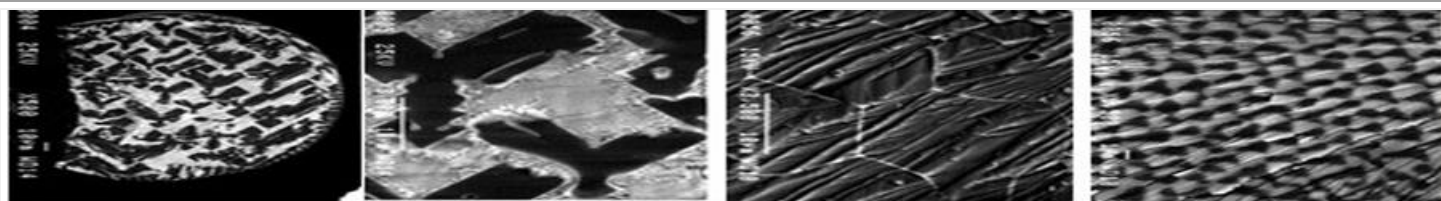


# 2017 Aerospace Materials for Extreme Environments Program Review

Dr. Ali Sayir | May 15-19, 2017 | KAFB, NM

## DAY 1 – 15 MAY 2017

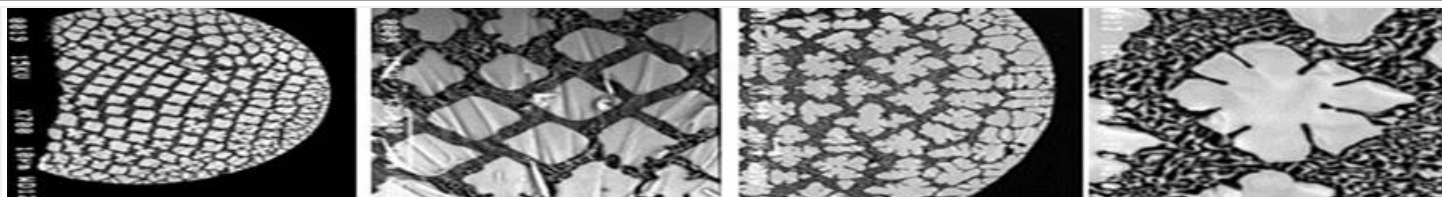
<b>8:30-9:00</b>	Future Directions of Aerospace Materials Portfolio	A. Sayir
COMPUTATIONAL MATERIAL SCIENCE:		
<b>9:00-10:00</b> (40+20)	(MURI) MOSAIC OF MICROSTRUCTURE Markov Random Fields: A Pervasive Method for Generating 3D Microstructures from 2D Image Data	M. DeGraef V. Sundararaghavan CMU / MICHIGAN / PURDUE
<b>10:00-10:30</b> (20+10)	Rare Event Simulation for Modeling of Low-Probability Events in Materials Systems	M. Comer PURDUE
<b>10:30-11:00</b>	<b>BREAK</b>	
<b>10:00-11:30</b> (20+10)	Stochastic Models for Cold Sprayed Microstructures	F. Willott ECOLE DES MINES
<b>11:30-12:00</b> (20+10)	Continuum-Equivalent Traction Fields: Quantitative Descriptors of Nanoscale Interfaces	H. B. Chew UIUC
<b>12:00-12:30</b> (20+10)	Experiments and Modeling of the Thermo-Mechanical Properties of Micro-Architected Tungsten Coatings	J. El-Awady JOHNS HOPKINS
<b>12:30-13:30</b>	<b>LUNCH</b>	
<b>13:30-14:10</b> (30+10)	High-Throughput Experimentally and Computationally Guided Discovery of Next Generation HT Shape Memory Alloys	J. Vlassak and R. Arroyave HARVARD U. & TEXAS A&M
<b>14:10-14:30</b> (15+5)	Synthesis of Crystalline Thin Films using Electrochemical Atomic Layer Deposition	R. M. Modibedi CNR
<b>14:30-14:50</b> (15+5)	Development of TiPt-Based HTSMA for Actuator Applications at 1000C	S. Chikosha CNR
<b>14:50-15:10</b> (15+5)	The local Structure and Chemistry in Marginal Glass Forming Alloys	E. Kalay ODTU
<b>15:10-15:30</b>	<b>BREAK</b>	
<b>15:30-18:00</b>	<b>2016 / 2017 NEW STARTS &amp; POSTER SESSION</b>	<b>Time</b>
(2015 YIP) Electronic Structure Basis for Solubility and Phase Stability in Metals	M. Ghazisaeidi / OSU	10
(2016 YIP) Far from Equilibrium Structures and Processes	R. Rajan / CMU	10
Fundamental Studies of Heavy Metal Oxide Glasses for High Power Lasers	K. Lipinska / UNM	10
Dissolution, Supersaturation and Crystallization Enabling the Cold Sintering	C. Randall / PSU	10
Theoretical Investigation of Quantum Thermal and Electric Transport Properties	T. Haugan / AFRL	10
Mechanisms of Surface Chemical and Electrochemical Stability on Perovskites	B. Yildiz / MIT	10
Radio-Frequency Cathode with Ferrite Core for Use in Space Propulsion	M. Celik / BOGAZICI	10
High Temperature Melt Infusion through B <sub>4</sub> C	V. Kumar and A. Bronson	10
(2016 DURIP) Enhanced Test Facility for Survivability	J. Dennison / UST	10
(2016 DURIP) Field-induced Chemical and Microstructure Evolution	E. Dickey and D. Vashae NCSU	10
(2016 DURIP) UV to mid-IR Nonlinear Spectroscopy for Characterizing Defects	Y. Ren and S. Greenbaum HUNTER COLLEGE NY	10



## DAY 2 – 16 MAY 2017

### MATERIAL COUPLING WITH EXTERNAL FIELDS I:

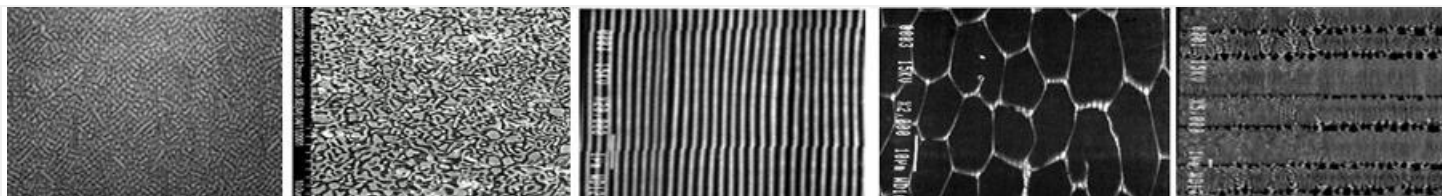
<b>8:30-9:30</b> (40+20)	<p>(MURI) Template-Directed Directionally Solidified Eutectic Metamaterials (Braun)</p> <ul style="list-style-type: none"> <li>- Topological and Parity-time Symmetric Meta-material (Fan)</li> <li>- 3D Modeling of Solidification (Thornton)</li> <li>- Film Deposition (Martin)</li> </ul>	<p>P. Braun, S. Fan K. Thornton, and L. Martin UIUC / HARVARD / MCHIGAN / STANFORD</p>
<b>9:30-10:00</b> (20+10)	Quantum-Engineered Semiconductor Metamaterials for Giant Non-Reciprocity without Magnetic Effects	A. Alu UT AUSTIN
<b>10:00-10:30</b> (20+10)	Broadband Reflective Surfaces for Infrared Radiation	K. Sendur SABANCI
<b>10:30-11:00</b>	<b>BREAK</b>	
<b>11:00-11:40</b> (30+10)	From Atom Probe Tomography Imaging to Microstructural Quantification: An Iterative Optimization Approach	E. Marquis & W. Windl U. MICHIGAN / OSU
<b>11:40-12:10</b> (20+10)	(2013 YIP) A Transformational Approach to Quantify Chemistry at the Atomic Scale	J. LeBeau NCSU
<b>12:10-13:30</b>	<b>LUNCH</b>	
<b>13:30-14:00</b> (20+10)	Atomic-Scale Modeling of Equilibrium and Transport Properties at Metal-Dielectric Interfaces	W. Windl OSU
<b>14:00-16:00</b> (90+30)	<p>The Role of Interfaces in Performance, Degradation, and Breakdown of Non-Linear Dielectrics (Randall)</p> <ul style="list-style-type: none"> <li>- Structural Point Defect Characterization (Dickey)</li> <li>- Phase Field Prediction of Dielectric Breakdown (Chen)</li> <li>- Predictive science of Point Defects (Irving)</li> <li>- Development of Perovskite Single Crystals (Lee)</li> <li>- Electronic Modification of Electrode Interfaces (Klein)</li> </ul>	<p>C. Randall, P. Hopkins, B. Dickey D. Irving, L.-Q.- Chen, H.Y. Lee, and A. Klein PSU / UVA / NCSU DARMSTADT SUNMOON</p>
<b>16:00-16:30</b> (20+10)	Linear and Nonlinear Spectroscopic Studies of Linear and Nonlinear Dielectrics and Interfaces	S. Greenbaum and Y. Ren HUNTER COLLEGE NY
<b>16:30-17:00</b> (20+10)	Coupled Stress-Induced Evolution of Nanoscale Materials Interfaces	A. Martini UC MERCED



### DAY 3 – 17 MAY 2017

#### MATERIAL COUPLING WITH EXTERNAL FIELDS II:

<b>8:30-10:00</b>  (70+20)	<p>Oxide Hetero Integration (Demkov and Ekerdt)</p> <p>I. Charge transfer at Metal Dielectric Interfaces</p> <ul style="list-style-type: none"> <li>- Development of Test Structures (all).</li> <li>- Lessons Learned (Ekerdt)</li> </ul> <p>II. Beyond 2DEG at oxide interfaces</p> <ul style="list-style-type: none"> <li>- Vacancy-related 2DEG: <math>\text{Al}_2\text{O}_3</math>-STO and EuO-STO (Ekerdt, Demkov, Smith, Mccarthy)</li> <li>- Integrated non-linear Optics: Oxides on Si and Ge (Demkov, Ekerdt)</li> <li>- Active EO Materials and Si photonics (Demkov)</li> </ul>	<p>A. Demkov, J. Ekerdt, M. McCartney, C. Young and D. Smith UT AUSTIN/ ASU / UT DALLAS</p>
<b>10:00-10:30</b>	<b>BREAK</b>	
<b>10:30-12:10</b>  (80+20)	<p>Nonlinear Terahertz Studies of Electro-Optic and Magneto-Electric Materials (Khodaparast)</p> <ul style="list-style-type: none"> <li>- Multiferroic Materials (Priya)</li> <li>- Non-Linear Ultrafast Field Imaging (Raschke)</li> <li>- Theory of Non-Linear Effects (Belyanin &amp; Stanton)</li> </ul>	<p>G. Khodaparast, S. Priya, M. B. Raschke, A. Belyanin and C. Stanton VIRGINIA TECH / COLORADO/ FLORIDA</p>
<b>12:10-13:30</b>	<p style="text-align: center;"><b>WORKING LUNCH</b></p> <p style="text-align: center;">Upcoming and Ongoing Initiatives and Opportunities at the National Science Foundation</p>	<p>Alexis Lewis NSF</p>
<b>13:30-14:00</b> (20+10)	<p>Nanoscale probing of Magnetoelectric Phases using Coherent X-ray Photons and Neutrons</p>	<p>E. Fohtung NM STATE</p>
<b>14:00-15:30</b> (80+20)	<p>Quantitative Identification of Electro-Physical Properties of Hetero-Interfaces at Extreme Environments (Sehirlioglu)</p> <ul style="list-style-type: none"> <li>- Electronic Structure &amp; Point Defects (Lambert)</li> <li>- Nanostructural Investigation (Berger)</li> <li>- Transport Effects (Gao)</li> </ul>	<p>A. Sehirlioglu, W. Lambrecht M. H. Berger, and X. Gao CWRU / ECOLE DES MINES –PARIS</p>
<b>15:30-15:40</b>	<b>BREAK</b>	
<b>15:40-16:10</b> (20+10)	<p>Studies of the Properties of Bulk and Thin Film <math>\beta</math>-<math>\text{Ga}_2\text{O}_3</math> Materials</p>	<p>D. Thomson, S Badescu AFRL</p>
<b>16:10-16:40</b> (20+10)	<p>Beta-Gallium Oxide</p>	<p>J. Speck and S. Ringel UCSB / OSU</p>



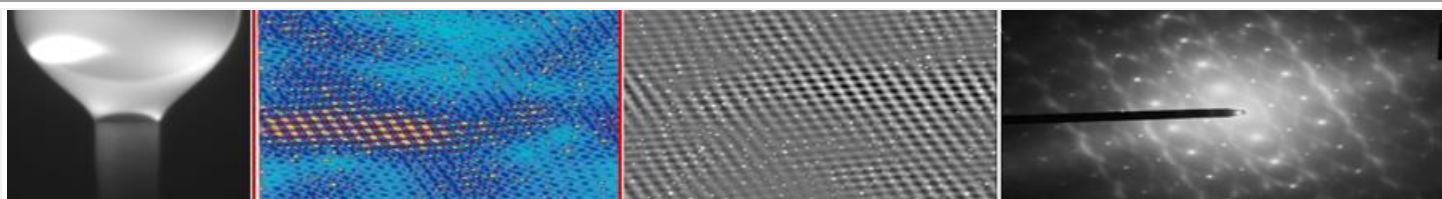
**DAY 4 – 18 MAY 2017**

**MATERIALS FOR HYPERSONICS|:**

<b>8:00-8:30</b> (20+10)	Fracture Toughness of Ultra-High Temperature Ceramics	B. Fahrenholtz, M. AsleZaeem MISSOURI S & T
<b>8:30-9:00</b> (20+10)	Mechanical Properties and Creep Deformation and Durability of Ultra High Temperature Ceramics	M. Ruggles-Wrenn AFIT
<b>9:00-9:30</b> (20+10)	High Temperature Composites using Microwave Enhanced Chemical Vapor Infiltration	J. Binner BIRMINGHAM
<b>9:30-10:00</b>	<b>BREAK</b>	
<b>10:00-10:30</b> (20+10)	(PECASE) Soft Chemical Approaches to the Synthesis of Metastable Materials,	D. Freedman NORTHWESTERN
<b>10:30-11:00</b> (20+10)	(YIP) Understanding the stability and Microstructure of the Zeta Phase in Transition Metal Carbides and Nitrides	C. Weinberger DREXEL
<b>11:00-11:30</b> (20+10)	Influence of Group IV& V Alloying Elements on the Microstructure Engineering and Deformation in TaC	G. Thompson U. ALABAMA
<b>11:30-12:00</b> (20+10)	Scalable, Solution-Phase Routes Towards Metal Carbides	J. Goldberger OSU
<b>12:00-12:30</b> (20+10)	In Situ Studies of Thermal, Chemical and Mechanical Stabilities of Refractory Materials	S. Kodambaka UCLA
<b>12:30-13:30</b>	<b>LUNCH</b>	

**SYNTHESIS SCIENCE:**

<b>13:30-14:00</b> (20+10)	Design and Assessment of Multifunctional Coatings for Ablation and Emissivity Performance	R. Trice PURDUE
<b>14:00-14:30</b> (20+10)	High-Temperature Interfacial Thermodynamics and Control of HT Ceramic GB with Electric Field	J. Luo UCSD
<b>14:30-15:00</b> (20+10)	Toward a Phenomenological Theory of Transport Phenomena in Molten Sulfide system	A. Allanore MIT
<b>15:00-15:30</b>	<b>BREAK</b>	
<b>15:30-16:00</b> (20+10)	Elucidating Actuation-Induced Failure Mechanisms in High Temperature Shape Memory Alloy	I. Karaman TEXAS A&M
<b>16:00-16:30</b> (20+10)	Prediction of Diffusionless Phase Transformations in Complex Materials: Applications to Transformation Plasticity	Randall Hay AFRL
<b>16:30-17:00</b> (20+10)	High Temperature Phase Transformations in the Rare Earth Titanate System	T. Kriven UIUC



## DAY 5 – 19 MAY 2017

### MATERIALS FOR DIRECTED ENERGY:

<b>8:30-9:30</b> (40+20)	Chalcogenides for Mid-IR Lasers (Mirov)  - Cr-, and Fe Doped Chalcogenide (Camata)  - Theoretical Model (Kawai)	S. Mirov, R. Camata, R. Kawai and V. Fedorov U. ALABAMA
<b>9:30-10:00</b> (20+10)	High Quantum Efficiency and High Purity Rare Earth Doped Crystal for Solid State Cooling: Synthesis and Characterization	M. Sheik-Bahae UNM
<b>10:00-10:30</b>	<b>BREAK</b>	
<b>10:30-11:00</b> (20+10)	Feasibility and Mechanisms of Chemical Reactions as a Basis for Heat Transfer Media	B. Lear PSU
<b>11:00-11:30</b> (20+10)	(2015 YIP) Toward Bio-Inspired Smart Thermal Spreaders	H. Ghasemi U. HOUSTON
<b>11:30-12:00</b> (20+10)	Phase-change on Nanoporous Graphene for Advanced Thermal Management	E. Wang MIT
<b>12:00-13:00</b>	<b>LUNCH</b>	
<b>13:00-13:30</b> (20+10)	Electromagnetic and Thermal Design of Optimal Common Aperture Materials with Ceramics and Composites	J. Park AFRL
<b>13:30-14:00</b> (20+10)	Nonreciprocal Metal-Dielectric Photonic Structures for Electromagnetic Isolation	A. Chabanov UT SAN ANTONIO
<b>14:00-14:30</b> (20+10)	Cathode Materials for Electron Emission	T. Back AFRL
<b>14:30-14:50</b>	<b>BREAK</b>	
<b>14:50-15:20</b> (20+10)	Millimeter Wave Interactions with High Temperature Materials	B. Hoff AFRL
<b>15:20-15:50</b> (20+10)	Multiscale Methods in Beamed Energy Harnessing Applications	B. S. Tilley WPI
<b>15:50-16:20</b> (20+10)	Development of Non-Equilibrium Materials with Extraordinary Electronic Properties	D. Vashaee NCSC