics and mechanisms of breakup modes of droplet generation occurring in microfluidic cross-flow, co-flow, flow-focusing, and step emulsification configurations. The review of active approaches for droplet generation covers the state-of-the-art techniques employing either external forces from electrical, magnetic and centrifugal fields or methods of modifying intrinsic properties of flows or fluids such as velocity, viscosity, interfacial tension, channel wettability, and fluid density, with a focus on their implementations and actuation mechanisms. Also included is the contrast among different approaches of either passive or active nature.

Biography

Liqiu Wang received his PhD from University of Alberta, Canada, and is currently a professor in the Department of Mechanical Engineering, the University of Hong Kong (HKU). He also serves as the Director and the Chief Scientist for the Laboratory for Nanofluids and Thermal Engineering at the Zhejiang Institute of Research and Innovation (HKU-ZIRI), the University of Hong Kong. Prof. Wang has over 20 years of university experience in transport phenomena, materials, nanotechnology, biotechnology, energy & environment, thermal & power engineering, and mathematics, and 2 years of industry experience in technology and IP development/management/transfer as the Chief Scientist & the Global CTO. In addition to 6 authored scholarly monographs/books, 4 edited scholarly monographs, 8 book chapters, 66 keynote lectures at international conferences and over 120 invited lectures in universities/industries/organizations, Prof. Wang has published 410+ papers, many of which have been widely used by researchers all over the world, and been ranked amongst the top 1% of most-cited scientists according to Clarivate Analytics' Essential Science Indicator. Prof. Wang has also filed 30+ patents/software copyrights, and developed, with an international team consisting of about 100 scientists and engineers, a state-of-the-art thermal control system for the Alpha Magnetic Spectrometer (AMS) on the International Space Station (ISS).

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Nanoscale engineering of plasmonic materials for biosensing and bioimaging

Early diagnosis plays an increasingly significant role in current clinical drive. Detection, identification, and quantification of low abundance biomarker proteins form a promising basis for early clinical diagnosis and offer a range of important medical benefits. Amplification of light from NIR fluorophores by coupling to metal nanostructures, i.e. Metal Induced Fluorescence Enhancement (MIFE), represents a promising strategy for dramatically improving the detection and quantification of low abundance biomarker proteins, and potentially increase already sensitive fluorescence-based detection by up to three orders of magnitude. The amplification of the fluorescence system is based on interaction of the excited fluorophores with the surface plasmon resonance in metallic nanostructures. The enhanced fluorescence intensity due to the existence of metal nanostructures makes it possible to detect much lower levers of biomarkers tagged with fluorescence molecules either in sensing format or for tissue imaging. The first part of my talk will focus on some recent developments of plasmonic metal nanostructures by both "top-down" and "bottom up" methods. I will then discuss the prepared plasmonic nanostructures in the applications of biosensing and bioimaging, with the emphasis on plasmonic enhancement towards NIR I and NIR II regionss.

Biography

Fang Xie is a Senior Lecturer at Department of Materials, Imperial College London. She is also Deputy Director for MSc in Advanced Materials. She has expertise in functional nanomaterials including metal, semiconducting, and oxide nanomaterials synthesis, as well as the applications of the functional materials in energy and life sciences. Her current research interests include plasmonic nanostructures for efficient light harvesting for solar cells and solar fuels, as well as in ultrasensitive biosensing and Bioimaging applications. She is member of Royal Society of Chemistry and serves as associate editor for Materials Today Advances and Nature Scientific Reports. She has over 60 publications including five patents. She has also delivered over 10 keynote and invited talks in the international conferences.

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Ni-Cr-Mn-Y based resistive films prepared by co-sputtering

Ni-Cr-Mn-Y based resistive thin films were prepared on glass and Al2O3 substrates by DC magnetron co-sputtering from targets of Ni-Cr-Mn-Y casting alloy and Cu or Tb metals. Electrical properties and microstructures of Ni-Cr-Mn-Y based films under the different proportion of elements and annealing temperatures were investigated. The phase evolution, microstructural and composition of Ni-Cr-Mn-Y based films were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM) and Auger Electron Spectroscopy (AES). When the annealing temperature was set to 350°C, the Ni-Cr-Mn-Y based films with an amorphous structure was observed. The Ni-Cr-Mn-Y films with 6.4% Cu addition annealed at 300°C which was exhibited the resistivity 770□□-cm with +15ppm/°C of the temperature coefficient of resistance (TCR). The Ni-Cr-Mn-Y films with 32% Tb addition annealed at 300°C which was exhibited the resistivity 1750□□-cm with -4.5 ppm/°C of the temperature coefficient of resistance (TCR).

Biography

Ying-Chieh Lee is currently a Professor of Materials Engineering, at the National Pingtung University of Science and Technology, Taiwan. He earned a B.S. in Materials Science from the Feng Chia University, Taiwan in 1990, and a Ph.D. in Materials Science and Engineering from National Chung Hsing University in 2003. His research interests include Thin Film Technology, Electrical Ceramics, Recycled Materials, and nanomaterials. He was promoted from Associate Professor to Full Professor with tenure in 2013. He has published more than 80 papers in reputed journals and has been serving as a coatings guest editor.

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Thermoresponsive Reactions and Dual Characteristics of Shape Memory Alloys

A series of materials take place in class of advanced smart materials with adaptive properties and stimulus response to the external changes. Shape memory alloys take place in this group, due to the shape reversibility and capacity of responding to changes in the environment. These alloys exhibit a peculiar property called shape memory effect, which is characterized by the recoverability of two certain shapes of material at different temperatures. Shape memory effect is initiated by thermomechanical cooling and stressing treatments on the material and performed thermally on heating and cooling. This behaviour can be called thermoelasticity. The material recovers original shape on heating, and shape of material cycles between deformed and original shape on cooling and heating in bulk level. This is the result of thermoresponsive reactions, and this behaviour can be called thermoelasticity. These alloys have dual characteristics called thermoelasticity and superelasticity, from viewpoint of memory behaviour. Two successive structural transformations, thermal and stress induced martensitic transformations govern shape memory phenomena in crystallographic basis. Thermal induced martensitic transformation occurs with the cooperative movement of atoms in □110>- type directions on {110}-type planes of austenite matrix, by means of shear-like mechanism, and ordered parent phase structures turn into twinned martensite structures. Stress induced martensitic transformations occur along with crystal or lattice detwinning reaction by stressing material in low temperature condition, and twinned structures turn into detwinned martensite structures. Upon cooling after these treatments, detwinned martensite structures turn into ordered parent phase structure by means of reverse austenite transformation. Superelasticity is performed by stressing and releasing material at a constant temperature in parent phase region, and shape recovery is performed simultaneously upon releasing the applied stress. Superelasticity exhibits the normal elastic materials, but it is performed in non-linear way; stressing and releasing paths are different in the stress-strain diagram, and hysteresis loop refers to energy dissipation. These alloys are used in building industry, against to the seismic events, due to this property.

Biography

Dr Adiguzel graduated from Department of Physics, Ankara University, Turkey in 1974 and received PhD- degree from Dicle University, Diyarbakir-Turkey. He has studied at Surrey University, Guildford, UK, as a post-doctoral research scientist in 1986-1987, and studied on shape memory alloys. He worked as research assistant, 1975-80, at Dicle University and shifted to Firat University, Elazig, Turkey in 1980. He became professor in 1996, and he has already been working as professor. He published over 80 papers in international and national journals; He joined over 100 conferences and symposia in international and national level as participant, invited speaker or keynote speaker with contributions of oral or poster. He served the program chair or conference chair/co-chair in some of these activities. In particular, he joined in last seven years (2014 - 2020) over 80 conferences as Keynote Speaker and Conference Co-Chair organized by different companies. He supervised 5 PhD- theses and 3 M.Sc.- theses.

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Heat Exchanger Technology and Applications

Early diagnosis plays an increasingly significant role in current clinical drive. Detection, identification, and quantification of low abundance biomarker proteins form a promising basis for early clinical diagnosis and offer a range of important medical benefits. Amplification of light from NIR fluorophores by coupling to metal nanostructures, i.e. Metal Induced Fluorescence Enhancement (MIFE), represents a promising strategy for dramatically improving the detection and quantification of low abundance biomarker proteins, and potentially increase already sensitive fluorescence-based detection by up to three orders of magnitude. The amplification of the fluorescence system is based on interaction of the excited fluorophores with the surface plasmon resonance in metallic nanostructures. The enhanced fluorescence intensity due to the existence of metal nanostructures makes it possible to detect much lower levers of biomarkers tagged with fluorescence molecules either in sensing format or for tissue imaging. The first part of my talk will focus on some recent developments of plasmonic metal nanostructures by both “top-down” and “bottom up” methods. I will then discuss the prepared plasmonic nanostructures in the applications of biosensing and bioimaging, with the emphasis on plasmonic enhancement towards NIR I and NIR II regions.

Biography

Abdeen Omer a Senior Lecturer at Department of Materials, Imperial College London.He has expertise in functional nanomaterials including metal, semiconducting, and oxide nanomaterials synthesis, as well as the applications of the functional materials in energy and life sciences.

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