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14. ABSTRACT

Understanding and predicting the effects of cultural factors in cooperation and negotiation are of significant importance to the mission of the US military. The overall goal of this multidisciplinary research is to develop validated theories, flexible and scalable computational techniques for descriptive and predictive models of dynamic collaboration and negotiation that consider cultural and social factors; generate new theory and an integrated theoretical perspective that encompasses dynamic collaboration and negotiation as processes on a context-sensitive and situationally determined continuum of behavior; explore novel dimensions of conflict resolution decision

15. SUBJECT TERMS

intracultural negotiation, intercultural negotiation, culture, negotiation, conflict resolution, sacred values

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Report Title

Modeling Cultural Factors in Collaboration and Negotiation

ABSTRACT

Understanding and predicting the effects of cultural factors in cooperation and negotiation are of significant importance to the mission of the US military. The overall goal of this multidisciplinary research is to develop validated theories, flexible and scalable computational techniques for descriptive and predictive models of dynamic collaboration and negotiation that consider cultural and social factors; generate new theory and an integrated theoretical perspective that encompasses dynamic collaboration and negotiation as processes on a context-sensitive and situationally determined continuum of behavior; explore novel dimensions of conflict resolution decision making, such as Sacred Values and discover as yet unknown factors underlying these processes; make innovative extensions to computational state of the art models to understand what are the cultural factors that influence dynamic cooperation and negotiation and how, entail shifts from competitive to cooperative interactions and vice versa and how to model, predict and influence these tipping points.. The domains will be the Middle East, Turkey, Iran, Lebanon, Morocco. The research aims to (a) understand how cultural factors at individual, group and social levels affect the processes of dynamic collaboration and negotiation, (b) create new theory and models that incorporate the understanding of these factors, and (c) implement, test and evaluate these culturally-sensitive models into computational algorithms and tools to be used for prediction of performance, interventions, dynamic training and mission planning.

Received   Paper

04/23/2014 97.00 •, Bernhard Leidner , , •, Hammad Sheikh,, , •, Jeremy Ginges. Affective Dimensions of Intergroup Humiliation. ,
DOI: 10.1371/journal.pone.0046375, (03 2012): 1. doi:

04/23/2014 00.00 Scott Atran, Jeremy Ginges. Religious and Sacred Imperatives in Human Conflict,
Science, (08 2012): 855. doi:

04/23/2014 99.00 Baruch Fischhoff. The sciences of science communication,
Proceedings of the National Academy of Sciences, (08 2013): 14033. doi:

04/23/2014 01.00 Scott Atran. From mutualism to moral transcendence,
10.1017/S0140525X12000714, (10 2013): 81. doi:

04/23/2014 02.00 Hammad Sheikh, Jeremy Ginges, Scott Atran. Sacred values in the Israel-Palestine conflict: Resistance to social influence, temporal discounting, and exit strategies,
DOI: 10.1111/nyas.12275, (09 2013): 11. doi:

04/23/2014 09.00 Elnaz_ Nouri, Kallirroi_Georgila, David_Traum. Culture-specific models of negotiation for virtual characters: multi-attribute decision-making based on culture-specific values.,
AI and Society, Special Issue on Culturally Motivated Virtual Characters, (09 2014): 0. doi:

04/23/2014 12.00 Zhaleh Semnani, Alin Coman, Wendi L. Adair, Katia Sycara, Michael Lewis. Sacred values and observer perceptions in negotiation: The role of deontological versus instrumental reasoning frames,
Group Decision and Negotiation, (08 2014): 0. doi:

04/25/2014 19.00 Scott Atran. God and the Ivory Tower,
Foreign Policy, (08 2012): 0. doi:

04/25/2014 23.00 Raphael Sagarin, Candance Alcorta, Scott Atran, Daniel Blumstein, Gregory Dietl, Michael Hochberg, Dominic Johnson, Simon Levin, Elizabeth Madin, Joshua Madin, Elisabeth Prescott, Richard Sosis, Terence Taylor, John Tooby, Geerat Vermeij. Decentralize, adapt and cooperate,
Nature, (05 2010): 292. doi:

04/25/2014 24.00 Hammad Sheikh, Jeremy Ginges, Alin Coman, Scott Atran. Religion, group threat and sacred values,
Judgment and Decision Making, (03 2012): 110. doi:

04/25/2014 25.00 Scott Atran. Social Warfare,
Foreign Policy, (03 2013): 1. doi:

04/25/2014 26.00 Catherine H. Tinsley, Nazli Turan, Soroush Aslani, Laurie R. Weingart. the interplay between Culturally- and Situationally-based Mental Models of Intercultural Dispute Resolution: West Meets Middle East1,
International Negotiation , (09 2011): 481. doi:

04/25/2014 27.00 Emily Amanatullah, Catherine Tinsley. Ask and ye shall receive? How gender and status moderate negotiaiton success,
Negotiation and conflict management research, (11 2013): 253. doi:

04/25/2014 28.00 Emily Amanatullah, Catherine Tinsley. Punishing female negotiators for asserting too much.. or not enough: exploring why advocacy moderates backlash against assertive female negotiators,
Organizational Behavior and Human Decision Processes, (04 2013): 110. doi:

04/25/2014 30.00   Scott Atran. A question of honor: why the taliban fight and what to do about it,
               Asian Journal of Social Science, (04 2010): 341. doi:

04/25/2014 33.00   Guoming Lai, Katia Sycara. A generic framework for automated multi-attribute negotiation,
               Group Decision and Negotiation, (08 2009): 169. doi:

04/25/2014 36.00   Michael Prietula, Laurie Weingart. Negotiation offers and the search for agreement,
               Negotiation and conflict management research, (10 2011): 77. doi:

04/25/2014 37.00   Mara Olekans, Laurie Weingart. Emergent negotiations: stability and shifts in negotiation dynamics,
               Negotiation and conflict management research, (09 2008): 135. doi:

04/25/2014 39.00   Matthew Cronin, Katerina Berzrukova, Laurie Weingart, Catherine Tinsley. Subgroups within a team: the
               role of cognitive and affective integration,
               Journal of Organizational Behavior, (10 2011): 831. doi:

08/15/2011 19.00   Baruch, Fischhoff. Communicating about the risks of terrorism,
               , (08 2011): 0. doi:

08/16/2011 25.00   Roxane Cohen Silver. An introduction to "9/11: Ten years later".,
               American Psychologist, (1 2011): 1. doi: 10.1037/a0024804

08/16/2011 26.00   J. Ginges, S. Atran. War as a moral imperative (not just practical politics by other means),
               Proceedings of the Royal Society B: Biological Sciences, (02 2011): 0. doi: 10.1098/rspb.2010.2384

08/16/2011 28.00   Scott Atran. Keystone Al-Kaeda: In the battle against Al Qaeda, the only thing we have to fear is fear
               itself,
               Foreign Policy, (11 2010): 0. doi:

08/16/2011 29.00   Scott Atran, Rumen Iliev, Sonya Sachdeva, Douglas Medin, Jeremy Ginges, Morteza Dehghani. Sacred
               values and conflict over Iran's nuclear program,
               Judgment and Decision Making, (12 2010): 540. doi:

08/16/2011 37.00   . Modeling Group Negotiation: Three Computational Approaches that can Inform Behavioral Sciences,
               Research on Managing Groups and Teams, (01 2011): 189. doi:

08/17/2011 42.00   Jeremy Ginges, Scott Atran, Sonya Sachdeva, Douglas Medin. Psychology out of the laboratory: The
               challenge of violent extremism.,
               American Psychologist, (08 2011): 1. doi: 10.1037/a0024715

TOTAL: **26**

Number of Papers published in peer-reviewed journals:

(b) Papers published in non-peer-reviewed journals (N/A for none)

<u>Received</u>   <u>Paper</u>

04/23/2014 98.00 Emily Bell1, , C. Monica Capra1,, Michael J. Prietula2, , Sara Moore1,, Brittany Anderson1,, Jeremy Ginges, Scott Atran4, Gregory S. Berns1,*,.). The price of your soul: Neural evidence for the non-utilitarian representation of sacred values,
DOI: 10.1098/rstb.2011.0262, (05 2012): 754. doi:

04/23/2014 03.00 Scott Atran. From mutualism to moral transcendence,
doi:10.1017/S0140525X12000714, (10 2013): 81. doi:

08/15/2011 20.00 Roxanne Silver, Baruch Fischhoff. what should we expect about the next attack?,
American Psychologist, (08 2011): 1. doi:

08/16/2011 24.00 Raphael D. Sagarin, Candace S. Alcorta, Scott Atran, Daniel T. Blumstein, Gregory P. Dietl, Michael E. Hochberg, Dominic D. P. Johnson, Simon Levin, Elizabeth M. P. Madin, Joshua S. Madin, Elizabeth M. Prescott, Richard Sosis, Terence Taylor, John Tooby, Geerat J. Vermeij. Decentralize, adapt and cooperate,
Nature, (5 2010): 1. doi: 10.1038/465292a

08/16/2011 23.00 Scott Atran. A Question of Honour: Why the Taliban Fight and What to Do About It,
Asian Journal of Social Science, (05 2010): 341. doi: 10.1163/156853110X499918

08/16/2011 31.00 Jeremy Ginges, Scott Atran. What Motivates Participation in Violent Political Action,
Annals of the New York Academy of Sciences, (06 2009): 115. doi: 10.1111/j.1749-6632.2009.04543.x

   TOTAL: **6**

Number of Papers published in non peer-reviewed journals:

(c) Presentations

Sheikh, H., & Ginges, J. (2014, February). Sacred Values in the Israeli-Palestinian Conflict. Presented at the 14th Annual Meeting of the Society for Personality and Social Psychology, Austin, TX.

Atran, S. (2013, February). Religious Violence and Reconciliation, Inaugural lecture, Abelson Reconciliation Lecture, University of Science and Arts of Oklahoma.

Atran, S. (2013, April). Issues in the Neurobiology of Sacred Values. Department of Economics, Emory University, Atlanta.

Atran, S. (2013, September) The Thinking Behind Nuclear Proliferation in the Middle East; the Role of Sacred Values. Harris Manchester College, Oxford University.

Atran, S. (2013, September) Where Do Terrorists Come From? Presented to Pax et Bellum, Uppsala University, Stockholm.

Atran, S. (2013, October). The Devoted Actor: A Framework for Understanding Intractable Conflict and Existential Decision Making, Central European University, Budapest.

Atran, S. (2013, November). Behavioral and Neurobiological Inquiry into Sacred Values and Devoted Actors: Possibilities for Collaborative Research. Brain and Creativity Institute, University of Southern California, Los Angeles, CA, November.

Sheikh, H., & Ginges, J. (2013, January). Religious Ritual, Group Threat, and the Emergence of Sacred Values. Presented at the 13th Annual Meeting of the Society for Personality and Social Psychology, New Orleans, LA.

Ginges, J. & Sheikh, H. (2012, October). Sacred Values and Intergroup Violence. Presented at the Meeting of the Society of Experimental Social Psychology, Austin, TX.

Atran, S. (2012, July). Religion and the Sacred. William J. Lonner Distinguished Lecture. 21st International Conference International Association for Cross-Cultural Psychology, Stellenbosch, South Africa.

Atran, S. (2012, October). Male martyrdom networks. Foundation for Male Studies, New York.

Atran, S. (2012, November). Managing values and responsibilities. "Neuroethics: from Lab to Law. A Scientific Scrutiny of Sociability, Responsibility and Criminality." International Center for Scientific Debate. Barcelona.

Atran, S. (2012, December). The science of the sacred and seemingly intractable conflicts. Conference in honor of Dan Sperber. Paris.

Atran, S. (2012, June). Defusing Religious Conflict. Oxford University. Oxford, England.

Ginges, J., (2012, February). Humiliation and Sacred Values. Talk presented at a meeting on "Neuroscience and Social Conflict: Identifying New Approaches for the 21st Century", MIT, Cambridge, MA.

Ginges, J., (2012, June). Negotiating Sacred Values. Talk presented at a meeting on "Culture, Identity and Change in the Middle East: Insights for Conflict and Negotiation", Harvard University, Cambridge, MA.

Atran, S. (2013, February). Talking to the Enemy. Presented at ARMY Fort Belvoir.

Atran, S. (2013, February). Religious Violence and Reconciliation, Inaugural lecture, Abelson Reconciliation Lecture, University of Science and Arts of Oklahoma.

Atran, S. (2013, April). Issues in the Neurobiology of Sacred Values. Department of Economics, Emory University, Atlanta.

Atran, S. (2013, September) The Thinking Behind Nuclear Proliferation in the Middle East; the Role of Sacred Values. Harris Manchester College, Oxford University.

Atran, S. (2013, September) Where Do Terrorists Come From? Presented to Pax et Bellum, Uppsala University, Stockholm.

Atran, S. (2013, October). The Devoted Actor: A Framework for Understanding Intractable Conflict and Existential Decision Making, Central European University, Budapest.

Atran, S. (2013, November). Behavioral and Neurobiological Inquiry into Sacred Values and Devoted Actors: Possibilities for Collaborative Research. Brain and Creativity Institute, University of Southern California, Los Angeles, CA, November.

Elnaz Nouri. A cross-cultural study of playing simple economic games online with humans and virtual humans. Talk at the HCII conference, Las Vegas, Nevada, USA, July 25, 2013.

Non Peer-Reviewed Conference Proceeding publications (other than abstracts):

<u>Received</u>   <u>Paper</u>

08/16/2011 35.00 Kallirroi Georgila, David Traum. Reinforcement Learning of Argumentation Dialogue Policies in
                  Negotiation,
                  12th Annual Conference of the International Speech Communication Association (InterSpeech 2011). 19-
                  OCT-11, . : ,

   TOTAL: **1**

Number of Non Peer-Reviewed Conference Proceeding publications (other than abstracts):

Peer-Reviewed Conference Proceeding publications (other than abstracts):

Received   Paper

04/23/2014 05.00 Zhaleh Semnani-Azad, Alin Coman, Katia Sycara, Michael Lewis. Perception formation and global
                  negotiation: the role of culture and sacred value,
                  HICSS. 06-JAN-14, . : ,

04/23/2014 15.00 Dong Li, Zhimming Xu, Sheng Li, Xin Sun, Anika Gupta, Katia Sycara. Link Recommendation for
                  Promoting Information Diffusion in Social Networks,,
                  The 22nd International World Wide Web Conference . 13-MAY-13, . : ,

04/23/2014 14.00 Dong Li, Zhimming Xu, Yishu Luo, Sheng Li, Anika Gupta, Katia Sycara, Shengmei Luo, Lei Hu, Hong
                  Chen. Modeling Information Diffusion over Social Networks for Temporal Dynamic Prediction,
                  ACM Conference on Information and Knowledge Management. 27-NOV-13, . : ,

04/23/2014 13.00 Zhaleh Semnani-Azad, Wendi Adair. Negotiation in Honor and Dignity Cultures: Implications of Aspiration
                  on Negotiation Process and Outcome,
                  International Association for Conflict Management. 30-JUL-13, . : ,

04/23/2014 11.00 Elnaz Nouri, David Traum. Prediction of game behavior based on culture factors,
                  13th Conference on Group Decision and Negotiation. 17-JUN-13, . : ,

04/23/2014 08.00 Avinava Dubey, Ahmed Hefny, , Sinead Williamson, Eric Xing. A Non-parametric Mixture Model for Topic
                  Modeling Over Time,
                  Social Data Mining. 15-OCT-13, . : ,

04/23/2014 07.00 Ahmed Hefny, Geoofrey Gordon, Katia Sycara. Random walk features for network-aware topic models,
                  NIPS Workshop on Frontiers of Network Analysis: Methods, Models, and Applications. 19-AUG-13, . : ,

04/23/2014 06.00 Anika Gupta, Katia Sycara, Geoffrey Gordon, Ahmed Hefny. Exploring Friends' Influence in Cultures in
                  Twitter,
                  International Conference on Advances in Social Networks Analysis and Mining. 27-AUG-13, . : ,

04/25/2014 17.00 Lisa-Maria Hofmann, Nilanjan Chakraborty, Katia Sycara. The evolution of cooperation in self interested
                  agent societies: a critical study,
                  Autonomous Agents and Multiagent Systems. 02-MAY-11, . : ,

04/25/2014 41.00 Geoffrey Gordon, Sue Ann Hong, Miroslav Dudik. First order mixed integer linear programming,
                  Uncertainty in Artificial Intelligence. 10-JUL-09, . : ,

04/25/2014 38.00 Miroslav Dudik, Geoffrey Gordon. A sampling based approach to computing equilibria in succinct
                  extensive form games,
                  Uncertainty in Artificial Intelligence. 15-JUL-09, . : ,

04/25/2014 35.00 Laurie Weingart, Julia Bear, Gergana Todorova. Excited to disagree? A study of conflict and emotions,
                  22 Annual international association of conflict management conference. 15-JUN-09, . : ,

04/25/2014 32.00 Steven Solomon, Matthew Hays, Grace Chen, Milton Rosenberg. Evaluating a framework for representing
                  cultural norms for human behavior models,
                  Conference on behavior representation in modeling and simulation. , . : ,

04/25/2014 31.00 David Traum. Models of culture for Virtual human conversations,
                  Human Computer Interation . 06-JUL-09, . : ,

04/25/2014 29.00 Roie Zivan, Miroslav Dudik, Steven Okamoto, Katia Sycara. Reducing untruthful manipulation in envy free pareto optimal resource allocation,
Intelligent Agent Technology. 30-AUG-10, . : ,

04/25/2014 18.00 Lingzhi Luo, Nilanjan Chakraborty, Katia Sycara. Prisoner's dilemma in graphs with heterogeneous agents,
International Conference on Social Computing, Behavioral Modeling, and Prediction . 10-MAY-10, . : ,

08/15/2011 22.00 Andrew Bagnell, Geoffrey Gordon, Katia Sycara, Kevin Waugh, Brian Ziebart. Strategy transfer learning via parametric deviation sets,
International conference on machine learning. 28-JUN-11, . : ,

08/16/2011 34.00 Kallirroi Georgila, Ron Artstein, Angela Nazarian, Michael Rushforth, David Traum, Katia Sycara. An Annotation Scheme for Cross-Cultural Argumentationand Persuasion Dialogues,
SIGDIAL 2011: the 12th Annual Meeting of the Special Interest Group on Discourse and Dialogue. 17-JUN-11, . : ,

08/16/2011 41.00 Zhaleh Semnani-Azad, Wendi L. Adair, Michael Lewis, Katia Sycara. Stereotypes in intercultural negotiation:Change in observer perception across stages of negotiation,
71st Annual Meeting of the Academy of Management. 12-AUG-11, . : ,

08/16/2011 40.00 Geoff Gordon, Miroslav Dudik , Katia Sycara, Brian Ziebart. Identifying Culture and Leveraging CulturalDifferences for Negotiation Agents,
45th Annual Hawaii International Conference on Systems Science (HICSS 2012). 04-JAN-12, . : ,

08/16/2011 38.00 Zhaleh Semnani-Azad. The influence of relational construal on cross-cultural negotiation.,
The 24th Annual Conference of the International Association for Conflict Management. 03-JUL-11, . : ,

08/16/2011 36.00 Brian D. Ziebart, Kevin Waugh, Andrew Bagnell, Geoffrey J. Gordon, Katia Sycara. Strategy Prediction via Parametric Deviation Sets,
Twenty-Fifth Annual Conference on Neural Information Processing Systems (NIPS 2011). 12-DEC-11, . : ,

08/16/2011 39.00 Victor Sanchez, Katia Sycara, Tinglong Dai, Zaleh Semnani. Modeling power distance and individualism/collectivism in negotiation team dynamics,
45th Annual Hawaii International Conference on Systems Science (HICSS 2012). 04-JAN-12, . : ,

08/30/2012 59.00 Elnaz Nouri, David Traum. A cultural decision-making model for virtual agents playing negotiation games,
International Workshop on Culturally Motivated Virtual Characters,. 14-SEP-11, . : ,

08/30/2012 69.00 Jimena Ramirez Marin, Jeanne Brett. Ralational construal in negotiation,
International Association for Conflict Management. 06-JUL-11, . : ,

08/30/2012 67.00 Catherine Tinsley, Nazli Turan, Laurie Weingart, Soroush Aslani, Rebecca Heino. Western and Middle-Eastern models of intercultural dispute resolution.,
Annual Meeting of the Academy of Management. 14-AUG-11, . : ,

08/30/2012 66.00 Zhaleh Semnani Azad, Katia Sycara, Michael Lewis. Dynamics of helping behavior and cooperation across culture,
International Conference on Collaboration Technologies and Systems . 22-MAY-12, . : ,

08/30/2012 64.00 Ronghuo Zheng, Nilanjan Chakraborty, Tingling Dai, Katia Sycara, Michael Lewis. Automated Bilateral Multiple-issue Negotiation withNo Information About Opponent,
46th Hawaii Internation Conference on the System Sciences. 08-JAN-13, . : ,

08/30/2012 63.00 Kallirroi Georgilla, David Traum. Reinforcement Learning of Argumentation Dialogue Policies in Negotiation,
12th Annual Conference of the International Speech Communication Association. 15-SEP-11, . : ,

08/30/2012 60.00 Elnaz Nouri, Kallirroi Georgilla, David Traum. A cultural decision making model for negotiation based on inverse reinforcement learning,
34th Annual Meeting of the Cognitive Science Society (CogSci),. 01-AUG-12, . : ,

08/31/2012 70.00 Zhaleh Semnani-Azad, Wendy Adair, Katia Sycara, Michael Lewis. Being tough doesn't always pay off: the culture of honor and dignity in negotiation,
Conference of International Association of Conflict Management. 13-JUL-12, . : ,

09/01/2013 71.00 Katia Sycara, Geoffrey Gordon, Anika Gupta, Ahmed Hefny. Exploring Friends' Influence in Cultures in Twitter,
The 2013 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining. 28-AUG-13, . : ,

09/01/2013 72.00 Elnaz Nouri , David Traum. Prediction of game behavior based on culture factors,
13th Conference on Group Decision and Negotiation. 17-JUN-13, . : ,

09/01/2013 74.00 Elnaz Nouri, Kallirroi Georgila, David Traum. A Cultural Decision-Making Model for Negotiationbased on Inverse Reinforcement Learning,
34th Conference of the Cognitive Science Society. 01-AUG-12, . : ,

09/01/2013 84.00 Ronghuo Zheng, Nilanjan Chakraborty, Tingong Dai, Katia Sycara, Michael Lewis. Automated Bi-lateral Multi-issue Negotiation with No Information about the Opponent,
The 46th Hawaii International Conference on Systems Science. 07-JAN-13, . : ,

09/01/2013 85.00 Dong Li,, Zhiming Xu,, Sheng Li,, Xin Sun, Anika Gupta,, Katia Sycara. Link Recommendation for Promoting Information Diffusion in Social Networks,
The 22nd Intrnational World Wide Web Conference (WWW-2013). 13-MAY-13, . : ,

09/01/2013 86.00 Ronghuo Zheng, Nilanjan Chakraborty, Tinglong Dai, Katia Sycara. Multiagent Negotiation on Multiple Issues with Incomplete Information,
Autonomous Agents and Multi-Agetn Systems. 06-MAY-13, . : ,

09/01/2013 87.00 Zhiming Xuy, , Yishu Luoy, , Sheng Liy,, Anika Gupta, Dong Li, Katia Sycara, Shengmei Luo, Lei Hu, , Hong Chen. Modeling Information Diffusion over Social Networks for Temporal Dynamic Prediction,
, ACM Conference on Information and Knowledge Management. 27-OCT-13, . : ,

09/01/2013 88.00 Alin Coman, Katia Sycara, Michael Lewis, Zhaleh Semnani-Azad. Perception formation in global negotiations: The role of culture and sacred value,
The Hawaii International Conference on System Sciences (HICSS-47). 07-JAN-14, . : ,

09/01/2013 89.00 Zhaleh Semnani-Azad, Katia Sycara, Michael Lewis, Wendi L. Adair. Stereotype and Perception Change in Intercultural Negotiation,
The Hawaii International Conference on System Sciences (HICSS-45),. 07-JAN-12, . : ,

   TOTAL: **40**

Number of Peer-Reviewed Conference Proceeding publications (other than abstracts):

(d) Manuscripts

Received   Paper

08/16/2011 30.00   Scott Atran. TALKING TO THE ENEMYVIOLENT EXTREMISM, SACRED VALUES &WHAT IT MEANS TO BE HUMAN,
Presentation (08 2011)

08/30/2012 47.00   Baruch Fishhoff. communicating about the risks of terrorism,
American Psychologist (09 2011)

08/30/2012 68.00   Nazli Turan, Soroush Aslani, Laurie Weingart, Catherine Tinsley. The interplay between culturally and situationally based mental models of intercultural dispute resolution,
International Negotiation (09 2011)

08/30/2012 58.00   Jeremy ginges, Scott Atran. War as a moral imperative (not just practical politics by other means),
Proceedings of the Royal Society B: Biological Sciences (10 2011)

08/30/2012 57.00   Gregory Berns, Emily Bell, Monica Capra, Michael Prietula, Sara Moore, Brittany Anderson, Jeremy ginges, Scott Atran. The price of your soul: neural evidence for the non-utilitarian representation of sacred values,
Philosophical Transactions of the Royal Society - B (01 2012)

08/30/2012 56.00   Scott Atran. Talking to the enemy: an alternative approach to ending intractable conflicts,
Solutions (02 2012)

08/30/2012 54.00   Jeremy Ginges, Scott Atran. Religious and sacred imperatives in human conflict,
Science (05 2012)

08/30/2012 53.00   Hammad Sheikh, Jeremy ginges, Alin Coman, Scott Atran. Religion, group threats and sacred values,
Judgement and Decision Making (03 2012)

08/30/2012 52.00   Jeremy Ginges, Scott Atran, Sony Sancheva, Douglas Medin. Psychology out of the lab: the challenge of violent extremism,
American Psychologist (09 2011)

08/30/2012 51.00   Eugene Rosa, Thomas Dietz, Richard Moss, Scott Atran, Suzanne Moser. Managing the risks of climate change and terrorism,
Solutions (04 2012)

08/30/2012 50.00   Scott Atran. Enemies,
Chronicle of Higher Education (08 2011)

09/01/2013 78.00   Jeremy Ginges, Scott Atran. Religious and sacred imperatives in human conflict. ,
Science (05 2012)

09/01/2013 75.00   Elnaz Nouri, Kallirroi Georgila, David Traum. Culture-specific models of negotiation for virtual characters: multi-attribute decision-making based on culture-specific values,
AI and Society, Special Issue on Culturally Motivated Virtual Characters (08 2012)

09/01/2013 77.00   Jeremy Ginges, Alin Coman, Scott Atran, Hammad Sheikh. Religion, group threat and sacred values.,
Judgment and Decision Making (07 2012)

09/01/2013 79.00   Baruch Fischhoff. The sciences of science communication,
Proceedings on the National Academy of Sciences (05 2013)

09/01/2013	80.00	Hammad Sheikh, Jeremy Ginges, Scott Atran. Sacred values in the Israel-Palestine conflict: Resistance to social influence, temporal discounting, and exit strategies, Annals of the New York Academy of Sciences (05 2012)
09/08/2009	3.00	C. K.W. DeDreu, L. Weingart. Task Versus Relationship Conflict, Team Performance, and Team Member Satisfaction: A Meta-Analysis, ( )
09/08/2009	4.00	L. Weingart. Manage Intra-Team Conflict Through Collaboration, ( )
09/08/2009	5.00	M. Olekalns, L. Weingart. Emergent Negotiations: Stability and Shifts In Negotiation Dynamics, ( )
09/08/2009	6.00	K. Sycara, T. Dai. Agent Reasoning in Negotiation, ( )
09/08/2009	7.00	L. Weingart, J. Bear, G. Todorova. Excited to disagree? A Study of Conflict and Emotions, ( )
09/09/2009	8.00	M. Dudik, G. Gordon. A Sampling-Based Approach to Computing Equilibria in Succinct Extensive-Form Games, ( )
09/09/2009	9.00	J. Ginges, I. Hansen, A. Norenzayan. Religion and Support for Suicide Attacks, ( )
09/09/2009	11.00	L. Luo, N. Chakraborty, K. Sycara. Prisoner's Dilemma on Graphs with Heterogeneous Agents, ( )
09/09/2009	12.00	L. Luo, N. Chakraborty, K. Sycara. Modeling ethno-religious conflicts as Prisoner's Dilemma game in Graphs, ( )
09/09/2009	10.00	G. Gordon, S. Hong, M. Dudik. First-Order Mixed Integer Linear Programming, ( )
09/09/2009	13.00	R. Zivan, P. Paruchuri, K. Sycara. Truthful requirement elicitation for resource allocation, with no monetary payments, ( )
09/09/2009	14.00	D. Bartels, C. Bauman, L. Skitka, D. Medin. Moral Judgment and Decision Making, ( )
09/09/2009	15.00	D. Traum. Models of Culture for Virtual Human Conversation, ( )
09/09/2009	16.00	S. Solomon, M. Hays, G. Chen, M. Rosenberg. Evaluating a Framework for Representing Cultural Norms for Human Behavior Models, ( )
09/09/2009	18.00	J. Ginges, S. Atran. What Motivates Participation in Violent Political Action Selective Incentives or Parochial Altruism, ( )
09/09/2009	17.00	B. Fischhoff, S. Atran, M. Sageman. The ANNALS of the American Academy of Political and Social Science, ( )

TOTAL: **32**

Number of Manuscripts:

Books

08/15/2011 21.00 Committee Behavioral Social Science, National Research Council. Intelligence analysis for tomorrow, Washington DC: National Academy Press, (05 2011)

08/16/2011 27.00 Scott Atran. Talking to the Enemy. Faith, Brotherhood, and the (UN) Masking ofTerrorists, New York, NY: HarperCollins Publishers, (10 2010)

08/16/2011 33.00 Scott Atran, Craig Roberts (ed). War, Martyrdom, and Terror:Evolutionary Underpinnings of the Moral Imperative to Extreme Group Violence. In Craig Roberts (ed.) Applied Evolutionary Psychology , Oxford, GB: Oxford University Press, (12 2011)

08/16/2011 32.00 Scott Atran, Adam Dolnik (ed). An Anthropologist at Work:Field Study with Terrorists. In Adam Dolnik (ed) Up Close and Personal: Conducting Field Research onTerrorism, London: Routledge, (12 2011)

08/30/2012 43.00 Miro Dudik, Geoff Gordaon. A Game-Theoretic Approach to ModelingCross-Cultural Negotiation, A Game-Theoretic Approach to ModelingCross-Cultural Negotiation: book chapter, (01 2013)

08/30/2012 65.00 Katia Sycara, tingong Dai. An Overview of Argumentation-BasedNegotiation Theoryand Decision Support Systems, New York: Bentham Science , (01 2013)

08/30/2012 62.00 David Herrera, David Novick, Dusan Jan, David Traum. Dialog Behaviors across Culture and Group Size, Belrin: Springer, (09 2011)

08/30/2012 61.00 Kallirroi Georgilla, David Traum. Learning Culture-Specific Dialogue Modelsfrom Non Culture-Specific Data, Berlin: Springer, (09 2011)

08/30/2012 55.00 Scott Atran. Moral imperatives and democratic dynamics in the fight against AQAP in the context of the Arab spring: Policy and research challenges, Washington, DC: Sept of Defense Office of the Sec of Defense, (11 2011)

08/30/2012 45.00 Preveen Paruchuri, Nilanjan Chakraborty, Geoff Gordon, Katia Sycara, Jeanne Brett, Weni Adair. Intercultural opponent behavior modeling in a POMDP based automated negotiating agent, New York: Springer, (01 2013)

08/30/2012 44.00 Jeremy Ginges. Negotiating conflicts over sacred values, New York: Spinger, (01 2013)

09/01/2013 83.00 Katia Sycara, Michele Gelfand, Allison Abbe. Models of Inter-Cultural Collaboration and Negotiation, Berlin: Springer, (02 2013)

TOTAL: **12**

Patents Submitted

Patents Awarded

Awards

Katia Sycara: Selected as member of the National Academies Study "From Data to Decision: Integrating Humans, Machines and Networks" (2012-2014)

Katia Sycara: Co-recipient (second time in a row) of the Semantic Web Scientific Association most influential 10-year paper award for the paper titled "Semantic Matching of Web Services Capabilities.".

Baruch Fischhoff: Co-chair, National Academy of Sciences Sackler Colloquium on the Science of Communicating Science (with Ralph Cicerone, NAS/UCI; Alan Leshner, AAAS; Barbara Schall, NAS/WU; Dietram Scheufele, Wisconsin). [two colloquia, May 2012, September 2013]

Baruch Fischhoff: Co-chair,National Research Council Committee on Future Research Goals and Directions for Foundational Science in Cybersecurity (with Peter Weinberger, Google)

Baruch Fischhoff:Member National Research Council Committee on Ethical and Societal Implications of Advances in Militarily Significant Technologies that are Rapidly Changing and Increasingly Globally Accessible

Semnani-Azad, Z., Aslani, S., Ramirez, J., Adair, W.L., & Brett, J.M. (2013). Negotiation in Honor and Dignity Cultures: Implications of Aspiration on Negotiation Process and Outcome. Annual Meeting of the International Association of Conflict Management Conference, Tacoma, WA, USA. *Awarded the IACM Graduate Student Scholarship

Graduate Students

NAME	PERCENT_SUPPORTED	Discipline
Elnaz Nouri	1.00	
Dusan Jan	1.00	
Michael Rushforth	1.00	
Zhaleh Semnani-Azad	0.50	
Tinglong Dai	1.00	
Sarah Bennett	1.00	
Kate Jassin	1.00	
Hammad Sheikh	1.00	
Ahmed Hefny	1.00	
Annelle Sheline	1.00	
Steve Slota	1.00	
Shi-Yi Chien	1.00	
Ronghuo Zheng	1.00	
Salar Rad	1.00	
Oliger Abdyli	1.00	
Nadine Obeid	1.00	
Nazli Turan	1.00	
FTE Equivalent:	**16.50**	
Total Number:	**17**	

Names of Post Doctorates

NAME	PERCENT_SUPPORTED
Tracey Nichole Argo	1.00
Jimena Ramirez	1.00
Lydia Wilson	1.00
Biran Ziebart	1.00
Praveen Paruchuri	1.00
Noam Hazon	1.00
Nilanjan Chakraborty	1.00
Alin Coman	1.00
Roie Zivan	1.00
Miro Dudik	1.00
FTE Equivalent:	**10.00**
Total Number:	**10**

Names of Faculty Supported

NAME	PERCENT_SUPPORTED	National Academy Member
Katia Sycara	0.30	
Baruch Fischoff	0.10	Yes
Geoffrey Gordon	0.20	
Scott Atran	0.20	
Jeremy Ginges	0.20	
Robert Axelrod	0.10	Yes
David Traum	0.10	
Cathy Tinsley	0.10	
Robin Dillon Merril	0.15	
Michael Lewis	0.15	
Rebecca Heino	0.10	
Laurie Weingart	0.15	
FTE Equivalent:	**1.85**	
Total Number:	**12**	

Names of Under Graduate students supported

NAME	PERCENT_SUPPORTED	Discipline
Jillian Gerten	1.00	
Angela Nazarian	1.00	
FTE Equivalent:	**2.00**	
Total Number:	**2**	

Student Metrics

This section only applies to graduating undergraduates supported by this agreement in this reporting period

The number of undergraduates funded by this agreement who graduated during this period: 2.00

The number of undergraduates funded by this agreement who graduated during this period with a degree in science, mathematics, engineering, or technology fields:...... 2.00

The number of undergraduates funded by your agreement who graduated during this period and will continue to pursue a graduate or Ph.D. degree in science, mathematics, engineering, or technology fields:...... 0.00

Number of graduating undergraduates who achieved a 3.5 GPA to 4.0 (4.0 max scale):...... 0.00

Number of graduating undergraduates funded by a DoD funded Center of Excellence grant for Education, Research and Engineering:...... 0.00

The number of undergraduates funded by your agreement who graduated during this period and intend to work for the Department of Defense 0.00

The number of undergraduates funded by your agreement who graduated during this period and will receive scholarships or fellowships for further studies in science, mathematics, engineering or technology fields:...... 0.00

Names of Personnel receiving masters degrees

NAME
Dusan Jan
Michael Rushforth
Anika Gupta
Oliger Abdyli

Total Number: 4

Names of personnel receiving PHDs

NAME
Sarah Bennett
Kate Jassin
Hammad Sheikh
Tinglong Dai
Tracy Nicole Argo
Nadine Obeid

Total Number: 6

Names of other research staff

NAME	PERCENT_SUPPORTED
Kallirroi Georgila	0.15
Andrea Fatica	0.20
Steve Solomon	0.50
Priti Aggarwal	0.50
Ron Artstein	0.20
Lila Brooks	0.15
FTE Equivalent:	**1.70**
Total Number:	6

Sub Contractors (DD882)

Inventions (DD882)

Scientific Progress

See Attachment

Technology Transfer

Final Report

Award Number: W911NF0810301
Award Title: Modeling Cultural Factors in Collaboration and Negotiation (ARO MURI 14)

Team Members:

CMU: Katia Sycara (PI), Geoffrey Gordon, Baruch Fischhoff
Georgetown University: Catherine Tinsley, Robin Dillon
CUNY and U of Michigan: Scott Atran, Jeremy Ginges, Robert Axelrod
University of Pittsburgh: Michael Lewis
University of Southern California: David Traum, Ron Artstein

Background and Research Goals

Understanding and predicting the effects of cultural factors in cooperation and negotiation are of significant importance to the mission of the US military. The overall goal of this multidisciplinary research is to develop validated theories, flexible and scalable computational techniques for descriptive and predictive models of dynamic collaboration and negotiation that consider cultural and social factors; generate new theory and an integrated theoretical perspective that encompasses dynamic collaboration and negotiation as processes on a context-sensitive and situationally determined continuum of behavior; explore novel dimensions of conflict resolution decision making, such as Sacred Values and discover as yet unknown factors underlying these processes; make innovative extensions to computational state of the art models to understand what are the cultural factors that influence dynamic cooperation and negotiation and how, entail shifts from competitive to cooperative interactions and vice versa and how to model, predict and influence these tipping points.. The domains will be the Middle East, Turkey, Iran, Lebanon, Morocco. The research aims to (a) understand how cultural factors at individual, group and social levels affect the processes of dynamic collaboration and negotiation, (b) create new theory and models that incorporate the understanding of these factors, and (c) implement, test and evaluate these culturally-sensitive models into computational algorithms and tools to be used for prediction of performance, interventions, dynamic training and mission planning.

Inter-Muri Collaboration

Sycara, K., Gelfand, M. Abbe, A. (Eds) "Models for Inter Cultural Collaboration and Negotiation", Springer Series on Advances in Group Decision and Negotiation, Springer, March 2013.

Awards Honors and Impact

- Katia Sycara: Member of the National Academies Committee for Data to Decision: Integrating Humans, Machine and Networks (2012-2014)

- Katia Sycara, Co-recipient (second time in a row) of the Semantic Web Scientific Association most influential 10-year paper award for the paper titled "Semantic Matching of Web Services Capabilities.". The award was presented at the 11th International Semantic Web Conference (ISWC), Boston, USA, November 11-15, 2012.

- Katia Sycara, Co-recipient of the Semantic Web Scientific Association most influential 10-year paper award, for the paper titled "DAML-S: Semantic Markup for Web Services". The award was presented at the 10th International Semantic Web Conference (ISWC), Bonn, Germany, October 23-27, 2011.

- Semnani-Azad, Z., & Adair, W.L. (2011). *The Influence of Relational Construal on Cross-cultural Negotiation.* Talk presented at the International Association of Conflict Management Conference, Istanbul, Turkey. **Paper was awarded the Dispute Resolution Research Center Scholarship**

- Semnani-Azad, Z. Culture and nonverbal behavior in negotiation. Outstanding Graduate Student Paper (Runner-up), International Association of Conflict Management (2012)

- Semnani-Azad, Z Nominee for the Carolyn Dexter Award, 72nd Academy of Management Annual Conference (2012) - Honor, dignity cultures in negotiation

- Scott Atran: elected member of the Cognitive Science Society (2011)

- Baruch Fischhoff elected Fellow of the Society of Experimental Psychologists (2011)

- Baruch Fischhoff: Chair, National Research Council Committee on Social and Behavioral Contributions to Intelligence Analysis (2009-2011)

- Baruch Fischhoff: Co-Chair, National Research Council Committee on Future Research Goals and Directions for Foundational Science in Cybersecurity (with Peter Weinberger, Google) (2012-present)

- Baruch Fischhoff: Co-Chair, National Academy of Sciences Sackler Colloquium on the Science of Communicating Science (with Ralph Cicerone, President, NAS/; Alan Leshner, Executive Officer, AAAS; Barbara Schall, WU; Dietram Scheufele, UW). (2011-present)

- Baruch Fischhoff: Member, National Research Council Committee on Ethical and Societal Implications of Advances in Militarily Significant Technologies that are Rapidly Changing and Increasingly Globally Accessible (sponsored by head of DARPA) (2011- present)

- Baruch Fischhoff: Member, Department of Homeland Security Science and Technology Advisory Committee.

- Baruch Fischhoff: Member of the National Academies of Science Sackler Colloquium Committee, "The Science of Communication"

Selected Recent Keynote Talks/High Level Briefings

- Baruch Fischhoff: March 16, 2011: Briefing, National Intelligence Analysis and Production Board

- Baruch Fischhoff: June 9, 2011: Briefing, head of intelligence (J-2) for head of the Joint Chiefs of Staff

- Baruch Fischhoff: April 5, 2012: Briefing, Gen. David Petraeus, Director, Central Intelligence Agency

- Baruch Fischhoff: April 25, 2012: Briefing, Admiral Dennis Blair (ret), former Director of National Intelligence

- Baruch Fischhoff: June 20, 2012: Opening speaking, National Research Council Government-University-Industry Research Roundtable, Decision Making Under Uncertainty

- Baruch Fischhoff: September 20, 2012: Briefing, RADML (ret) Andrew Skinner, Naval Postgraduate School

- Baruch Fischhoff: December 6, 2012: Briefing, RDML Diane E. H. Webber, Chief of Naval Operations, Director, Communications and Networks Division (N2/N6F1)

- Baruch Fischhoff: February 12, 2013: Briefing, LTG William Flynn, Director, Defense Intelligence Agency; Meeting with leadership of National Intelligence University

- Baruch Fischhoff: April 16, 2013: Briefing, RDML William Rogers, Director of Intelligence (J2) US Navy

- Baruch Fischhoff: November 7, 2013: Briefing, Col Robert Simpson, head Army Training Doctrine

- Baruch Fischhoff: December 4, 2013: Briefing, RDML William E. Leigher, Director of Warfare Integration for information Dominance (OPNAV N2/N6F)

- Baruch Fischhoff: September 23, 2013 National Academy of Sciences Sackler Colloquium on the Science of Science Communication, Washington DC. (keynote

speaker, co-chair)

- Baruch Fischhoff: August 26, Bulletin of the Atomic Scientists-Global Challenges Foundation, Chicago.

- Katia Sycara "Network Dynamics of Information Propagation" 5th International Symposium on Intelligent Distributed Computing, Delft, the Netherlands, October 5-7, 2011.

- Katia Sycara "Propagation Dynamics of Beliefs in Large Heterogeneous Networks", 8th European Workshop on Multi-Agent Systems, Paris, France, December 16-17, 2010.

- Katia Sycara "Ontologies and Agents", NATO Advanced Study Institute on Software Agents, Tangiers, Morocco, September 17-23, 2010.

- Katia Sycara "Emergent Dynamics of Information Propagation in Large Networks", Seventh International Conference on Rough Sets and Current Trends in Computing, Warsaw, Poland, June 28, 2010.

- Katia Sycara "Modeling Human Traits in automated Negotiation", Conference on Human Factors and Models of Negotiation, Delft, The Netherlands, June 23, 2010.

- Katia Sycara "Agent Based Aiding in Human Teams", International Conference on Intelligent Agent Technology, Milan, Italy, September 18, 2009.
- Katia Sycara "Negotiation and Culture", Conference on Group Decision and Negotiation, Toronto, CA., June 15, 2009.

- Katia Sycara "Formal Computational Models of Negotiation", Symposium on Psychological and Computational Issues in Modeling Persuasion and Negotiation, Singapore, June 9, 2009.

- Atran, S., "US Government Efforts to Counter Violent Extremism," US Senate Armed Services Committee, 2010-2011 (Testimony, Statement, Response, Questions

- Atran, S. (2012, November). Round Table at the House of Lords on Water and Conflict in the Middle East. Convened by Lord John Alderdice (UK) and Crown Prince Hassan (Jordan).

- Atran, S. *Wars are Won When Enemies Become Friends* (Keynote Address), International Conference on "Societies in Transition: Balancing Security, Social Justice and Tradition," Marrakesh, Morocco, June, 2010

- Atran, S. *Talking to the Enemy*: *Violent Extremism, Sacred Values, and What it Means to be Human*, Address to the Royal Society for the Encouragement of the

Arts (RSA), London, November 2010

- Atran, S. *Sacred Values and the Limits of Reason in Political Decision Making and Conflict* (keynote address). European Conference of Cognitive Science (EuroCogSci) Sofia, Bulgaria, May 2011.

- Atran, S. *Talking to the Enemy*: *Faith Brotherhood, and the (Un)Making of Terrorists*, Center for Strategic and International Studies, Washington DC, October 2010.

- Atran, S. *Talking to the Enemy*: *Violent Extremism, Sacred Values, and What it Means to be Human,* Parliament-House of Lords, London, November 2010.

- Atran, S. *How to Deal with Radicalization to Violent Extremism*, Presentation to: Swedish Institute for Foreign Affairs, Swedish Ministry of Foreign Affairs, Stockholm, November 2010.

- Atran, S. *Should we be talking to the Taliban?* Presented to the United Nations Al Qaeda-Taliban Monitoring Team at the Canadian Mission to the UN, January 21, 2011

ACCOMPLISHMENTS - DESCRIPTION OF RESULTS:

Our most recent research concerns moral decision-making in intractable intergroup conflicts and allied issues of war and peace, terrorism and revolution. The focus is not on fairness and reciprocity, which occupies much moral philosophy and psychology (including evolutionary and neuropsychology). Neither is the aim more nuanced appreciation of rational choice or heuristic frameworks for decision-making based on relative risks and rewards (however hedged by lack of information, cultural awareness, or other resources). Rather, the objective is to understand "The Devoted Actor," motivated by "Sacred Values" – inalienable parts of individual and collective identity that compel actions beyond evident reason.

Historical studies, behavioral and neuroimaging experiments, fieldwork with terrorist groups across Eurasia and Africa, and interviews with political leaders and militant supporters suggests that when sacred values become embedded in fused groups of imagined kin who consider themselves in existential competition with other groups, then individuals in such groups (e.g., bands of brothers) become empowered to make great sacrifices and exertions, for ill or good. This research seeks to explain why efforts to broker peace that rely on money or other material incentives fail when sacred values clash: we find that offers of material incentives to compromise on sacred values often backfire, increasing anger and violence toward a deal. While sacralization of preferences blocks the standard give-and-take tactics of "business-like" negotiation and strategies of *realpolitik*, strong symbolic gestures (sincere apologies, demonstrating respect for the other's values) can generate surprising flexibility, even among devoted militants and political leaders, enabling subsequent material negotiations.

1. **Sacred Values and Devoted Actors**
   (Scott Atran, CUNY and Jeremy Ginges, New School of Social Research)

Our latest research explores the relationship between: (1) what we and others have termed "sacred values" (Durkheim 1912/2012; Eliade, 1959; Rappaport 1971; Tetlock 2003; Ginges, Atran, Sachdeva & Medin. 2011; Atran & Ginges, 2012), and (2) "fused groups" of imagined kin in which such values may become embedded (Atran, 2010, 2012; Swann et al., in press). Our research hypothesis is that when fused, value-driven groups perceive existential threats, they produce "Devoted Actors" capable of extreme acts of self-sacrifice and violence without regard to likely risks or rewards, costs or consequences.

While the term "sacred values" (SVs) intuitively denotes religious belief, in line with recent work we use the term to refer to any preferences regarding objects, beliefs or practices that people treat as both incompatible or non-fungible with profane or economic goods, as when land becomes "Sacred Land," and which are part of our conception of "self" and of "who we are." This includes the "secularized sacred" as exemplified, for example, in political notions of "human rights" (Atran, 2012; Smith et al., 2013), or in the transcendent ideological *–isms* that have dominated political life ever since the Enlightenment's secularization of the universal religious mission to redeem and save "humanity" through political revolution (liberalism, socialism, anarchism, communism, fascism, etc.) (Gray, 2007).

Progress in the fields of moral psychology and philosophy has mostly focused on universal "Golden-Rule" principles of fairness and reciprocity emotionally supported by empathy and consolation (Greene, 2009; Baumard, André & Sperber, 2013; Van Slyke, 2014), rather than on what Darwin referred to as the primary virtue of "morality… patriotism, fidelity, obedience, courage, and sympathy" with which winning groups are better endowed in history's spiraling competition for survival and dominance (Darwin, 1871:163). Nevertheless, a smaller body of work (Baron & Spranca, 1997; Fiske & Tetlock 1997; Tetlock 2003) suggests that people resist attempts to compromise sacred values no matter the cost to themselves or others. But even this research has often assumed that uncompromising commitment to SVs, while possibly heartfelt, is actually impossible in the real world because other pressing material needs may invariably arise that require attention, thus relaxing absolute commitment (Baron & Leshner, 1999). Such values, then, can only be "pseudo-sacred" and ultimately materially negotiable owing to this "reality constraint" (McGraw & Tetlock, 2005).

However, humans sacrifice self interest, and in extremes they are willing to die and to kill, in the name of abstract and often ineffable values—like God or national destiny or history (Atran, 2002; Atran & Ginges, 2012; Atran, 2013). Acts of extreme sacrifice that so frequently punctuate human history suggest that SVs are not so readily re-construed to allow compromise under the pressure of instrumental pressures. Our fieldwork with suicide terrorists and political and militant leaders and supporters in violent conflict

situations provides empirical evidence that ordinary people, when motivated by SVs, become "Devoted Actors".

Our research indicates that when people act as "Devoted Actors" they think and behave differently than "Rational Actors" (however bounded by psychological or ecological constraints). Devoted actors show: 1) commitment to a rule-bound logic of moral appropriateness to do what is morally right no matter the likely risks or rewards, rather than following a utilitarian calculus of costs and consequences (Atran & Ginges, 2012; Sheikh, Ginges, Coman & Atran, 2012), 2) immunity to material tradeoffs, coupled with a "backfire effect," where offers of incentives or disincentives to give up SVs heighten refusal to compromise or negotiate (Ginges et al., 2011, Dehghani, et al., 2010), 3) resistance to social influence and exit strategies (Atran & Henrich, 2012; Sheikh, Ginges & Atran, 2013), which leads to unyielding social isolation and opposition as well as to unshakeable social solidarity, and which binds genetic strangers to voluntarily sacrifice for one another, even unto death, 4) insensitivity to spatial and temporal discounting, where considerations of distant places and people, and even far past and future events, associated with SVs significantly outweigh concerns with the here and now (Atran, 2010; Sheikh et al. 2013), 5) brain-imaging patterns consistent with processing SVs as rules rather than as calculations of costs and consequences, and with processing perceived violations of SVS as emotionally agitating and resistant to social influence or discounting (Berns et al., 2012, 2013; Note, the brain imaging studies were complementary to our ARO MURI, and in part motivated by MURI funded behavioral experiments and surveys, but under separate NSF funding).

Although SVs may operate as necessary moral imperatives to action, they are not sufficient. It is important to understand that group morality does not operate simply from ideological canon or decontextualized principles that drive decisions and actions, but is almost always embedded and distributed in social groups, most effectively in intimate networks of "imagined kin": Brotherhoods, Motherlands, Fatherlands, Homelands, and the like (Atran, 2011). Knowledge of the moral imperatives that drive people to great exertions towards one political goal or another, as well the group dynamics that bind individuals to sacrifice for one another in the name of those values, both appear indispensable to extreme actions where prospects of defeat and death are very high, as with terrorism and revolution.

2. **Devoted Actors are Deontic Actors**
   (Scott Atran and Jeremy Ginges)

Philosophers of moral virtue suggest that moral values might be deontological (Kant, 1785/2005) or utilitarian (Mill, 1871). Deontic processing is defined by an emphasis on rights and wrongs (Weber, 1864/1958), whereas utilitarian processing is characterized by costs and benefits (von Neumann & Morgenstern, 1944). Models of rational behavior predict many of society's patterns, such as favored strategies for maximizing profit or likelihood for criminal behavior in terms of opportunity costs (Becker, 1978) and important aspects of conflict management (Allison & Zelikow, 1999). But the prospects of crippling economic burdens and huge numbers of deaths don't necessarily sway people

from positions on whether going to war, or opting for revolution, is the right or wrong choice.

For example, in one series of studies, we confronted people in the United States and Nigeria with hypothetical hostage situations and asked them if they would approve of a solution—which was either diplomatic or violent—for freeing the prisoners (Ginges & Atran, 2011). When told that their action would result in all hostages being saved, both groups endorsed the plan presented to them. When asked how many hostages they required to be saved to ensure their support (from 1-100), those evaluating the military only one hostage to be rescued, showing a remarkable insensitivity to scope. In contrast, those evaluating the diplomatic option required a majority of hostages to be rescued.

Commitment to SVs can be key to the success or failure of insurgent or revolutionary movements with far fewer material means than the armies or police arrayed against them (which tend to operate more on the basis of typical "rational" reward structures, such as calculated prospects of increased pay or promotion). Ever since WWII, on the average, revolutionary movements have emerged victorious with as little as ten times less firepower and manpower than the state forces arrayed against them (Arreguín-Toft, 2001).

Our research with political leaders and general populations shows that SVs—not political games or economics—underscore seemingly intractable conflicts like those between the Israelis and the Palestinians or Iran and the Western allies that defy the rational give-and-take of business-like negotiation (Ginges et al., 2011; Dehghani et al., 2010; Atran & Ginges, 2012; Sheikh et al. 2012, 2013). Take the Israel-Palestine conflict, where rational cost-benefit analysis says the Palestinians ought to agree to forgo sovereignty over Jerusalem, or the claim of refugees to return to homes in Israel, in exchange for an autonomous state encompassing their other pre-1967 lands because they would gain more sovereignty and more land than they would renounce. They should support such an agreement even more if the U.S. and Europe sweetened the deal by giving every Palestinian family substantial, long-term economic assistance. Instead we find that the financial sweetener makes Palestinians more opposed to the deal, and more likely to support violence to oppose it, including suicide bombings. Israeli settlers also rejected a two-state solution that required Israel to give up "Judea and Samaria" or ''recognize the legitimacy of the right of Palestinian refugees to return" (in an agreement not actually requiring Israel to absorb the refugees). But they too were even more opposed if the deal included additional long-term financial aid, or a guarantee of living in peace and prosperity (Ginges et al., 2011).

In another series of studies we find that a relatively small but politically significant portion of the Iranian population believes that acquiring nuclear energy (but not necessarily nuclear weapons) has become a SV in the sense that proposed economic incentives and disincentives backfire by leading to increased and more emotionally entrenched support (Dehghani et al., 2010). Here, it appears that SVs can emerge for issues with relatively little historical background and significance when they become

bound up with conflicts over collective identity—the sense of "who we are." For a minority of Iranians (13% in these experiments) the issue had become a sacred subject through association with religious rhetoric and ritual (e.g., Iranian women marching and chanting in favor of "nuclear rights" while waving the Koran), This group, which tends to be close to the regime, now believes a nuclear program is bound up with the national identity and with Islam itself, so that offering material rewards or punishments to abandon the program only increases anger and support for it.

Sacred values do not make people opposed to any sort of compromise. Instead they appear to invoke specific taboos protecting these values against material trade-offs. Offering people materially irrelevant symbolic gestures can work where material incentives do not. For example, Palestinian devoted actors were more willing to consider recognizing the right of Israel to exist if the Israelis simply offered an official apology for Palestinian suffering in the 1948 war. Similarly, Israeli settlers were less disapproving of compromising sacred land for peace if Hamas and the other major Palestinian groups symbolically recognized Israel (Ginges et al., 2007).

Our survey results were mirrored by our discussions with political leaders (Atran 2010; Atran & Axelrod, 2010). Mousa Abu Marzook (the deputy chairman of Hamas) said no when we proposed a trade-off for peace without granting a right of return. He became angry when we added in the idea of substantial American aid for rebuilding: "No, we do not sell ourselves for any amount.'" But when we mentioned a potential Israeli apology for 1948, he said: "Yes, an apology is important, as a beginning. It's not enough because our houses and land were taken away from us and something has to be done about that.'" His response suggested that progress on sacred values might open the way for negotiations on material issues, rather than the reverse. We got a similar reaction from Israeli leader Benjamin Netanyahu. We asked him whether he would seriously consider accepting a two-state solution following the 1967 borders if all major Palestinian factions, including Hamas, were to recognize the right of the Jewish people to an independent state in the region. He answered, "O.K., but the Palestinians would have to show that they sincerely mean it, change their anti-Semitic textbooks." Making these sorts of wholly intangible symbolic but sincere gestures, like recognition of a right to exist or an apology, simply does not compute in any utilitarian calculus. And yet the science suggests they may be the best way to cut through the knot.

More systematic understanding of what kinds of "symbolic" gestures involving SVs are likely effective in conflict prevention and resolution, including signatures of emotional sincerity, could provide novel possibilities for breakthroughs towards conflict. More recently, in a meeting of senior Iranians, Saudis, Israelis, Americans and British arranged by members of our team and Lord John Alderdice (Convenor, UK House of Lords) at Oxford on the nuclear issue in early September 2013, we informally monitored expressions of devotion to values, including emotional attachment, and suggested to open negotiations via a "symbolic" gesture evoking SVs rather than political positions. In response, we received a message that Iran's President Rouhani would publicly acknowledge the Holocaust in New York (which US and Israeli officials told us would be a positive development for negotiations).

3. **Devoted Actors are Fused Actors**
   (Scott Atran and Jeremy Ginges)

Thus far our research indicates that sacralizing parochial preferences, and prioritizing those sacred values, is a necessary factor in producing actors willing to sacrifice for a cause. Nevertheless, it is by no means usually sufficient. For example, many millions of people express sympathy with Qaeda or other forms of violent political expression that support political violence, but relatively few willingly use violence. From a 2001–2007 survey of thirty-five predominantly Muslim nations (with fifty thousand interviews randomly chosen to represent about 90 percent of the Muslim world), a Gallup study projected that 7 percent of the world's 1.3 billion Muslims thought that the 9/11 attacks were "completely justified." If one includes Muslims who considered the attacks "largely justified," their ranks almost double. Adding those who deemed the attacks "somewhat justified" boosts the number to 37 percent, which implies hundreds of millions of Muslims. (Polls also imply that 20 percent of the American public has a "great deal" of prejudice against Muslims, two-thirds has "some prejudice" against them, and 6 percent of Americans think that attacks in which civilians may be victims are "completely justified") (Esposito and Mogahed, 2008).

Of these many millions who express support for violence against the out-group, however, there are only thousands willing to actually commit violence. This also appears to be the case in the European Union, where fewer than 5,000 suspects have been imprisoned for jihadi activities out of a Muslim population of perhaps 20 million. In the United States, fewer than one thousand suspects have been arrested for having anything remotely to do with Al Qaeda ideology or support for terrorism after 9/11, with less than one hundred cases being considered serious out of an immigrant Muslim population of more than 2 million.

Numerous case studies show that people usually go on to extreme violence in small, action-oriented groups of friends and family, where the extent of ideological commitment to a cause may vary greatly among individual member of the group (Sageman, 2008; ARTIS, 2009). Young jihadis are powerfully bound to each other – they are often campmates, school buddies, soccer pals, and the like -- who become die-hard bands of brothers united in what they perceive to be a thrilling and heroic cause. In the book *Talking to the Enemy,* Atran (2010) describes how the "jihadi bug" developed in Hamburg among a group of Middle Eastern buddies who became the core of the 9/11 plot; how Qaeda's viral movement spread among self-styled "Afghan Alumni," Southeast Asian veterans of the Soviet-Afghan War, who bonded through friendship, marriage, and soccer to blow up tourist spots and hotels in Bali and Jakarta; how an internet tract, "Iraqi Jihad," culminated in the "organized anarchy" of the Madrid train bombers, whose core group consisted mostly of petty criminals originating from one small Moroccan neighborhood who had little religious education or organized direction; and how ten boys from the same "al-Jihad" soccer team came to be Palestinian martyrs, with parents unaware of what was going on.

There is more to group dynamics than just the weight and mass of people, their behavior, and ideas. There are also the structural relationships between group members that make the group more than the sum of its individual members. It's also the networking among members that distributes thoughts and tasks that no one part may completely control or even understand. Case studies of suicide terrorism and related forms of violent extremism suggest that: "people almost never kill and die [just] for the Cause, but for each other: for their group, whose cause makes their imagined family of genetic strangers—their brotherhood, fatherland, motherland, homeland" (Atran, 2010).

In line with these observations, a promising new theory holds that when people's collective identities become fused with their personal self-concept, they subsequently display increased willingness to engage in extreme pro-group behavior when the group is threatened (Swann, et al., 2012). Swann and colleagues have dubbed this powerful form of personal investment in the group "identity fusion," but it is possible that people may fuse not only with groups of people but also with particular issues and values.

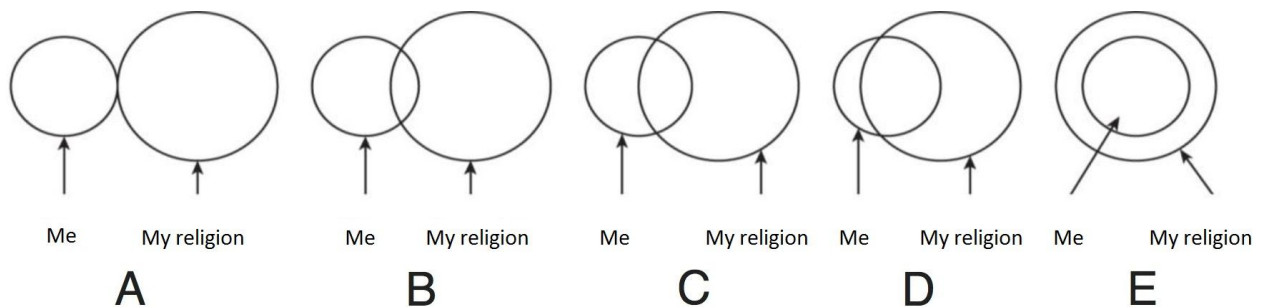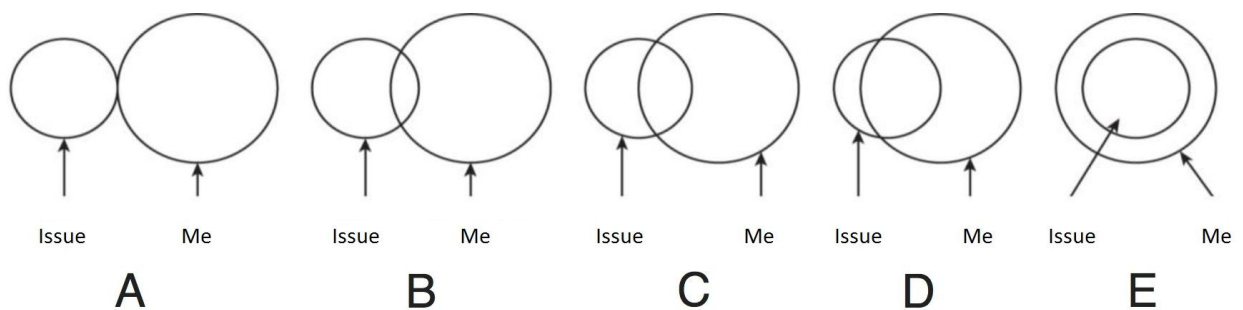**Figure 1A. Measuring Fusion with Group**

Figure 1B. Measuring Fusion with Issue/Value.

> **Responses show a dichotomous distribution: non-fused (A.B,C,D) vs. fully fused (E). This is replicated even when the measure is continuous (e.g., sliding a smaller circle into a larger circle on a smart phone).**

In an ongoing collaboration with fusion theorists, we find highly convergent measures of SVs: resistance to monetary payoffs, alternative benefits to society, and social pressure are strongly related to one another, and to fusion of a number of politically conservative

issues with "Who I am." We are currently running experiments among various groups in Spain (Catalan independentists, Pakistani and Mororccan immigrants) and Lebanon (Sunni, Shi'a, Maronites) to investigate causal relationships between SVs, fusion and devoted action.

Table 1 gives the conditional probabilities calculated from these measures applied across our study groups These interrelations tend to be maximized among individuals who are fully fused with their group.

Table 1. Conditional Probabilities of Commitments to Issues/Values
(predictors in rows and outcomes in columns)

	Fusion	Social Immunity	Immunity to SocietalBenefit	Trade-off Resistance to Money
Fusion	0% ☐ 100%	60% ☐ 95%	28% ☐ 74%	36% ☐ 80%
Social Immunity	26% ☐ 75%	0% ☐ 100%	7% ☐ 78%	8% ☐ 84%
Immunity to SocietalBenefit	37% ☐ 82%	59% ☐ 99%	0% ☐ 100%	11% ☐ 96%
Trade-off Money	39% ☐ 78%	48% ☐ 98%	12% ☐ 88%	0% ☐ 100%

For example, the second row of the third column shows that when people were immune to social influence there was a 78% chance they would refuse to relinquish their position for great societal benefits, as compared to just 7% chance when they were not immune to social influence.

Fusion theory is markedly different from various social identity theories in its privileging of group cohesion through social networking and emotional bonding of people and values rather than through processes of categorization and association, thus empowering individuals and their groups with sentiments of exceptional destiny and invincibility. In a recent set of cross-cultural experiments, Swann et al. (in press) found that when fused people perceive that group members share core characteristics, they are more likely to project familial ties common in smaller groups onto the extended group, and this enhances willingness to fight and die for the larger group.

What *is* surprising is that there exist psychological forces that are so potent that they override people's survival instinct... After Atran (2010), we suggest that these forces consist of the perception of familial ties to other members of the group. Such perceptions emerge when people who have developed a visceral sense of oneness with a group – dubbed "identity fusion" – feel that group members share core characteristics. The fusion process produces individuals who believe that their actions on the group's behalf are not for faceless strangers, but for "family." (Swann et al., in press)

4. **Neural Aspects of the Devoted Actor** (Scott Atran, Greg Berns, Jeremy Ginges)

In collaboration with Greg Berns and colleagues we recently investigated neural processing of SVs (Berns et al., 2012). Using functional magnetic resonance imaging (fMRI), we presented participants with a set of values, asked them to choose between them, and then offered them a chance to sell off their choice. In the first "passive phase" of the experiment, participants were presented, under the scanner, with 124 statements involving 62 issues that ranged from items dealing with religious issues (e.g. belief in God) and moral issues (e.g. harming an innocent person) to the mundane (e.g. a preference for Macs over PCs). In subsequent phases participants were asked to choose between two pairs of statements (e.g., "You believe in God/You do not believe in God"), and were then asked if they would be willing to sell off their belief. For example, participants who did not believe in God (or who were "Mac people") were asked to nominate a dollar amount to sign a report disavowing their preference. Participants were given the option of opting out—refusing to nominate a monetary amount, which was taken as one indication of a SV. Out of the scanner, people were given the option of auctioning off their belief for any amount of money between $1 and $100. The higher the amount of money, the less chance they had of winning the money. Again, a decision not to participate was taken as an indication of a claim to a SV.

We were interested in distinguishing between two interpretations of SVs. One interpretation of refusals to sell off SVs is simply that people have not been offered enough money to do so. If a refusal to sell off a value was indicative of greater utility of that value, then passive processing of that value should be associated with greater activation in brain regions associated with processing utility, such as the ventromedial prefrontal cortex (VMPFC), striatum/nucleus accumbens, and parietal cortex. We found instead that SVs were associated with increased activity in the left temporoparietal junction (TPJ) and ventrolateral prefrontal cortex (VLPFC), regions associated with semantic rule retrieval. This suggests that SVs affect behavior through the retrieval and processing of deontic rules and not through a utilitarian evaluation of costs and benefits. Moreover, the statements that resulted in more amygdala activation represent the most repugnant items to the individual, which is consistent with the idea that when SVs are violated they induce moral outrage (Tetlock, Kristel, Elson, Green, & Lerner, 2000).

In a follow-up study, Berns et al. (2013) introduced a social influence manipulation at the stage of the study when people are asked to choose which statement they identified with (e.g. "I believe in God"). People could see the percentage of fellow participants who agreed with them (i.e., subjects see a "thermometer" consisting of a column of 5 circles, where each half-filled circle represents 10 % social support from the subject's reference population). It turned out that social influenceability (i.e., willingness to change positions on an issue to reflect majority opinion) on a given issue was negatively correlated with activation of the VLPFC and the amygdala—the same brain regions activated for SVs in Berns et al (2012).

Our theory of the devoted actor, as someone who treats preference as sacred, and whose identity changes to become fused with values and relevant groups, finds support in a

recent cross-cultural neuroimaging study. Here narratives invoking SVs are processed differently from narratives that do not evoke the sacred (Gimbel et al., 2013). The core finding is that sacred narratives are associated with increased activation in the posterior medial cortices (PMC), medial prefrontal cortex (MPFC), and temporoparietal junction (TPJ). PMC, TPJ, and MPFC may be involved in integrating emotion, cognition, and memory into complex models of the self in relation to the community and the world at large. The PMC is also recruited during the experience of complex social emotions such admiration and compassion, which require a complex conceptualization of the social and moral consequences of actions (Immordino Yang, McColl, Damasio & Damasio, 2009). This brain region is unique in its wide ranging connections to the rest of the brain, putting it in a special position to coordinate the integration of information from various distal brain regions involved in emotion, memory, and perception in order to construct complex abstract meaning structures, such as those that are central to identity and culturally derived values.

In November 2013, we began a collaboration with the Brain and Creativity Institute at USC (Director, Antonio Damasio) to jointly pursue this line of research.

5. **Conclusion**.

A common approach of political scientists, economists, and policymakers assumes that individual and collective decision making is motivated by a desire to maximize pleasure and minimize pain, preferably in the here and now. This approach has the benefit of elegance; it is attractive to scientists and policy makers alike because it suggests consistent modes of decision making, and thus of dispute resolution, across cultures and contexts. Yet many critical choices in life, such committing to a cause, nation or God, involve sacrifice of individual rewards for a greater good that may not be immediately attainable, or even reasonable or ever likely. Arguably, this feature of human nature facilitated creation of complex cultures and political structures that require sublimation of individual and genetic interests to a greater group and cause under the evolutionary imperative "cooperate to compete" (Atran & Henrich, 2012).

Unlike other creatures, humans form the groups to which they belong in abstract terms. Often they make their greatest exertions and sacrifices not just in order to preserve their own lives or kin and kith, but for the sake of an idea—the conception they have formed of themselves, of "who we are" (Hobbes, 1651/1901). Thus, for Darwin (1871), moral virtue was most clearly associated not with intuitions, beliefs and behaviors about fairness and reciprocity, but with a propensity to what we nowadays call "parochial altruism" (Choi & Bowles, 2007; Ginges & Atran, 2009): especially extreme self-sacrifice in war and other intense forms of human conflict, where likely prospects for individual and even group survival had very low initial probability. Heroism, martyrdom, and other forms of self-sacrifice for the group appear to go beyond the mutualistic, Golden Rule principles of fairness, reciprocity, and related conceptions of cooperation and universal justice (Rawls, 1971).

Our current research hypothesis, in line with Darwin, is that sacred values (SVs) confer a decisive advantage for those who hold them; that once values are sacralized and associated with conditions of intergroup conflict, people will adhere to them regardless of social pressures, considerations of time, or the benefits associated with other important values and alternative courses of action and exit. When SVs become embedded in fused groups under conditions of perceived threat, then "Devoted Actors" emerge from those groups to defend or advance those values through extreme actions that lead to intractable conflicts.

Although actions in accordance with SVs appear to defy the logic of *realpolitik* and 'business-like' negotiation, SVs may also provide surprising opportunities for symbolic breakthroughs, including sincere displays of recognition and respect, which may open the way to material compromise. Understanding how and why we get these effects, and learning how to leverage them against enduring or spiraling conflict to promote peaceful outcomes, should be a priority for social science research and for policymaking.

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6. **Culture and Sacred Values in perception formation during negotiations**

Michael Lewis (U. of Pittsburgh), Katia Sycara (CMU), Zhaleh Semnani-Azad (U of Waterloo), Alin Coman (Princeton)

Sacred values are fundamental beliefs that reflect moral norms, and national culture. In this study we investigate how sacred values interact to influence perceptions in cross-cultural negotiation. Perceptions formed toward a negotiator can subsequently affect decision-making, cooperative behavior, outcomes and reputations. 124 Caucasian-American and 121 South Asian-Indian observers viewed an intercultural negotiation with a negative, distributive outcome. The participants rated their perception of a culturally in-group (same culture) versus culturally out-group (different culture) negotiator. Prior to viewing the negotiation, we manipulated observer and negotiator congruency of sacred values with regards to deontological (moral) versus instrumental (material) values. The results illustrate a "black sheep effect", where observers perceived the cultural in-group negotiator negatively, only when they shared similar sacred values but not when those values were different. In contrast, sacred value congruence did not matter when observers rated the cultural out-group negotiator. Instead, observers' perceptions were heavily influenced by the negotiator's sacred values.

7. **Perception formation in intercultural negotiations**

Michael Lewis (U. of Pittsburgh), Katia Sycara (CMU), Zhaleh Semnani (U of Waterloo)

We investigate levels of in-group bias in North American-Middle Eastern international negotiations from an observer perspective, and how these initial stereotypes and biases form perceptions in intercultural negotiations. We measure in-group bias through initial perceptions (stereotypes) of in-group and out-group observer participants when viewing an intercultural negotiation involving in-group and out-group negotiators. We also

examine shifts in in-group bias as a function of negotiation stage and negotiation outcome. 120 North American (Canadian and American Caucasians) and 80 Middle Eastern observers (born and raised in a Middle Eastern country, resided in North America for less than 10 years) viewed a videotaped negotiation between North American and Middle Eastern businessmen, with two distinct stages (competitive and cooperative) and one of three negotiation outcomes (impasse, compromise, or integrative). Before, during, and after viewing the videos, participants rated both negotiators on positive and negative attributes, allowing us to measure in-group favoritism and out-group denigration as two distinct aspects of in-group bias. Results indicate strong patterns of in-group bias measured with positive attributes (e.g. trustworthiness) and negative attributes (e.g. competitiveness) regardless of negotiation stage and outcome. Overall, positive perception of in-group and negative perception of out-group increased over time during the different stages of negotiation, regardless of whether the negotiation stage involved cooperative or competitive behaviors. Interestingly, negotiation outcome significantly impacted positive and negative perceptions toward the out-group negotiator. When viewing the impasse outcome (distributive, competitive, no relational or economical gain), observers showed very high in-group bias by rating the out-group negotiator significantly lower on positive attributes and higher on negative attributes compared to the in-group negotiator. In contrast, cooperative outcomes (compromise and integrative) lowered in-bias, but this varied across culture. For North American observers, the compromise outcome (high rational, low economic gain) lowered in-group bias such that these negotiators were more likely to view the out-group negotiator in a positive light, compared to the other negotiation outcomes. For Middle Eastern observers, the integrative outcome (high relational and high economic gain), yielded a favorable impression of the out-group negotiator, compared to the other negotiation outcomes.

8 Cooperation across cultures

Michael Lewis (U. of Pittsburgh), Katia Sycara (CMU)

Helping behavior during intercultural interactions have been extensively studied. Prior research shows variation in helping behavior across culture due to cultural differences in values, perceptions, and motivations. Our study extends on past research by examining how culture and fusion with one's culture influences helping behavior when interacting with a cooperative versus non-cooperative counterpart. Sixty Canadians, fifty Chinese and forty Indian participants engaged in an intra-cultural dyadic interaction using a virtual decision making game, FireSim. FirSim is a computer simulation of two villages where various events (e.g. fires) can happen. The participants were put into a scenario where they had to protect their village and its assets from seasonal fires with the option of requesting help and/or providing help to a neighboring village (counterpart). The results illustrate that Canadians were less influenced by the situation, as their helping behavior was not significantly affected by partner's helping behavior, compared to Chinese and Indian individuals. Moreover, Canadians were less likely to request for help but overall received more help compared to individuals from collectivistic cultures.

8. Honor and Dignity Culture Negotiations

Katia Sycara (CMU), Michael Lewis (U of Pitt), Wendi Adair (U of Waterloo)

This research extends prior work on cross-cultural negotiation by applying a new theoretical lens, honor-dignity cultural framework, to compare and predict Middle Eastern and Western negotiation styles. We examine the implications of a negotiator's competitive aspirations on quality of communication, negotiation strategy, and outcomes using actor-partner interdependence model. Intracultural Iranian and Canadian dyads acted as storeowners in a negotiation simulation and negotiated about sharing a space at a market place. 100 Canadian Caucasian and 80 Iranian (born and raised in Iran, resided in Canada for less than 5 years) university students participated in our study. Quality of communication was examined through facial expression and vocal paralanguage associated with comfort and responsiveness, and self-report measure of insight. Prior to negotiation, participants were provided with pre-negotiation questionnaire to determine participants' goals, aspirations, reservations, and insights. The negotiation interaction was video-recorded (without participants' awareness, however participants were debriefed at the end of the study) and nonverbal behaviors (facial expression and vocal paralanguage) were observed and coded. Participants were also given a post negotiation questionnaire examining psychological scripts, negotiation strategies (e.g. level of competitiveness, information sharing, paying honor and respect) that participants employed. The findings show that Iranian negotiators behave in accordance with the honor cultural norm in competitive context, which is associated with developing and maintaining a reputation for toughness. Compared to Canadian negotiators, Iranian negotiators were more likely to set higher aspirations prior to negotiation, exhibit lower quality of communication and engage in distributive strategies during the interaction, and consequently have lower negotiation outcomes. This research contributes to the understanding of negotiation style in honor cultures and the downside of setting high aspirations among honor culture negotiators. We discuss implications for cross-cultural negotiation.

9. A study of three cultures in negotiations

Cathy Tinsley (Georgetown University), Zhaleh Semnani-Azad (U of Waterloo)

This comparative study of negotiation strategy and outcomes in the three cultures opens a new theoretical window into culture and negotiation research. Hypotheses were grounded in the differences and similarities among dignity, face, and honor cultures. Emic results emphasizing cultural differences showed that negotiators from Qatar and China – who respectively represent honor and face cultures – approached a multi-issue deal-making negotiation with more competitive aspirations and used more emotional tactics than negotiators from the United States, a dignity culture. Etic results showed that across cultures competitive aspirations mediated the relationship between culture and use of emotional tactics and that information sharing and insight mediated the relationship between culture and joint gains. The study provides new culture and negotiation theory, new culture and negotiation data, which demonstrate the utility of dignity, face, and honor culture theory as a framework for organizing our understanding of negotiation strategy and outcomes.

10. Studies of Social media across cultures
Katia Sycara (CMU), Geoff Gordon (CMU)

Cultures vary on the amount of emphasis they give on encouraging individuality or on promoting interdependence. A collectivist culture acknowledges the importance of relationships and presence of social factors in influencing a person's opinion. By contrast, in an individualist culture, self-worth is intrinsic and independence of actions and opinions is valued. We studied whether the social behavior of Twitter users reflects the characteristics of the culture they belong to. Twitter can be considered as emulating a human society. There are several social factors which play an important role in modeling the user behavior. A user might comment on a general topic trending globally, or might refer to a topic which is being extensively discussed in his local network. Some users prefer tweeting about a topic of their interest, irrespective of the global and local trends, while some are strongly influenced by a subset of their friends

We model the social influence factors as features in our task to predict the content in a user's tweet. We perform a fine-grained analysis by modeling each user network locally. We later apply our model to study the social influence in users of Egypt, India and US. Egypt and India are identified in the social sciences literature as collectivist cultures, with Egypt being more collectivist as compared to India. The US culture is strongly inclined towards individualism.

We study the cultural difference in social influence by analyzing the weights given by our model to the various factors to help in predicting the user behavior. From the technical standpoint, our work provides the following contributions.

--To the best of our knowledge, this is the first work to study the influence of friends in social media across cultures.

--We define and compute the notion of relatedness between the keywords. The relatedness value captures the degree of co-occurrence between the keywords; this helps in our prediction task.

--Most literature on social networks studies the network as a whole in order to understand large scale global behavior, while ignoring the local analysis of user behavior. By contrast, in our work we perform a fine-grained analysis of social influence on Twitter. We train a model for each user independently by modeling the social influences with respect to each particular user.

Our hypothesis was that users of individualistic cultures (e.g. the US) would not be influenced as much by their friends in their twitting behavior as users of collectivist cultures (e.g. Egypt and India). Our analysis shows that, contrary to our hypothesis, the US users give more importance to their friends than the Egypt users. The Egypt users do not deviate much from their latent topic of interest as compared to their US counterparts. Indian users give considerable importance to both their friends as well as latent interest. These differences were statistically significant.

We have multiple explanations of the results. First, the sample of data was rather small (1,500 users and their networks of friends) compared with the population of the countries under study. Second, our sample may have been skewed concentrating on the technology savvy users. Third, friends in social media are not necessarily the users' friends in the real life.

Our surprising results open new avenues of investigation on user behavior in social media across cultures. An interesting hypothesis that we plan to investigate is that social media is a culture of its own with potentially new cultural dimensions that need investigation.

11. Intercultural Topic Models on Twitter
Geoff Gordon (CMU) Katia Sycara (CMU)

We have designed two new methods for understanding the behavior of social network users of multiple cultures. These methods allow us to model various kinds of context — time, place, friend/follower relationships — in social networks. Therefore, they allow us to ask questions such as:

- what are the important topics of discussion?
- what are the important social groupings of users?
- which users are influential for these topics and groups?
- how do users influence their friends and followers
- how are the answers to all of the above questions affected by the cultural background of the users?

Our new methods are particularly useful for networks with short posts, such as Twitter: with longer documents, we can rely more on the content of each document to determine its meaning and relationship to other users and documents, but with shorter documents we must rely more on context.

The two methods both fit within the family of latent topic modeling algorithms. Each one adds new capabilities to this family; these capabilities allow for more expressive models, and therefore for more nuanced conclusions. In addition, these new methods reduce *model mismatch:* the difference between the computationally-tractable class of models that we fit and the true unknown model that describes the world. Model mismatch can badly skew the conclusions of any modeling study, and so reductions in model mismatch are important steps in increasing our confidence in the conclusions we draw.

The first method is called "topics over time," and it adds a model of how discussion topics change over time. Temporal context is important to model, since discussion topics can change rapidly, e.g., in response to external events. Without a temporal model, we could accidentally assign a document to a nonsensical topic: e.g., to a topic about Tahrir Square even though it was posted weeks or months prior to the actual event.

The second method is called "network-aware topic modeling," and it adds a model of the

network of relationships among users and documents — or in fact any arbitrary other entities that we want to include, such as news stories, images, web pages, or physical locations. In doing so, it lets us add even more context: for example, it could resolve an ambiguity about the topic of a post based on the fact that the user was in a particular physical location when posting.

In both of these new methods, our contribution is twofold: in addition to defining a statistical model which lets us take into account more information, we needed to design new algorithms that allow us to work with these models using feasible amounts of computational resources. In the case of topics over time, the new algorithm is a Gibbs sampler based on two interlocking hierarchical Dirichlet processes; in the case of network-aware topic modeling, the new algorithm is based on stochastic EM and accelerated proximal gradient methods.

As an example of the power of the new models, we were able to accurately assess the preferred topics of discussion of Twitter users, and how these change over time, in a dataset of about 10k tweets from Egypt during Jan-Mar 2011. Typical topic models do not surface users' preferred topics, but doing so lets us fit this data better (produces a reduction in held-out perplexity). As a result, we can for example ask questions about the group of users who frequently conduct Arabic-language discussion of the Egyptian constitutional referendum.

Figure 1: a topic for Arabic-language discussion of the Egyptian constitutional referendum. It is topic 15 in Figure 3.

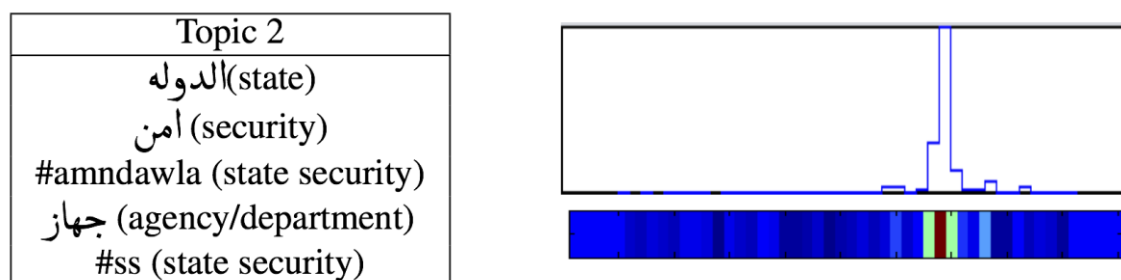| Topic 2 |
| :---: |
| الدوله (state) |
| أمن (security) |
| #amndawla (state security) |
| جهاز (agency/department) |
| #ss (state security) |

Figure 2: a topic for attacks on state security buildings in February. It is topic 2 in figure 3. Left: common words for the topic. Right: the times when the topic is being discussed.
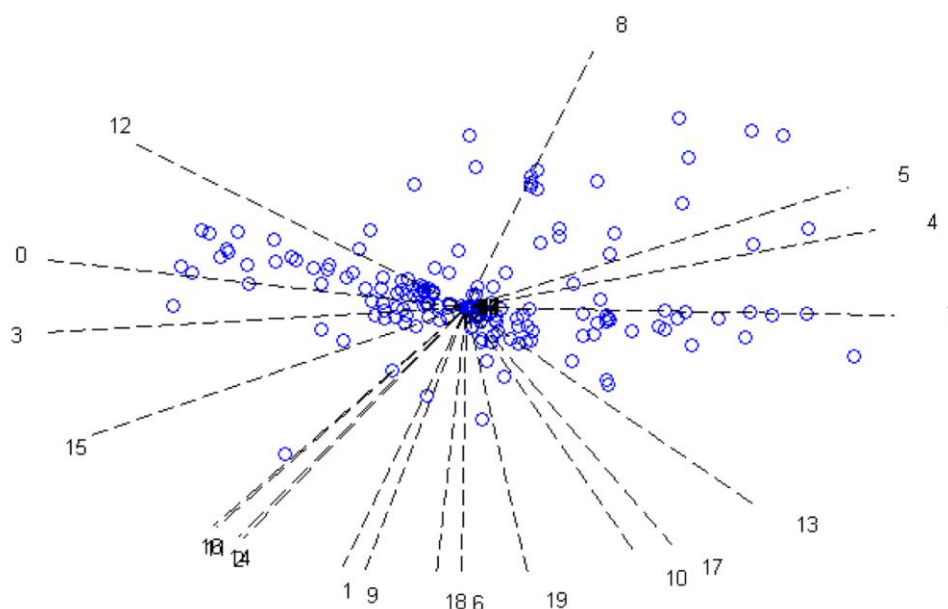
Figure 3: a scatter plot of the assignment of users to topics. We have projected the high-dimensional assignments onto two principal axes for visualization. The figure shows, for example, communities of users based on language (English vs. Arabic vs. Franko-Arabic) and discussion topic (e.g., the two topics above.)

12. Schemas that include cultural factors in the cultures of interest.

Catherine Tinsley (Georgetown University), Robin Dillon-Merrill (Georgetown University)

Data collection in: U.S., Turkey, Egypt, Qatar, Bahrain, Oman, UAE, Syria, Lebanon, Palestine, KSA, Yemen, Egypt & Qatar/

We designed survey to measure *appropriateness* of general negotiation / dispute/ conflict resolution goals and strategies. That is, not what people do descriptively but what people should and should not do normatively speaking. Further analyses of first 2 waves of data collection and write up of results. We conducted a different set of analyses on the data to determine whether or not we could tease out any significant interactions between the culture of the participant and the culture of the disputing parties.

To examine the question of whether it is the culture of the respondent, that of the disputing parties or a combination of both that predicts stereotyping, we conducted a mixed model Analysis of Variance (ANOVA) using culture of the respondent as the independent, between-subjects variable and the culture of the disputing party of as the independent within-subjects variable and the magnitude of the goal or the strategy being ascribed as the dependent variable. This analysis gives us the ability to observe changes in how much of a given strategy or goal participants ascribed to the disputing parties as a function of both their own culture and that of the target. Our preliminary findings indicate that people attribute more desirable strategies, such as compromising, more to their own culture and the less desirable strategies, such as threatening the other negotiator, more to the other culture. However, when evaluating neutral strategies, such as using past precedent to resolve the dispute, participants did not make such self-interested evaluations. Taken together, these initial findings point out that people evaluate observable negotiation behaviors from a lens that favors their own cultural group, such that they attribute positive behaviors more and negative behaviors less to members of their own group. On the other hand, neutral behaviors do not suffer from such biased evaluations.

We conducted an additional survey and performed analysis of the new data. We had 341 participants (180 from the United States, 161 from the Middle East). Our goal in this survey was twofold. One was to explore the extent to which participants viewed the negotiation goals and strategies as appropriate so that we could categorize them as positive or negative goals and strategies. Two was to examine whether these perceptions of appropriateness differed by culture of the respondent. In other words, we wanted to see if participants from the United States and the Middle East had similar views whether a certain goal or strategy was negative or positive. To do that, we compared the means on every goal and strategy against the scale neutral point, i.e. "neither inappropriate nor appropriate" as values above the midpoint represent a positive attitude and those below represent a negative attitude toward that particular goal and strategy. To examine potential cultural group differences, we conducted these tests separately for each respondent group.

13. Literature review and annotation scheme for cross-cultural argumentation and persuasion dialogues
David Traum (USC/ICT), Kallirroi Georgila (USC/ICT), Katia Sycara (CMU)

In both cooperative and non-cooperative negotiation the nature of arguments used can be crucial for the outcome of the negotiation. Argumentation and persuasion are basic elements of negotiation. Moreover, different cultures favor different types of arguments (Koch, 1983; Han and Shavitt, 1994; Zaharna, 1995; Brett and Gelfand, 2006). For

example, it is claimed that Western individualistic cultures favor arguments based on logic over arguments that appeal to emotions. On the other hand, people from Eastern collectivistic cultures are more likely to use arguments in which the beneficiary is not themselves. Furthermore, Arab cultures tend to favor more indirect ways of argumentation and expression (Koch, 1983; Zaharna, 1995).

In order to analyze negotiation in detail, including aspects such as persuasion, negotiation, and cross-cultural differences, we have developed a novel annotation scheme. This is because general purpose dialogue annotation schemes such as DAMSL (Core and Allen, 1997) and DIT++ (Bunt, 2006) represent moves in the dialogue but do not capture enough details of the interaction to distinguish between different styles of persuasion and argumentation, especially cross-cultural differences.

In order to develop this scheme, we first did a literature review on cross-cultural argumentation and persuasion (e.g. Koch, 1983; Han and Shavitt, 1994; Zaharna, 1995; Aaker and Williams, 1998; Peng and Nisbett, 1999; Brett and Gelfand, 2006; Nelson et al., 2006), on argumentation and dialogue (Prakken 2008; 2010), and on persuasion (Cialdini, 1998; Barrett et al., 2004; Petrova et al., 2007). We also examined existing argumentation schemas, i.e. structures or templates for forming arguments. Schemas are necessary for identifying arguments, finding missing premises, analyzing arguments, and evaluating arguments (Cohen, 1987; Dung, 1995; Pollock, 1995; Katzav and Reed, 2004; Walton et al., 2008). Furthermore, we looked into work on using machine learning techniques for automatically interpreting (George et al., 2007), generating (Zukerman, 2001), and detecting arguments (Mochales and Moens, 2009).

Our scheme is an adaptation of existing coding schemes on negotiation (Pruitt and Lewis, 1975; Carnevale et al., 1981; Sidner, 1994). The development of our scheme was done in collaboration with the CMU MURI partner (Katia Sycara), and our work was published in Georgila et al. (2011a). Our coding scheme has been refined through application to coding both two-party and multi-party negotiation dialogues for various domains (see Task 2). So far our coding scheme has been proven general enough to be applicable to new domains with few if any extensions.

Our goal for developing this coding scheme is two-fold. First, we aim to fill the gap in the literature of cross-cultural argumentation and persuasion. To the best of our knowledge this is the first coding scheme designed specifically for coding cross-cultural argumentation and persuasion strategies. Previous work on cross-cultural negotiation, e.g. Brett and Gelfand (2006), has not focused on argumentation or persuasion in particular. Also, previous work on argumentation, e.g. Prakken (2008; 2010), has not attempted to capture cross-cultural differences in argumentation and persuasion strategies. Second, we use this coding scheme in order to annotate negotiation dialogues to automatically learn argumentation and persuasion dialogue policies for different cultures, i.e. the policies of virtual humans that can argue and persuade similarly to the way a human of a specific culture would (see Task 3 below).

14. Annotation of negotiation dialogues based on the above coding scheme

David Traum (USC/ICT), Kallirroi Georgila (USC/ICT)

To facilitate annotations we developed an annotation tool specifically designed to work in conjunction with our annotation scheme. The tool allows the user to annotate an utterance with many codes or alternatively split an utterance into sub-parts and annotate each sub-part with one code. It also allows for merging of existing annotations as well as updating the available codes and organizing them in a tree structure. For example, the code "provide_argument" can have many branches, e.g. "effect", "cost", "precedent", etc., each branch corresponding to a different type of argument.

We have annotated the following data:

- 54 dialogues collected by Laurie R. Weingart, Jeanne M. Brett, and Mary C. Kern at Northwestern University. These were dialogues between American undergraduates playing the role of a florist and a grocer who share a retail space. The florist and the grocer negotiate on four issues: the design of the space, the temperature, the rent, and their advertising policy. The florist and the grocer have different goals, preferences, and use different types of arguments.
- 5 dialogues in SASO domain (Traum et al., 2008). These are role-play dialogues in English between a US Army captain and a Spanish doctor in Iraq. 3 English and 3 Arabic dialogues in the toy-naming domain where groups of four people negotiate about how to name a toy. The dialogues are part of the UTEP-ICT cross-cultural multiparty multimodal dialogue corpus (Herrera et al., 2010).
- 8 dialogues in the cartoon domain; deal-making negotiations collected by Wendi Adair and Jeanne Brett. This is a multicultural version of the Moms.com exercise (Tenbrunsel and Bazerman, 1995) about the sale of syndication (rerun) rights for 100 episodes of a children's cartoon. (Adair et al., 2001; Adair and Brett, 2005). These dialogues take place within the same culture (US-US, China-China, Israel-Israel, Japan-Japan, Russia-Russia, Sweden-Sweden, Thailand-Thailand) or across cultures (US-Japan). These dialogues are generally very long, on average there are approx. 80 speaker turns per dialogue and each turn may contain many utterances. More specifically, we have annotated 2 US-US, 3 China-China, and 3 Russia-Russia dialogues.
- 23 dialogues in the summer intern negotiation scenario, provided to us by the MURI partner Georgetown (Cathy Tinsley). In these negotiations, the director of personnel and the director of engineering have a dispute with regard to the hiring of summer interns. More specifically, we have annotated 10 dialogues between people from Hong-Kong and 13 dialogues between people from US.

An example annotated dialogue from the cartoon domain is shown below:

Speaker	Utterance	Code
Prod. Comp	And will it be okay if you buy at three… thirty… $30,000 per	repetition_self, proposal.standard

	episode?	
TV manager	**$30,000…**	**repeat_other**
Prod. Comp.	**Thirty… thirty.**	**repetition_self**
	…	
Prod. Comp.	**Um I think it's better to have 40.**	**provide_info.preference**
TV manager	**40.**	**repetition_other**
Prod. Comp.	**Yeah.**	**positive_feedback**
TV manager	**40%.**	**elaborate_self**

We also performed a statistical analysis of our annotations in the cartoon domain mentioned above. Our sample is small and more annotated data is required, however, our analysis suggests the following:

- There are large differences between all 3 cultures with regard to argumentation, general reaction, and proposal dialogue moves.
- There are large differences in elaboration/repetition moves between China and Russia, and China and US. On the other hand, Russia and US have similar frequencies of elaboration/repetition moves.
- There are large differences in request proposal moves between China and Russia, and US and Russia. On the other hand, China and US have similar frequencies of request proposal moves.
- There are small or no differences between all 3 cultures with regard to clarification/confirmation and information exchange dialogue moves.

We also collaborated with Sarit Kraus and her group (Bar-Ilan University and University of Maryland) with the goal of combining our annotation scheme with their annotation scheme. Our annotation scheme is more general, designed to capture cross-cultural differences, and domain-independent, focusing on the type of dialogue moves (e.g. proposals vs. elaborations). On the other hand, their annotation scheme focuses more on the semantic content of the utterances, which makes it more domain-specific. The idea is to combine the two schemes to get the best of both worlds.

15. Learning dialogue policies for cross-cultural argumentation and persuasion
David Traum (USC/ICT), Kallirroi Georgila (USC/ICT)

We have been investigating how we could use dialogues annotated with our coding scheme to automatically learn the policies of virtual humans, i.e. dialogue policies that dictate what kind of arguments and persuasion strategies a virtual human will use to accomplish its goal depending on the cultural behavior that we want to simulate. In order to learn these dialogue policies we used a machine learning technique called reinforcement learning (RL) (Sutton and Barto, 1998) in conjunction with simulated users (SUs), i.e. models that simulate the behavior of human users (Georgila et al., 2006; 2010). Our work was published in Georgila and Traum (2011b; 2011c).

Our two experiments (Georgila and Traum, 2011b; 2011c) use the florist-grocer annotated dialogues (see Task 2). The main limitation of the florist-grocer data is that it does not include negotiations between people from different cultures. To overcome this problem we have developed the following novel approach. First, we learn a general model of the user (simulated user). Then we tweak this model for a particular culture based on various parameters, e.g. individual gain, mutual gain, and fairness. For example, a SU of an Eastern collectivistic culture will generate arguments in favor of her interlocutor with a higher probability than a SU of a Western individualistic culture. After we have developed different types of SUs based on these parameters, we have these SUs interact with our virtual humans using RL in order to learn different virtual human dialogue policies. A virtual human that learns by interacting with a SU tweaked to care about individual gain, obviously will learn how to negotiate better against this type of conversational interlocutor. To ensure that our virtual human will also learn to simulate a particular culture we manipulate the reward functions used in RL. For example, a virtual human that cares about individual gain will always be rewarded for actions that lead to individual gain and penalized for actions that lead to individual loss or mutual gain.

In the first experiment (Georgila and Traum, 2011b) we learn policies for two cultural norms (individualists and altruists) whereas in the second more advanced experiment (Georgila and Traum, 2011c) we learn policies for three cultural norms (individualists, collectivists, and altruists). Furthermore, the second experiment is much more advanced and complex because the state space is far larger and the virtual agents have to choose between a much larger number of actions. More specifically, in the first experiment we have 864 possible states and 8 possible actions whereas in the second experiment we have 4374 states and 12 actions.

With this work our research contribution is four-fold: First, to our knowledge these are the first studies that use RL for learning argumentation policies and two of the few studies on using RL for negotiation; see also the work of Heeman (2009) and Georgila (2013). Second, for the first time in the literature, we learn policies for three different types of SUs representing three cultural norms (individualists, collectivists, and altruists). Third, unlike (Heeman, 2009) who built hand-crafted SUs for learning negotiation dialogue policies, our SUs are hybrid (partly learned, partly hand-crafted), which allows

for more fine-grained tuning. Fourth, our hybrid SUs allow us to learn policies for different cultural norms from a corpus that contains no such information.

16. A cultural decision-making model for negotiation
David Traum (USC/ICT) Kallirroi Georgila (USC/ICT) Elnaz Nouri (USC/ICT)

We have developed a novel Multi-Attribute Relational Value (MARV) model for decision-making in social tasks. This model used Hofstede's multi-dimensional model of culture (Hofstede, 2001) to determine the relative weights of different factors, such as the agent's own gain, the gain of another, the relative gain of the negotiators, and the lower bound of any participant (the aim of Rawls' theory of justice (Rawls, 1971)). We integrated MARV into the dialogue manager of a virtual human system, and developed protocols and dialogue capabilities to support virtual humans in playing a simple negotiation game, the Ultimatum Game. The Ultimatum Game involves two players bargaining over a certain amount of money (in our experiments, $100). One player, the proposer, proposes a division, and the second player, the responder, accepts or rejects it. If the responder accepts, each player earns the amount specified in the proposal, and if the responder rejects, each player earns zero. This classic experimental economics game has received a great deal of attention since the initial experiment by Güth et al. (1982). Results from these studies often deviate from the predictions of game theory (Henrich, 2000; Camerer, 2003). In fact there is considerable variation of offers and rejection rates across studies (Henrich, 2000; Buchan et al., 1999), and it has been reported that people from different cultures behave differently in this game. We performed evaluations between both a culturally oriented virtual human and a person and between two virtual humans (with different culture models). In order to evaluate the result of the experiments done so far and the performance of the model we referred to the extensive data available from the literature. Camerer (2003) provides a detailed description of the history and data of the different ultimatum bargaining games experiments. Our model's behavior falls into the range of behaviors presented in Camerer (2003). This work is described in detail in Nouri and Traum (2011) and Nouri et al. (to appear).

However, in that work the weights of the MARV model were set manually using the authors' intuitions about how to apply the literature, which involved a number of relatively arbitrary decisions. So our next step was to learn these weights automatically from data. To do that, we used a machine learning technique called Inverse Reinforcement Learning (IRL) (Abbeel & Ng, 2004). As mentioned above, Reinforcement Learning (RL) (Sutton and Barto, 1998) is a machine learning technique used to learn the policy of an agent, i.e. which actions the agent should perform in a particular context. For an RL-based agent the objective is to maximize the reward it gets during an interaction. The reward depends on the task. For example for the Ultimatum Game task the reward is the money that the agent has accumulated at the end of the game. RL can learn policies directly from data or in conjunction with simulated users (SUs), i.e. models that simulate the behavior of users (Georgila et al., 2006; 2010) (see also Task 3 above). Designing the reward function of an agent in a realistic negotiation scenario is not an easy task. IRL is a machine learning technique used for automatically learning the reward function of the agent from data or simulations. We defined the agent's reward as a

function of features (or alternatively contributing factors to the decision-making process), and we used IRL to learn the weights of these features.

As in Nouri and Traum (2011), we used the Ultimatum Game as a testbed for our model. We used data of the distributions of offers and acceptances and rejections for four different cultures (US, Japan, Israel, and former Yugoslavia) reported in (Roth et al., 1991). For each culture, we generated SU-proposers and SU-responders by using probability functions that match the reported data. In our setup the game lasts 5 rounds. For each culture we generated "expert" data by having the SU-proposer interact with the SU-responder for that culture. We then applied IRL to learn weights of different motivational factors for each of these cultures and roles (proposer and responder), by iteratively playing against the appropriate SU. We evaluated success of the learned policies by how closely they matched the expert data. We compared our learned policies with two baselines: RL models trained with either a random reward function or a reward function based on maximizing the wealth of the agent. We also compared the policies learned for a particular culture with the policies learned for the other cultures and the human expert data of the other cultures.

Our results show that weights of contributing factors to negotiation (e.g. agent's own gain, relative gain of negotiators, etc.) learned from IRL surpass both a weak baseline with random weights, and a strong baseline that only seeks to maximize the agent's own gain. Our model outperformed both baselines by generating behavior that was closer to the human players of the game in four different cultures. We also showed that the weights learned with our model for one culture outperform weights learned for other cultures when playing against opponents of the first culture. Furthermore, our results verify our hypothesis that decision-making in negotiation is a complex, culture-specific process that cannot be explained just by the notion of maximizing one's own utility. We showed that cultures vary in goals, not just in conventional circumstances but also that we can successfully use IRL techniques to learn culture-specific goals.

To our knowledge this is the first time that IRL is used in the Ultimatum Game or generally to learn patterns of behavior in negotiation. Our work could potentially spin-off new directions in cognitive science and social science towards uncovering the mechanisms of decision-making, i.e. directly from data using IRL without making any arbitrary assumptions about the importance of one contributing factor over another contributing factor to decision-making. This work is presented in detail in Nouri et al. (2012; to appear)

17. Prediction of game behavior based on culture factors
Elnaz Nouri (USC/ICT) David Traum (USC/ICT)

In this task our goal is to investigate cultural differences in values (e.g. how much people care about self-gain, joint-gain, etc.) and decision-making. To address this issue, we developed protocols and dialogue capabilities to support virtual humans in playing two well-studied economic games: the Ultimatum Game and the Dictator Game. Using Amazon Mechanical Turk (www.mturk.com) we recruited participants from two cultures:

US and India. Participants were told that they were playing against another person from their country (US or India). Participants had to provide answers to Hofstede's Values Survey Models questions, and also report values of possible factors that affected their decision-making, for example, how much their interest in self-gain or joint-gain influenced their decision.

Our results showed that in the two games most people tend to offer their opponent about 50% of the total amount to be split, and that the offers were higher in the Ultimatum Game than the Dictator Game. The offers in both games followed a normal distribution. Considering the simplicity of these one shot games we were not able to detect significant cultural differences in behavior between the US and Indian offers in the context of the Ultimatum Game and the Dictator Game. Significant cultural differences were observed in the answers to the Hofstede survey questions and the original Hofstede values. It is worth mentioning that the self-reported values demonstrated that participants had more than one valuation criterion when they were making their decisions. We used this data and machine learning (Support Vector Machines) to learn models that can predict the behavior in the games based on the culture or self-reported values of the players. These models were able to classify participants to the correct culture with higher than chance probability, based on the offers that they made.

This task is described in detail in Nouri and Traum (2013a).

18.A cross-cultural study of playing simple economic games online with humans and virtual humans
Elnaz Nouri (USC/ICT) David Traum (USC/ICT)

In this task we set out to answer the following question: Do humans behave the same way towards virtual humans as they would with other humans in economic domains? To address this question we used the data collected in Task 5 as well as a parallel study in which participants played against virtual humans.

We analyzed the interactions and our results showed that people from US and India both treated virtual humans similar to how they would have treated another human. The most prominent cause affecting the game behavior and the offer values was the type of the game being played. These results are consistent with reported results in the literature (Hoffman et al., 1996). Considering the simplicity of these games, it's not surprising that the effect of the culture or the opponent (human/virtual human) might not be captured in these two games. However, our results showed a strong correlation between culture and the opponent in the games with the values reported by participants; the valuation functions used by people from the two countries were different and the reasons should be further investigated. We conclude that virtual humans can be a reasonable substitute to humans in online economic interactions.

This task is described in detail in Nouri and Traum (2013b).

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MURI Publications (Last Two Years)

Monographs

Atran, S. *Intercultural Communication and the Development of Anti-Terrorist Attitudes*: *Negotiating Sacred Values and Reckoning the Limits of Rational Choice* Institute of National Strategic Studies, US Department of Defence 2012 (commissioned).

Journal Articles

Elnaz Nouri, Kallirroi Georgila, and David Traum. Culture-specific models of negotiation for virtual characters: multi-attribute decision-making based on culture-specific values. *AI & Society, Special Issue on Culturally Motivated Virtual Characters*. (to appear)

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Elnaz Nouri, Kallirroi Georgila, and David Traum. Culture-specific models of negotiation for virtual characters: multi-attribute decision-making based on culture-specific values*.* AI & Society, Special Issue on Culturally Motivated Virtual Characters (In press)*.*

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Aslani, S., Ramirez, J., Semnani-Azad, Z., Brett, J., & Tinsley, C. Honor, Face, and Dignity Cultures: Implications for Conflict Management. *Handbook of Research in Negotiation*, Edward Elgar, 2013. DOI 9781781005903

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Semnani-Azad, Z., Coman, A., Sycara, K., Lewis M. Perception Formation in Global Negotiations: The Role of Culture and Sacred Value, HICSS-2014, Big Island, Hawaii, January 5-9, 2014

Turan N., Tinsley, C.H., & Weingart, L.W. . Motivated Attributions of Cross-Cultural Dispute Resolution. International Association for Conflict Management Conference**.** 2014.

Zheng, R., Chakraborty, N. Dai, T. Sycara, K., Automated Bi-lateral Multi-issue Negotiation with No Information about the Opponent, Hawaii International Conference on System Sciences (HICSS), Jan 7-10, 2013, **Nominated for Best Paper Award.**

Li, D., Xu, Z., Luo, Y., Li, S., Gupta A., Sycara, K., Luo S., Hu L., Chen, H. Modeling Information Diffusion over Social Networks for Temporal Dynamic Prediction, ACM

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Gupta, A., Sycara, K., Gordon G., Hefny, A. Exploring Friends' Influence in Cultures in Twitter, The 2013 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining, Niagara Falls, ON. August 25-28, 2013.

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Aslani, S., Ramirez, J., Adair, W.L., Brett, J.M., Semnani-Azad, Z., Tinsley, C., Weingart, L., Yao, J., & Zhang, Z. (2013). *Honor, face, and dignity cultures: A tri-cultural study of negotiations.* Annual Meeting of the International Association of Conflict Management Conference, Tacoma, WA, USA.

Semnani-Azad, Z., Adair, W.L., Sycara, K., & Lewis, M. (2012). *Being Tough Doesn't Always Pay Off: The Culture of Honour vs. Dignity in Negotiation.* International Association of Conflict Management Conference, Cape Town, South Africa.

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Semnani-Azad, Z., & Adair, W.L. (2012). *Reputations in Intercultural Negotiations*. Annual Meeting of the Center for Behavioral Decision Research, Waterloo, ON, Canada.

Semnani-Azad, Z., & Adair, W.L. (2012). *In-group Bias in North American-Middle Eastern Negotiations: An Observer Perspective*. The Academy of Management, Boston, Massachusetts, USA.

Semnani-Azad, Z., & Adair, W.L. (2012). *In-group Bias in North American-Middle Eastern Negotiations*. Poster presented at the Society for Personality and Social Psychology Group Processes and Intergroup Relations (GPIR) Preconference, San Diego, California, USA.

Semnani-Azad, Z., Sycara, K., Adair, W.L., & Lewis, M. (2012). *Stereotype and Perception Change in Intercultural Negotiation*. The Hawaii International Conference on System Sciences (HICSS-45), Maui, Hawaii, USA.

Sánchez-Anguix, V., Dai, T., Semnani-Azad, Z., Sycara, K, & Botti, V. (2012). Modeling power distance and individualism/collectivism in negotiation team dynamics. The 45 Hawaii International Conference on System Sciences (HICSS-45), Maui, Hawaii, USA.

Semnani-Azad, Z., Langstaff, J., Adair, W.L., Sycara, K., & Lewis, M. (2012). *Cultural Variation in Patterns of Helping Behaviour and Cooperation: The Role of Cultural Fusion*. International Association of Conflict Management Conference, Cape Town, South Africa.

Semnani-Azad, Z., Langstaff, J., Adair, W.L., & Xie, Y. (2012). *Patterns of Helping Behaviour Across Culture: The Case of Cultural Fusion*. Annual Meeting of the Southern Ontario Behavioural Decision Research Conference, Waterloo, ON, Canada.

Semnani-Azad, Z., Sycara, K., & Lewis, M. (2012). *Dynamics of helping behaviour across culture*. International Conference on Collaboration Technologies and Systems (CTS), Denver, Colorado, USA.

Elnaz Nouri, Kallirroi Georgila, and David Traum. A cultural decision-making model for negotiation based on inverse reinforcement learning. In Proceedings of the 34th Annual Meeting of the Cognitive Science Society (CogSci), pp. 2097-2102, Sapporo, Japan, August 1-4, 2012.

David Traum. A cultural decision-making model for negotiation based on inverse reinforcement learning. Poster presentation at the 34th Annual Meeting of the Cognitive Science Society (CogSci), Sapporo, Japan, August 2, 2012.

Presentations and Keynotes

Sheikh, H., & Ginges, J. (2014, February). *Sacred Values in the Israeli-Palestinian Conflict.* Presented at the 14th Annual Meeting of the Society for Personality and Social Psychology, Austin, TX.

Atran, S. (2013, February). Religious Violence and Reconciliation, Inaugural lecture, Abelson Reconciliation Lecture, University of Science and Arts of Oklahoma.

Atran, S. (2013, April). Issues in the Neurobiology of Sacred Values. Department of Economics, Emory University, Atlanta.

Atran, S. (2013, September) *The Thinking Behind Nuclear Proliferation in the Middle East; the Role of Sacred Values*. Harris Manchester College, Oxford University.

Atran, S. (2013, September) *Where Do Terrorists Come From?* Presented to *Pax et Bellum*, Uppsala University, Stockholm.

Atran, S. (2013, October). *The Devoted Actor: A Framework for Understanding Intractable Conflict and Existential Decision Making*, Central European University, Budapest.

Atran, S. (2013, November). *Behavioral and Neurobiological Inquiry into Sacred Values and Devoted Actors: Possibilities for Collaborative Research*. Brain and Creativity Institute, University of Southern California, Los Angeles, CA, November.

Sheikh, H., & Ginges, J. (2013, January). Religious Ritual, Group Threat, and the Emergence of Sacred Values. Presented at the 13th Annual Meeting of the Society for Personality and Social Psychology, New Orleans, LA.

Ginges, J. & Sheikh, H. (2012, October). Sacred Values and Intergroup Violence. Presented at the Meeting of the Society of Experimental Social Psychology, Austin, TX.

Atran, S. (2012, July). Religion and the Sacred. William J. Lonner Distinguished Lecture. 21st International Conference International Association for Cross-Cultural Psychology, Stellenbosch, South Africa.

Atran, S. (2012, October). Male martyrdom networks. Foundation for Male Studies, New York.

Atran, S. (2012, November). Managing values and responsibilities. "Neuroethics: from Lab to Law. A Scientific Scrutiny of Sociability, Responsibility and Criminality." International Center for Scientific Debate. Barcelona.

Atran, S. (2012, December). The science of the sacred and seemingly intractable conflicts. Conference in honor of Dan Sperber. Paris.

Atran, S. (2012, June). Defusing Religious Conflict. Oxford University. Oxford, England.

Ginges, J., (2012, February). Humiliation and Sacred Values. Talk presented at a meeting on "Neuroscience and Social Conflict: Identifying New Approaches for the 21st Century", MIT, Cambridge, MA.

Ginges, J., (2012, June). Negotiating Sacred Values. Talk presented at a meeting on "Culture, Identity and Change in the Middle East: Insights for Conflict and Negotiation", Harvard University, Cambridge, MA.

Elnaz Nouri and David Traum. A cross-cultural study of playing simple economic games online with humans and virtual humans. Talk presented at the HCII conference, Las Vegas, Nevada, USA, July 25, 2013.

Papers in non-peer reviewed journals on Sacred Values and Extremism

- *Nature* ("Social Evolution: The Ritual Animal," by D. Jones, 23 January 2013); http://www.nature.com/news/social-evolution-the-ritual-animal-1.12256
- *El Pais Internacional* ("Las consecuencias alarmantes del modern terrorismo solitario," by Juan Arias, 29 April 2013); http://internacional.elpais.com/internacional/2013/04/29/actualidad/1367253222_828344.html
- *El Pais Semanal* (El terrorista mas oscuro," by Luis Ariza, 22 May 2013); http://blogs.elpais.com/planeta-prohibido/2013/05/el-terrorista-m%C3%A1s-oscuro.html
- *Scientific American* ("The Five Myths of Terrorism," by M. Shermer, 19 July 2013) http://www.scientificamerican.com/article.cfm?id=five-myths-of-terrorism-including-that-it-works

- *The Guardian* (Ander Breivik is a terrorist, so we should treat him like one," J. Freedland 20 April 2012); http://www.guardian.co.uk/commentisfree/2012/apr/20/breivik-terrorist-like-al-qaida
- *ABC News* ("Religion deserves more study by scientists, say researchers," Lee Dye, 17 May 2012); http://abcnews.go.com/Technology/science-religion-researchers-god-neglected-laboratory/story?id=16364587#.T8UTsZlYtAB
- ORTF.at (Austria, "Katalysator des Guten und Schlechten," R. Czepel, 18 May 2012); http://science.orf.at/stories/1698711/
- *Daily Mail* ("The good and bad of religion: How faith is a potent force for BOTH co-operation and conflict," E. Wrenn, 18 May 2012);

http://www.dailymail.co.uk/sciencetech/article-2146347/The-good-bad-religion-How-faith-potent-force-BOTH-operation-conflict.html#ixzz1wHhMi7ag
- *Le Scienze* (edizione italiana di *Scientific Americain*, Guerre di religion," D. Ovadia, 23 may 2012); http://ovadia-lescienze.blogautore.espresso.repubblica.it/2012/05/23/guerre-di-religione/
- *Big Think* ("What your brain looks like when you're selling out," D. Berreby, 25 May 2012); http://bigthink.com/ideas/what-your-brain-looks-like-when-youre-selling-out
- *The Daily Beast* ("Studying the sacred," by M. Simon, 12 Aug 2012); http://andrewsullivan.thedailybeast.com/2012/08/studying-the-sacred.html
- *The Chronicle of Higher Education* ("Dusting off God," by T. Bartlett, 13 Aug 2012); http://chronicle.com/article/Does-Religion-Really-Poison/133457/

Press Articles Related to the MURI

- *Psychology Today* ("Who Wants to Be a Terrorist and How Not to Help them," oped, 23 April 2013); http://www.psychologytoday.com/blog/in-gods-we-trust/201304/who-wants-be-terrorist
- *Dallas News* ("Scott Atran: Media played right into terrorists' hands," oped, 26 April 2013); http://www.dallasnews.com/opinion/sunday-commentary/20130426-scott-atran-media-played-right-in-to-terrorists-hands.ece
- - *Science and Religion Today* ("How Can a Better Understanding of Sacred Values Help Us Resolve Intergroup Conflicts?" oped, 22 May 2012); http://www.scienceandreligiontoday.com/2012/05/22/how-can-a-better-understanding-of-sacred-values-help-us-resolve-intergroup-conflicts/

- *New York Times* ("Probing the mentality behind a massacre," letter, 19 Dec. 2012); http://www.nytimes.com/2012/12/20/opinion/newtown-aftermath-probing-the-mentality-behind-a-massacre.html

Radio and Television Appearances

Fox News, "How Homegrown Terrorists become Radicalized," America Live with Megyn Kelly, April 22, 2013; http://www.foxnews.com/on-air/america-live/index.html#http://video.foxnews.com/v/2319146665001/how-homegrown-terrorists-become-radicalized/?playlist_id=87651
- New Point of Inquiry – Scott Atran: What Makes a Terrorist? (Podcast), Point of Inquiry with Chris Mooney, 22 April 2013; http://www.pointofinquiry.org/scott_atran_what_makes_a_terrorist/
- *Blogginhead TV*, Robert Wright and Scott Atran look back a hundred years and find a parallel to today's terrorist threat. Plus: How the media makes terrorism more likely, April, 24, 2013; *http://bloggingheads.tv/videos/17448*
- *MSNBC*, "What We Can Learn from Boston," with Steve Kornacki, April 26, 2013; http://video.msnbc.msn.com/up/51685511#51685511

- *Science (AAAS) LiveChat,* "Why We Fight," 16 May 2012;
  http://news.sciencemag.org/sciencenow/2012/05/live-chat-why-do-we-fight.html
  - *Public Radio International,* "Talking to the enemy: Scott Atran presents another way to think of terrorists," 28 May 2012;
  http://www.pri.org/stories/arts-entertainment/books/talking-to-the-enemy-scott-atran-on-understanding-terrorists-9997.html

Any issues/deviations from milestones etc

Six months no cost extension granted to further strengthen the interactions among the project tasks and complete analysis of collected data.

Personnel supported: names and role (eg PhD student, postdoc etc)

CUNY and New School
Tracey Nichole Argo (PhD student)
Hammad Sheikh (PhD student)
Sarah Bennett (PhD student)
Kate Jassin (PhD student)
Salar Rad (PhD student)
Oliger Abdyli – MA (CUNY)
Nadine Obeid – PhD (The New School)
Lydia Wilson (postdoc fellow)
Scott Atran (Professor)
Jeremy Ginges (Professor)
Andrea Fatica (Project Manager)
Robert Axelrod (consultant)

USC/ICT
David Traum (Project Leader, Research Scientist – Research Faculty)
Kallirroi Georgila (Research Scientist)
Ron Artstein (Research Scientist)
Angela Nazarian (Research Assistant)
Elnaz Nouri (PhD student)
Priti Aggarwal (Research Programmer)
Jillian Gerten (Project Specialist, similar to Research Assistant)
Alesia Egan (Special Project Manager, helps with administrative matters)
Lila Brooks (Project Manager)
Dusan Jan (PhD student)
Michael Rushforth (PhD Student/Research Assistant)
Steve Solomon (Research Programmer)

Georgetown:
Catherine Tinsley (Professor)
Robin Dillon (Professor)
Rebecca Heino (Professor)
Jimena Ramirez (post-doc)

Annelle Sheline (masters student)

CMU
Anika Gupta (MS student)
Ahmet Hefney (PhD student)
Tingong Dai (PhD student)
Ronghuo Zheng (PhD student)
Nilanjan Chakraborty (project scientist)
Katia Sycara (Professor)
Geoff Gordon (Associate Professor)
Baruch Fishhoff (Professor)

U of Pittsburgh
Steve Slota (PhD student)
Shi-Yi Chien (PhD student)
Michael Lewis (Porfessor)

Degrees and degree type granted
Tinglong Dai (CMU) was granted PhD in May 2013.. He is currently Assistant Professor at the Business School, Johns Hopkins University.

Anika Gupta (CMU) was granted MSc May 2013. She is currently a machine learning researcher at Google.

Nadine Obeid (The New School) was granted PhD in May 2013.

Hammad Sheikh (The New School) was granted PhD in May 2013. He will pursue postdoctoral studies at CUNY.

Transitions
N/A

Interactions

Periodic briefings provided to NSS, White House; Senate Armed Services Committee Staff upon request.

Atran, S. (2014, February 13-14). *Countering Violent Extremism.* Briefing to the U.S. Defense Science Board and U.S. Dept. of State Center for Strategic Counterterrorism Communications, on Countering Violent Extremism. **http://artisresearch.com/briefing-to-the-u-s-defense-science-board-by-scott-atran/**

Atran, S. (2013, February). Talking to the Enemy. Presented at ARMY Fort Belvoir.

Fischhoff, B., Briefing, LTG William Flynn, Director of Defense Intelligence Agency, Washington, DC, February 12, 2013.

Fischhoff, B., Briefing, RADM William Rogers, Director of Intelligence (J2) US Navy, April 16, 2013.

Fischhoff, B., Briefing, Chief of Naval Operation Rapid Innovation Cell (CIRC), Carnegie Mellon, May 22, 2013.

Fischhoff, B., Workshop for Chief of Naval Research and staff, Pentagon, June 13, 2013.

Atran, S. (2012, November). Managing MENA. Briefing to the NSS, White House, Washington, DC.

Atran, S. (2012, November). Round Table at the House of Lords on Water and Conflict in the Middle East. Convened by Lord John Alderdice (UK) and Crown Prince Hassan (Jordan).

Dod collaborations

Atran, S. – ARMY (counterterrorism course training) Fort Belvoir presentations and meetings February 18, 2013

Atran, S. – Collaboration with Air Force Culture and Language Center at Maxwell Air Base

Atran, S. (2011). Moral imperatives and democratic dynamics in the fight against AQAP in the context of the Arab Spring: Research policy and challenges. In. A. Chapman & J. Adelman (Fall 2011) *Influencing violent extremist organization pilot effort: Focus on Al Qaeda in the Arabian Peninsula (AQAP,* Strategic Multi-Layer Assessment Office (SMA), Dept. of Defense, Office of the Sec of Defense.

Fischhoff, B.: Co-chair, National Research Council Committee on Future Research Goals and Directions for Foundational Science in Cybersecurity (sponsored by SCORE)

Fischhoff, B.: Member, National Research Council Committee on Ethical and Societal Implications of Advances in Militarily Significant Technologies that are Rapidly Changing and Increasingly Globally Accessible (sponsored by DARPA)

Katia Sycara was selected as member of the Army-sponsored National Academies Study "From Data to Decision: Integrating Humans, Machines and Networks" (2012-2014)

David Traum collaborated at the West Point Negotiation project – MAJ Neil Hollenbeck and cadet AIAD David Grossman (summer 2013)

Courses developed/taught that include material from the research

Spring 2013- *Terrorism and Apocalyptic Violence* (Scott Atran, John Jay College of Criminal Justice, City University of New York)

Terrorism and Politics (Sarah Bennett, John Jay College of Criminal Justice, CUNY)

The Air Force Culture and Language Center at Maxwell Air Base has requested use of work by Atran et al. on sacred values (as applied to Afghanistan, Pakistan, Iran, etc.) in their General Officer Pre-Deployment Acculturation Course.

USC CSC 599 Natural Language Dialogue Systems, with topics on negotiation dialogue and different user populations.