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COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE/if not in response to a program announcement/solicitation enter NSF 14-1					FOR NSF USE ONLY	
NSF 14-548		06/24/14			NSF PROPOSAL NUMBER	
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TITLE OF PROPOSED PROJECT NRT-DESE: Flexibility in Language Processes and Technology: Human- and Global-Scale						
REQUESTED AMOUNT \$ 2,999,933	PROPOSED DURATION (1-60 MONTHS) 60 months		REQUESTED STARTING DATE 09/01/14		SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE	
THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW <input type="checkbox"/> BEGINNING INVESTIGATOR (GPG I.G.2) <input type="checkbox"/> DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C.1.e) <input type="checkbox"/> PROPRIETARY & PRIVILEGED INFORMATION (GPG I.D, II.C.1.d) <input type="checkbox"/> HISTORIC PLACES (GPG II.C.2.j) <input type="checkbox"/> VERTEBRATE ANIMALS (GPG II.D.6) IACUC App. Date _____ PHS Animal Welfare Assurance Number _____ <input checked="" type="checkbox"/> FUNDING MECHANISM Research - other than RAPID or EAGER						
<input checked="" type="checkbox"/> HUMAN SUBJECTS (GPG II.D.7) Human Subjects Assurance Number 00005856 Exemption Subsection _____ or IRB App. Date 10/11/13 <input type="checkbox"/> INTERNATIONAL ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.j) _____ <input checked="" type="checkbox"/> COLLABORATIVE STATUS Not a collaborative proposal						
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PROJECT SUMMARY

Overview:

There is widespread interest in training scientists to work effectively in interdisciplinary teams, allowing them to solve problems that are too complex for any individual. But achieving this is difficult, especially in academic settings where scientists are evaluated based on their individual research profile. This NRT program explores the hypothesis that successful team-based research depends on a series of enabling factors that might at first seem to be distractions from research, including public-facing science communication, and leadership in program organization and assessment. The training approach is explored through the lens of a research focus on flexible language expertise in humans and machines.

Intellectual Merit :

The world has been transformed by the Internet, by globalization of the markets for products, services, and employment, and by security threats from small groups that can emerge anywhere, anytime. In this setting there is an acute need for human and technological expertise that can be applied to any language of the world, at short notice. However, the current state of the art does not allow this. There have been enormous advances in language technology, and cellphones now routinely incorporate advanced automatic speech recognition technology. But these technologies remain inflexible: they struggle to adapt to variability in speech, and they do not readily transfer from the handful of 'high-resource' languages like English and Chinese to the 99% of languages that are 'low-resource' or 'zero resource'. We take 'data enabled science' to be about finding ways to make effective use of available data, not just about using large quantities of data. Our main research hypothesis is that improvements in learning in machines and in humans will come not simply from the availability of more training data, but from the ability to use training data more efficiently, at multiple scales. And we are guided by the fact that typically developing children are the parade case of flexible language learners: they can flexibly and successfully learn any language that they are immersed in, and they do so using less training data than the state-of-the-art technologies that they outperform. By understanding how children make such good use of 'medium data', we hope to better understand the language learning difficulties of individuals who are held back by impoverished language experience, due to socioeconomic status, disability, or simply due to starting too late in life.

The training program has four interconnected goals: for its students: (i) they should understand efficient use of language data, with a focus on the informativity of data to human and machine learners; (ii) they should adopt team-based approaches to complex research problems spanning multiple fields; (iii) they should become flexible communicators in writing and speaking; (iv) and they should be prepared to be future leaders in interdisciplinary research. These goals will be met through a suite of activities that includes intensive month-long summer research workshops, plus a program that engages students with Washington area organizations that connect science to policy.

The program will be both sustainable and scalable. Sustainability is built into the entire training approach. Aside from the students who will participate directly in the full program, plans are in place for transmission of the training innovations across career stages, across the University of Maryland, and across institutions.

Broader Impacts :

The interdisciplinary training model that is extended in this program can have national and international impacts, due to many steps that have been taken to ensure its scalability. The program will help to attract a more diverse population to science via its outreach activities, and it will contribute to public understanding of science via its policy program. Additionally, the research goals of the program are highly relevant to national priorities in multiple fields, including technology, commerce, education, health, and national security. The project will also contribute to the development of a free public digital tool, Langscape, that provides access to geographical and linguistic information about languages of the world.

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*Proposers may select any numbering mechanism for the proposal. The entire proposal however, must be paginated. Complete both columns only if the proposal is numbered consecutively.

4. Project Description

4a. Core Participants

Name	Position, expertise	Prior project role
Colin Phillips, PI	Professor & DST, Director, Maryland Language Science Center, <i>Psycholinguistics, Cognitive Neuroscience</i>	PI
Rochelle Newman, co-PI	Professor & Chair, Hearing & Speech Sciences <i>Infant Language, Psycholinguistics, Autism</i>	co-PI (added Y3)
Hal Daumé III, co-PI	Associate Professor, Computer Science/UMIACS; <i>Natural Language Processing, Machine Learning</i>	new since '07
Robert DeKeyser, co-PI	Professor, School of Languages, Literatures, and Cultures; <i>Second Language Acquisition</i>	
William Idsardi, co-PI	Professor & Chair, Linguistics, <i>Sound systems, Computational Psycholinguistics, Cognitive Neurosci.</i>	
Naomi Feldman	Assistant Professor, Linguistics/UMIACS, <i>Computational Psycholinguistics, Automatic Speech Recognition</i>	new since '07
Yi Ting Huang	Assistant Professor, Hearing & Speech Sciences, <i>Developmental Psycholinguistics,</i>	new since '07
Rebecca Silverman	Associate Professor, Special Education, Director, Maryland Language and Literacy Research Center	
Maria Polinsky	Professor Linguistics (currently Professor at Harvard U), <i>Syntax, Language Diversity, Heritage Languages</i>	new since '07
KerryAnn O'Meara	Associate Professor, Higher Education, co-PI, ADVANCE Program; <i>Evaluation/Assessment</i>	new

Department acronyms: LING: Linguistics; HESP: Hearing & Speech Sciences; CS: Computer Science; SLLC: School of Languages, Literatures, and Cultures; INST: College of Information Studies; COMM: Communication; ENGL: English; PHIL: Philosophy; PSYC: Psychology; NACS: Neuroscience & Cognitive Science; ECE: Electrical & Computer Engineering; EDUC: College of Education (3 departments); CASL: Center for Advanced Study of Language; NFLC: National Foreign Language Center; UMIACS: UM Institute for Advanced Computer Studies. The list above represents a subset of the ~50 faculty who we expect to participate, drawing on the close ties across the university-wide language science community, spanning 200 researchers (faculty, research scientists, PhD students) in 17 academic units in 6 colleges.

4b. Theme, Vision, and Goals

Research Problem: Our NRT project is a reaction to a remarkable mismatch. Our research focus -- flexible and efficient language learning, in humans and machines -- is nationally and globally critical. And this is well understood in some sectors of government, industry, and education. Yet public awareness of the problem is largely non-existent, it rarely appears on lists of grand challenges or STEM priorities, the skill-sets needed for breakthroughs are scarce, and congressional support is regularly under threat.

Why care? The biggest societal change of the past two decades is the internet and electronic communication, where progress depends on technology that works with human language. The biggest economic upheavals in recent years involve globalization of markets for products, services, and employees. The biggest security change, laid bare by repeated conflicts since 2001, involves the disruptive potential of threats from small groups, that can emerge at a moment's notice, using a language about which almost nothing is known (there are hundreds of such languages in Africa and South Asia). And some of the biggest recent changes in US education involve technology and the increasing diversity of students. Millions of Americans struggle to contribute effectively to society due to language barriers, caused by poverty, clinical conditions, or simply being adult learners. All these areas demand flexible expertise in human language, in adults, children, and machines; and communication between them.

But my phone talks to me, and Google Translate is awesome! No, first impressions are misleading. Current approaches remain inefficient and inflexible. For example, recent media reports highlighted Microsoft's plans to add speech translation capability to its popular *Skype* video-calling tool. Microsoft's CEO described the tool as 'magical', but a live demo of an English-German conversation (5/27/14: <http://tinyurl.com/kgmryy>) is as revealing as it is entertaining. The German speech is comically unnatural, errors abound in the translations, and slow turn taking is required. Microsoft commented that they could greatly improve the tool if *Skype* users would give the company access to even a small fraction of the 700

billion annual minutes of conversation, and that they want to extend the tool to more language pairs. The technology is already impressive, but the *Star Trek* universal translator is far off: speech recognizers struggle with variability and dialects [cf. 4d.iii below] even in well-described languages; simultaneous translation requires powerful predictive mechanisms to compensate for word-order differences between languages [cf. 4d.iv]; there are 7000 languages in the world -- even if we take just the top 1% of languages, that is 5000 language pairs -- and the Big Data strategies that current approaches rely upon are inefficient and expensive once we move beyond English and a handful of other languages.

Meanwhile, in the human arena, social, economic, and security needs call for flexible language learning abilities: in a rapidly changing world, individuals can no longer expect to build careers on expertise in a single language, we need a workforce that can adapt rapidly. Frustratingly, children have this ability, but adults do not. One of our team members recently spent a sabbatical with his family in the Basque region of Spain. After 9 months the 6-year-old daughter was happily conversing in 3 languages, but the father, a linguist and renowned expert on language acquisition, remained baffled. Children's special talent for language remains poorly understood, yet we need to make the most of that potential: by increasing K-12 language learning, by understanding what aspects of child abilities can transfer to adult learners, and by removing the barriers that prevent millions of children from using their special ability.

What is multi-scale data? An NRT webinar emphasized that “data-enabled science” is not equivalent to “Big Data” (4/29/14). We strongly agree. We take NRT's DESE theme to refer to making the best use of the data that you have, or that you can obtain, on whatever scale that might be. The Big Data approach to language technology relies on the fact that a lot of the things that people say are similar to things that have been said before. The term ‘similar’ is a cover for a large field of statistical inference, but if you are *Google*, and have already invested billions of dollars in indexing the web, and have vast amounts of text in English, Mandarin, or French, then the marginal cost of a Big Data approach is relatively low (in *Google* terms, at least), and one can do a lot. But data on that scale is simply not available for 99% of the world's languages. Reliably ‘tagged’ training data that is needed for more efficient supervised machine learning techniques is even more scarce, and *Google* style investments are unimaginable for most languages. Under currently dominant approaches, the effect of the internet has been the opposite of global democratization: the digitally rich have gotten richer, and the rest have gotten much poorer (‘Digital Language Death’: Kornai 2013). Almost all languages fall under the label of “low resource” or “zero resource” languages, meaning that at most a tiny fraction of the digital corpora and other materials are available as compared to what are available for English, and this is one of the most important growth areas in language technology. Working with “small data” requires far more efficient approaches that generalize across domains by constructing more abstract language models.

Meanwhile, a typical human child leaves the best language technologies in the dust, despite learning from “medium-sized data”, at best. It is clear that human learners do a lot more, with a lot less training data. Most importantly, they are robust to noise, and they are very good at generalizing across contexts and dialect differences. So it is important to understand how they learn so efficiently. At the same time, many millions of learners are held back by “language poverty”: children in lower-SES environments often are spoken to less, or hear less language input that is appropriate to their developmental level, and this leads to language learning delays that have cascading consequences throughout their education [cf. 4d.ii below, Durham et al. 2007]. Other learners, such as deaf children with cochlear implants (CIs) are held back because the speech input is severely degraded. So issues of the scale and the quality of the language input are just as important for human learners as for technology.

In both domains there is enormous potential for cross-fertilization. Computer scientists need to understand how human learners are so efficient. They also stand to gain much from experts in language diversity, who can help to develop technologies that learn more efficiently, and can collaborate on creating datasets that require human input rather than a web-crawler. Behavioral scientists can benefit enormously from working with computational experts, by helping them to build more explicit models of human learners, which in turn are crucial for understanding different outcomes across learner groups (children, adults, SES effects, etc.). But these connections occur very rarely indeed.

Training Goals: We have 4 interconnected training goals for the NRT program:

(i) Efficient use of language data: not just how to exploit massive datasets; with a focus on the ‘informativity’ of data. Different fields provide students with different pieces of this puzzle, so skill ‘upgrades’ will be tailored to individual student needs.

- (ii) Team-based approaches to complex problems spanning multiple fields. The signature activity will be intensive summer research workshops for students and faculty ("Summer Camp"), but many other training elements are needed as enablers for this kind of collaboration.
- (iii) Public-facing science: improving the science base through an extensive outreach program with high schools and other public groups, and through science policy partnerships that leverage the wealth of national organizations in the Washington DC area.
- (iv) Preparing future leaders in interdisciplinary research: students will take 'ownership' of program activities, increasing their engagement. Student training encompasses all sections of this proposal.

These goals are closely related to one another. For example, we have learned that outreach activities are not merely a noble add-on, they make us better communicators and better collaborators, so our outreach and policy programs are important contributors to our collaborative research goal. Similarly, the leadership training and policy initiatives are linked to the multi-scale data theme. Public support/understanding of language science is held back by disciplinary fractionation. Our public policy program will directly contribute to new partnerships among national professional organizations, and our research seeks to illustrate the scientific benefits of such connections.

Language is a great test case. Language is an easy-to-grasp theme for a training program, raising the concern that it may be insufficiently interdisciplinary. On the contrary, the challenges of integrating the different areas of language science are enormous, so much so that many regard it as pointless. The 17 academic units in 6 colleges that form our research community cut across diverse academic cultures, research and funding models, and student expectations. Our team's expertise ranges from special education to neuroscience to fieldwork in remote villages to language technology.

What is new here? Our group hosted an IGERT training program (starting in 2008, final cohort now entering 3rd year of PhD). The program was unusually successful relative to other similar programs, in terms of student participation, faculty buy-in, and concrete outcomes (cf. (4i) below). It led to genuine culture change in our community, and to institutionalization of the overall effort -- though not the funding. So what justifies further investment? Our NRT program builds in many ways on the lessons learned from IGERT, including much that we were unaware of 6 years ago. But NRT introduces a great deal that is new. This proposal represents our 3rd experiment in graduate education. The first experiment, started in the Linguistics Dept in 2002, replaced a standard disciplinary curriculum with a more flexible approach, and made breadth a goal from Day 1 rather than an afterthought. Together with continuous efforts to build cross-department connections, this provided the foundation for Experiment 2, our IGERT program *Biological and Computational Foundations of Language Diversity*. The IGERT focused on training individuals to be interdisciplinary and creating a broad intellectual community that would make the activities endure. This in turn provides the foundation for Experiment 3, the NRT program, which aims to (i) bring individual researchers together to solve problems that are too complex for any single researcher, (ii) provide the communication and data skills needed for collaboration across diverse types of research, (iii) equip students to understand large-scale problems and their connection to (inter)national needs. The multi-scale data theme, the team-focused activities, and the policy program are among the new features for NRT. And we contend that these would be impossible without the prior foundation.

Training needs, Employment market. The job market for MA and PhD graduates varies greatly across our participating fields. But the combined skills that our NRT focuses on are in high demand: the ability to combine research with humans and computational tools, to work across diverse scientific cultures, to link basic and applied science, together with multi-lingual expertise, and an understanding of precise learning models. In some participating fields the PhD employment market is bleak, but our graduates have been unusually successful, due to the talent that we attract and the skillset that we develop.

The demand for non-academic professionals lies mainly in 3 of our participating fields: clinical (MA speech pathologists), language education (e.g. MA/PhD in English as a Second Language), and computer science (PhDs in industry). Relative to other STEM fields, language science research is more concentrated in academia, with the exception of language technology. 80% of our 23 IGERT graduates are in academic positions, and only 1 is in industry. A growing area is government research, particularly in the Washington area, and our students have close ties to those employers. Our NRT plans respond to recent hiring practices, but also seek to shape future hiring practices, a realistic hope given our history. Our focus is on preparing PhD students for academic research in multiple fields, though some of our activities will be attractive to students pursuing professional MA degrees. But we seek to change the orientation of our PhDs, to make them more outward-looking, better able to partner with non-academic

professionals, and to sow the seeds for a broader research base in language science. Also, we know that there is a consistent premium for human-focused scientists with strong computational skills; and for computational experts who can integrate human-focused research. If our graduates are also articulate in speech and writing, and can work with multi-language phenomena, then their prospects are good.

Why Maryland? How is this scalable? A focus of our IGERT efforts was to spread our innovations beyond the select group of students who received NSF funding, so we are glad that “scalability” is among NSF’s priorities for NRT. Many factors make us uncommonly well positioned for success and scalability.

The scope of UMD’s expertise in language science is unique, but more importantly the broad support for interdisciplinary training and external engagement is essential for the level of commitment that the NRT program requires. The leadership from the Linguistics Department is a critical asset, as this makes it more feasible to foster a network that connects the many different participating fields. In fact, that network is largely in place already. Many linguistics departments are more inward-looking, and this has contributed to long-standing disconnects between fields, but UMD Linguistics has a strong history of collaboration across fields. Having recently risen to become one of the leading departments in its field, its efforts to overturn traditional training models attract visibility, and also create demand for its graduates.

The university’s setting as the main public university in the Washington DC area is also important for our objectives. The region hosts a wealth of resources for research, policy, and education -- the area has the largest concentration of national professional organizations, government agencies, and national labs, not to mention all foreign embassies and a melting pot of linguistic diversity, including a large sign language population, due to the presence of Gallaudet University, to which we have long-standing ties.

Our community has a record of successful innovation, and the network of cross-disciplinary collaborations has grown in recent years. This is fueled in part by a series of strong new hires in different departments, who have spawned new courses, new connections, and new ideas. We offered 12 interdisciplinary seminars in the past 5 years, and some of the research themes described in (4d) below emerged from the disciplinary collisions started there. This will be further enhanced by a series of senior appointments in interdisciplinary language science in the next 2 years (cf. Provost support letter); the first of these, Maria Polinsky, will move from Harvard to UMD in 2015, and is already a member of our team.

Many factors contribute to the scalability of our NRT program. First, we expect to enroll many more trainees in the program than those supported by NSF stipends. In our IGERT, twice as many students completed the full program as received NSF funding (cf. 4h, 4i). Second, our institution-wide connections make broad transmission across the university more feasible. Language Science is an institutional priority, and we have made plans with the Graduate School for dissemination of best practices (cf. Grad School support letter). Our evaluation lead, Prof KerryAnn O’Meara is a leading researcher on doctoral training and early faculty careers, and co-directs UMD’s NSF-ADVANCE Program for Inclusive Diversity, further connecting us to mechanisms for institutional change. Third, we have many specific plans to extend benefits across career stages, especially via our newly formed undergraduate interdisciplinary program (‘PULSAR’), our engagement with high-schoolers, and our mentoring of new faculty. Finally, our activities will be transmitted across institutions, via our students, who are hired specifically for their ability to build connections, via our publications and presentations about our results (Lidz & Kronrod 2014; Phillips et al. 2015), via our policy partners, who are the national professional organizations in their fields, and via our current efforts to build an international language science network via the Universitas21 consortium (cf. letter from VP for Research).

4c. Education and Training

What is needed, why it’s hard. We want scientists from different fields to work together in interdisciplinary teams to solve hard problems. Great -- that’s what everybody wants! So why isn’t everybody doing it, and what is distinctive about our approach that makes it sustainable and scalable?

In some IGERT programs participation barely extended beyond NSF-funded students, PIs struggled to get faculty buy-in, institutions lost interest after the funding ran out, and there was limited use of advisory and assessment mechanisms. Most start-ups are short-lived. So why did ours work better? We cannot rely on the top-down control found in industry or government, and our field is not one that can throw vast amounts of funding at the problem. Also, since we’re in fields where the path to scientific independence is relatively fast -- nobody gets 8 years of postdoc experience to fill out their professional profile -- students are expected to make their mark quickly, and have disincentives to teamwork.

Our primary hypothesis for our NRT ‘experiment’ is that successful team-based collaboration depends on an environment that cannot be created overnight, and that requires many enablers that may

at first seem to be distractions. We have not yet tested this hypothesis, but we believe that we have created the right environment ('Experiments 1 & 2'), and that we are now ready to put it to the test.

Environment. The keys for preparing successful interdisciplinary researchers are not what we expected when we launched our IGERT program in 2008. We certainly anticipated that students perceive it as risky to move into unfamiliar areas. (Will this delay my progress? Will I be able to understand this new area? Will my collaborators let me down, or think that I'm stupid? Will my advisor/home department think I'm wasting my time?) But we found that the best interdisciplinary researchers are not only those who are willing to take risks, but those who can communicate broadly, and who take ownership of their own training. A student-led 'coup' in 2010 led to students taking ownership of most important program activities, and organizing themselves into a series of leadership teams. This transformed our program: it increased students' commitment, it taught them to build community, it engaged them in active evaluation and improvement, and crucially it built networks of trust that provided a foundation for research collaborations. An ever-growing series of outreach activities highlighted the need for broad communication, which in turn fostered better communication among researchers. Engagement and risk-taking increased markedly as students moved from 'consumers' to 'contributors'. So, in addition to providing an environment that supports risk-taking, we must also prepare students to be life-long risk-takers and innovators, teach them how to manage the risks, engage them in the building of their own networks and communities, and train them to communicate their research to a broad audience and to see the connections among seemingly disparate fields. At the same time, it is essential that faculty share these values and that they feel that their students' broader engagement benefits their work also. Better yet, if the faculty participate in the same activities, this communicates their value to the students. And the faculty must trust their cross-disciplinary colleagues, value their research questions, and see the training program as part of a long-term effort. This environment is now in place. The best evidence for this is the institutionalization in 2013 of the grassroots language science network as the Maryland Language Science Center, which is an umbrella organization rather than a new building or institute; and the continuation of the IGERT as the *Language Science Fellows* program: 9 students from 5 departments joined the full program, submitting extensive applications, with no guarantee of funding.

Our IGERT showed us how to equip students to be successful individual interdisciplinary researchers. Students typically served as nodes connecting two research groups. As outlined in (4b), the NRT program builds upon this foundation in pursuit of more ambitious goals: (i) students (and faculty) should be prepared to tackle complex problems via working in larger teams; (ii) students should receive strong preparation in communicating to diverse audiences, and should be trained in connecting research to real-world applications and policy; (iii) students should develop leadership capacity, via ownership of program activities; (iv) students should learn to work with multiple-scale data: for some this involves working with big(ger) data; for others it involves the challenges of learning from small- or medium-scale data, or learning to acquire and curate human language data, rather than simply using what is handed to them.

Beyond the Curriculum 1: Signature Community Activities:

a. **"Summer Camp"** (new). These 4-week research-only workshops are the most ambitious feature of the NRT program. Successful models in Computer Science (Johns Hopkins, clsp.jhu.edu) and Biology (Woods Hole, Vale et al. 2012) have had powerful effects as incubators of new research areas, with effects that last for years. The goal of our experiment is to translate models from individual disciplines with fast methods into multi-discipline settings and more challenging methods (e.g., generating new corpora, or longitudinal studies). Each Summer Camp will focus on a single theme, and NRT trainees will commit to ONE workshop during their graduate career, with the timing determined by interests - we have been advised that such workshops benefit from enlisting students at multiple career stages. Participants will be teams of students and faculty from UMD, for whom the Summer Camp will be the culmination of an extended planning process, starting up to 18 months in advance. This allows the team to explore initial ideas via a semester-long seminar, then plan more specifics over the course of a semester or year (also taking advantage of Winter Storm, see below, and co-mentored research projects). The Summer Camp will allow students to work with faculty in a manner that is not possible in the hectic of the academic year. We will also invite established experts and promising students from outside UMD to participate, adding expertise to the teams and helping to spread the model. We have budgeted limited funding to support these participants; additional participants may come from partner institutions via our networks in the CIC/Big10 and Universitas21. Target size is one 15-person team or two 10-person teams per year. An ideal Summer Camp brings together experts from different fields to pursue well-defined problems

involving multi-scale language data. Examples are provided in (4d). A key feature of Summer Camp planning involves taking account of disciplinary time-frames: modelers might aim to complete a working prototype within a month; but human researchers whose studies require months of data collection will use the collaborative time differently.

b. **“Winter Storm”** (since 2009, but modified for NRT). Winter Storm is a 2-week intensive winter workshop, held during UMD’s January session. It was the signature initiative of our IGERT, and after 6 successful editions, there is strong support for continuing it. Unlike Summer Camp, Winter Storm is almost entirely student led, and the focus is on peer teaching of skills, broad discussions, building sustainable connections at a time when students are not spread across campus, and professional development. It is not a once-only ‘boot camp’, and students participate almost every year of their PhD. Participation includes many faculty, and totals 80-100 per year. Activities are different each year, and student organizers are encouraged to view each year as a new ‘experiment’. Activities have included programming tutorials, a linguistic field-work crash-course, and most recently a hands-on course on human experimentation, under the guise of testing the effectiveness of internet-based experiments. Winter Storm will be updated for NRT, to serve as a key venue for training that does not come in course-sized chunks, and that can be delivered in 6-10 hours of activities within a 2-week period. Brief modules can serve the multi-scale data theme; and students can use the time for speaker visits and planning for policy activities. Summer Camp participants will use part of Winter Storm to map out more detailed plans. Winter Storm is also an ideal tool for engaging international partners, and thereby spreading our training model. 5 students from Tübingen and Moscow visited in 2014, and left energized by the experience.

c. **“Language Science Day”** (since 2010). This student-run event serves the entire UMD language community, attracting 200 people in 2013. It is scheduled in September, as a way of engaging students and faculty with the broad community before schedules become ingrained. Activities vary, but one successful feature is group-based poster presentations: rather than showing up with a recycled disciplinary poster, each group creates a new poster that explains their broad goals to the community.

d. **Weekly Lunch Talks** (since 2000, modified for NRT). This established event brings the community of students and faculty together each week. Every NRT student will present once per year. In the past this showcased both good and poor interdisciplinary speaking skills, with little systematic instruction. In NRT, this activity will be integrated into the communication training, via pre- and post-talk mentoring.

Beyond the Curriculum 2: Public-facing Science:

e. **Science Policy Program** (new). This is the signature public-facing activity of our NRT program, jointly serving the goals of communication, broadening the science base, and helping students to appreciate the big picture of how science serves societal concerns. The program represents a unique opportunity: Washington DC is the ideal location, and we know of no similar programs at UMD; AAAS has policy internship programs that bring students from around the country, but we do not know of programs that are integrated into science PhD training. This program may open career pathways for some students, but our main goal is to engage the best young scientists with a broader perspective at the beginning of their careers. Students will pursue a part-time internship for a semester or a summer, in conjunction with a professional organization or government-related agency. Activities can include assisting with briefings for policymakers, shadowing staff on Capitol Hill lobbying visits, or developing advocacy messages. We have enthusiastic support for this program from many organizations, of which just two are shown in the support letters: the American Speech-Language-Hearing Association (clinical focus), the American Psychological Association, the Linguistic Society of America, and the American Councils Research Center, among others. Policy experts will present to students and faculty during Winter Storm sessions, and current and future interns will meet policy mentors for an annual forum in Washington DC, with presentations by former fellows and discussion of upcoming plans. Students can also work with UMD’s Division of Research on organizing a Capitol Hill briefing event that brings together (inter)national partners in language science, similar to a recent UMD-organized congressional briefing on brain trauma research.

f. **Outreach** (since 2009, expanded for NRT). As described in Lidz & Kronrod (2014) our outreach program started as an effort to broaden participation, working with the AP Psychology curriculum in a single high school. But it has greatly expanded to include multiple schools and other activities, e.g., local and national science fairs, and it turned out to be a valuable enabler for research partnerships, as it built communication skills and fostered collaborations between students. The main difference in this program for NRT is the integration with systematic communication training, and adding both undergraduate and faculty participants -- all faculty are expected to take part in one activity per year.

g. **Communication Training** (new). A key enabler for interdisciplinary science is the ability to flexibly communicate science to diverse audiences, orally and in writing. This training element is not stand-alone: many of our activities create opportunities for practice: outreach, policy, lunch talks, Winter Storm, advisory meetings. New systematic training activities will be integrated with these, helping students to prepare and get feedback. For speaking skills, we have made plans with Leslie Felbain of UMD's MFA in Theater Performance, who has experience working with scientists (in addition to Broadway performers, circus acts, and Dame Edna Everage). For written skills, we will work with our contacts among UMD's communications professionals.

Beyond the Curriculum 3: Student Leadership (since 2010; expanded in NRT); Student ownership of program activities will be a key part of NRT training. Students are involved in coordinating activities, program management, assessment, mentoring undergraduates, and planning Summer Camp. These activities implicitly prepare students for future leadership roles. For NRT we will add explicit preparation, in the form of an ongoing career series (not limited to language scientists) that engages students with the challenges that they may face as interdisciplinary scholars upon 'leaving the nest'. Based on our evaluation team's research and our direct experience, the most important topics are hiring, publication, developing peer networks, and visibility and promotion (Klein 2010).

Within the Curriculum: Discomfort and Data Skills: NRT students will be drawn from diverse disciplinary backgrounds. All students are expected to take an individualized set of 4-5 courses that stretch them beyond their 'comfort zone'. This not only builds new skills, it also prepares them to adapt throughout their careers. The courses will include an interdisciplinary NRT Seminar, ideally related to the student's Summer Camp team, plus a research ethics course (NACS 600).

Students' course curriculum will prepare them to work with multi-scale data, but no single core course is planned, due to students' diverse needs. Joint seminars will bring together two or more fields, and students' preparatory coursework will equip them to benefit from those seminars. Modules in Winter Storm will address overarching topics relevant to data analysis or data stewardship. Students with a cognitive focus will increase their data skills through gateway courses in psycholinguistics (LING 640/641), computational modeling (LING645), cognitive neuroscience (NACS642), math for biologists (NACS728); these can prepare students for more challenging courses in natural language processing (CMSC723), machine learning (CMSC726), or data analytics (INST737). Students with a computational background will include training in machine learning and big data as a part of their regular curriculum, but can use courses in linguistic fieldwork, psycholinguistics, language acquisition, syntax, or phonology to give them the tools needed to work more efficiently with multi-scale data.

Planning and Evaluation: Students will not be directly admitted to the NRT program (see (4h) below). They will first participate in activities, see the benefits, then submit a detailed application to join the program. We believe that this approach greatly benefited our IGERT program, in contrast to the typical practice of using fellowships as recruiting carrots. It increases student buy-in, avoids departmental quotas, and makes it possible for students to engage in sustained planning. The NRT application is like an extended NSF Graduate Fellowship application. Students will submit a 4-page research plan, including plans for a research experience that takes them beyond their home department and ideally integrates with a Summer Camp, together with a shorter training plan, and a plan for policy, outreach and broader impacts. 1st-year PhD students find the application process daunting, but they are almost all glad to have accomplished it, as it provides focus and contributes to their chances of success. It provides an opportunity for mentoring from experienced students and from their primary and secondary mentors. Students will be mentored throughout their PhD program, but the NRT program will emphasize student agency in their own evaluation. Students will update a detailed progress report biannually. They will take the lead on self assessment, to be followed by consultation with their mentors, based on a detailed document template shared with their advising team.

Engaging a Broader Audience: We are confident that the NRT training activities will meet the goal of broad reach. Our past record shows a strong likelihood that our trainee population will be much broader than the NRT-stipend holders. We will reach students at multiple career stages: graduate students will mentor undergraduates in our interdisciplinary PULSAR program. Early career faculty will be especially encouraged to take on program roles, to co-teach or co-mentor. Beginning faculty should not be "shielded" from this: that is a sure way to ingrain habits that are hard to reverse later. An important role for the PI is to support and advocate for early career faculty as interdisciplinary scholars. We will reach programs across the whole university (cf. Graduate School letter). And we will reach students far beyond

our university, due to our growing network of (inter)national partnerships in language science. Locally, we aim to continue engaging Deaf students from Gallaudet University, as happened with IGERT. A Washington area consortium allows deaf students to cross-register for regular classes, and crucially to obtain sign language interpreting; we have budgeted a small amount to support interpreting services for our many non-course activities.

4d. Major Research Efforts

Overarching Theme. Smart learners make better use of less data, more flexibly. And sometimes learners are fortunate enough to be able to learn from higher quality data. Understanding what counts as ‘smart’ and ‘higher quality’ is a key challenge for many areas of language science. Language technology requires models that learn flexibly, in order to handle 99% of the world’s languages, and in order to handle noise and variability in speech. Children have the much sought after flexibility, allowing them to generalize well from “medium sized data”, and human-focused research need to figure out how they achieve this, in order to understand why some other learner groups are less successful. Solving these problems has major societal importance ((4b) above). Computational and cognitive experts alike face barriers, and each group can benefit from what the other group is good at. Understanding flexible learning requires an account of what data is most informative to learners, and a need to distinguish data quality and data quantity. This in turn requires computationally explicit learning models, preferably ones that respect human constraints.

Our IGERT followed a ‘big tent’ research model: many interdisciplinary flowers bloomed as we focused on individual students working across two or more groups. This helped us to understand one another’s fields better. But it lays the foundation for the more targeted approach that we pursue with NRT. We will focus on bigger problems, and therefore we describe here specific cross-cutting challenges that engage with the theme of learning from multi-scale data. Each of these fits our “incubation” process for collaborative projects, which uses events like Winter Storm for initial brainstorming, cross-taught seminars and co-mentored students to develop ideas, and Summer Camp for intensive team-based research.

Key Enablers and Distinctive Strengths. One cannot simply put people from very different fields together in a room and expect them to start solving big problems. Getting them into the room is hard enough. (4b-c) above describe community and educational enablers that facilitate collaboration. A number of research resources also contribute. (i) Many recent and upcoming faculty appointments with an interdisciplinary focus (cf. Provost letter). (ii) The Center for Advanced Study of Language (CASL), a large research center that serves as a bridge between academic research and government needs: this exposes students to a model of goal-oriented research (cf. CASL letter). (iii) Multi-PI research groups within individual disciplines (psycholinguistics, computer science) that avoid traditional single-PI lab structures and provide valuable community resources. (iv) Unusual expertise and facilities for “psycholinguistic fieldwork”, which takes lab-based techniques to remote locations, expanding the linguistic breadth of our neurocognitive research. (v) *Langscape*, a new digital resource based at Maryland that combines best-in-class language mapping with digital archiving to aggregate information and expertise on the world’s languages (langscape.umd.edu). This tool can provide a focus for active curation of data for low-resource languages, for crowd-sourcing of media and information, for raising public awareness about language diversity, and responding to urgent needs, e.g., for emergency aid organizations. This also gives students access to our partnerships with groups such as UMD’s digital humanities institute, the Long Now Foundation, and Transparent Language Inc.

Theme #1: Low-resource languages and field-linguistics. Relevant faculty: Hal Daumé (CS), Maria Polinsky (LING), Omer Preminger (LING), Mike Maxwell (CASL), Alexander Williams (LING), Bill Idsardi (LING). This project brings together experts in multi-lingual language technology with experts in the detailed analysis of language diversity, two groups that rarely intersect. Almost all languages of the world are classified as ‘low-resource’ or ‘zero-resource’ from the perspective of natural language processing (NLP). A language for which corpora of tens to hundreds of thousands of words of training data are available would count as ‘low-resource’. At most 5% of languages are spontaneously generating large volumes of free online materials. Creating sufficient resources for creating NLP tools is costly, especially if this includes the cost of creating human-annotated corpora that can be used as training data. (Current techniques need ~100,000 words of unannotated text to achieve the same results as from ~10,000 of annotated text.) However, standard NLP approaches generally rely on text that is available, annotated or not, consisting of samples of what people happen to write and say. Language technologies can go a long way based on the fact that much of what people say is repetitive and predictable. But statistical approaches that fare well with formulaic or frequently occurring material do not generalize well. This

approach takes little account of what data is most informative for the learning models. In this project we will explore the possibility of creating ‘curated’ training data for NLP models, which could be used to create more successful technologies for low-resource languages, and could make it easier to turn zero-resource languages into low-resource languages.

This project could be the basis of a focused Summer Camp, in which computer scientists explore which specific items of language data are most informative for their learning models, by testing the impact of withholding different types of data from the models. This step already requires help from linguists, in determining natural classes of input data to withhold. Field linguists can also source sentence types that might be highly informative but too rare to reliably appear in small corpora. One version of this approach could lead to a template of “20 questions” about a language (or more likely “2000 useful sentences”), which could be used to guide fieldworkers in sourcing training data for NLP tools (Probst et al 2002). But this is likely also inefficient, as sentence types that may be highly informative in some languages may be uninformative in others. More efficient would be to use linguists’ typological expertise to allow automatic customization of the template (cf. Daumé & Campbell 2007). The outcome could be implemented in *Langscape* or in mobile-phone based applications (Bird et al 2014) for use by fieldworkers.

Theme #2: “Language Poverty” and Learner Differences. Relevant faculty: Yi Ting Huang (HESP), Jeff Lidz (LING), Valentine Hacquard (LING), Rebecca Silverman (EDUC), Nan Ratner (HESP), Robert DeKeyser (SLLC), Meredith Rowe (Harvard EDUC). This theme is the result of a creative collision of two rather different traditions in research on language learning. Cognitive scientists have examined children’s fine-grained linguistic abilities and marveled at how well they generalize beyond their experience (Lidz et al. 2003), leading them to downplay the role of language input. These findings generally reflect children from middle class backgrounds. Meanwhile, education experts have been more moved by the adverse effects that they encounter every day of “language poverty”: children from low SES families often receive limited language input (Hart & Risley, 1995), leading to language delays and cascading consequences (Durham et al 2007). The language of school is unfamiliar to many children (Snow 2010). Children are affected not only by how much input they receive, but also by its quality, i.e., whether the parent’s speech is tailored to the child’s developmental stage (Rowe 2008). A 2012 co-taught seminar brought together diverse groups, established many gaps in research, and led to reciprocal student rotations and joint proposals. Most existing knowledge about effects of language poverty involves coarse measures like “vocabulary size”, “diversity of constructions used”, and “talk beyond here-and-now”. Our group has begun to explore the more detailed syntactic and semantic phenomena that may be critical for school success, e.g., speed of processing complex constructions (Leech et al. subm.), or important knowledge-related meaning differences (e.g., factivity: *think* vs. *know*, Dudley et al. 2014). This is an important new area of collaboration at UMD: it introduces cognitive scientists to issues that they have traditionally overlooked, while providing valuable fodder for their learning models; it introduces education researchers to new lab-based techniques and fine-grained language measures. A key member of this team, Meredith Rowe, has now moved to Harvard, but is eager to continue collaboration (see letter).

A Summer Camp on this theme will operate differently than a computation-based one, due to the slow pace of data collection in this area. Participants can focus on analysis of extensive existing datasets from the UMD Infant/Child network that allows analyses of SES effects; developing and piloting of new studies; developing finer-grained characterizations of different learners’ linguistic experience. This theme could be valuably extended to examine effects of the quantity and quality of language experience in other learner groups, e.g., second language learners, heritage language speakers, and children with cochlear implants.

Theme #3: Flexible Automatic Speech Recognition. Relevant faculty: Naomi Feldman (LING/UMIACS), Rochelle Newman (HESP), Bill Idsardi (LING), Carol Espy-Wilson (ECE), Kira Gor (SLLC), Min Wang (EDUC), Mike Key (CASL). Automatic speech recognition (ASR) systems have become a normal part of everyday life, e.g., Apple’s *Siri*, and with this come increased expectations that speech recognizers will behave like human perceivers. Human listeners are remarkably good at rapidly adjusting their perception for how different people speak, adjusting for a speaker’s dialect/accent and their individual production style - even listening to a novel talker for the first time, humans rarely have difficulty. In contrast, ASR systems often have trouble adapting to speakers on whom they haven’t been trained (Boves et al. 2007), and have particular problems adjusting for variation across different dialect groups (Ghorshi et al. 2008). Human listeners succeed in the face of both systematic and random variability in ways that ASR systems have yet to match; yet we still do not understand the mechanisms underlying these adjustments. This research theme aims to extend both current theories of human

listening performance and current ASR systems in ways to better address dialectal differences at the level of the system of sound structure. This involves assessing further the extent of dialectal differences among speakers, examining how these differences relate to intelligibility in both humans and machines, and how listeners attribute acoustic variation to different potential causes (Kraljic et al. 2008). Parallel exploration of human data and machine learning has enormous potential for both fields. In our team, Naomi Feldman is a cognitive scientist who is exploring electrical engineering methods with this goal. There is growing interest in developing new approaches to ASR based on human perception, and research on human listeners can benefit from methods that have shown promise in ASR.

Our research will focus initially on three questions: (i) How do human and machine listeners differ in the errors that they make when encountering dialects and accents? (ii) Is non-native speech more variable than native speech, and how does this affect human and machine listeners? (iii) How do listeners draw analogies between dialects, i.e., how do they learn that an 'ah' in one dialect corresponds to 'ai' in another? This problem is too large for a Summer Camp, or for a 5-year project, but in a 4-week workshop we can start by attacking the problem of identifying individual syllables. This can be combined with internet testing of accent perception, and design of future research on fluent speech contexts.

Theme #4: Prediction and Millisecond-scale Information Management. Relevant faculty: Lau (LING), Daumé (CS), Phillips (LING), Feldman (LING/UMIACS), Resnik (LING/UMIACS), Huang (HESP), Jiang (SLLC), Polinsky (LING). This theme focuses on the efficient use of information on a far shorter time scale than the other themes. Predictive mechanisms aid comprehension in humans, leading to faster, noise-resistant understanding. The same is true for language technologies. Predictive text processing is an important application -- that is why typing on a smartphone works better than you would expect. And it is important for simultaneous machine translation: translating a verb-final language like Japanese into verb-medial English requires either waiting for the verb, or making predictions. Predictive mechanisms are also suggested to be critical for learning success (Chang et al 2006), and may contribute to the varying success of different learner groups (deLong et al. 2012, Martin et al. 2013). The goal of this theme is to understand human learners' success and speed, and in doing so to contribute to improvements in technology. Valuable clues to human mechanisms come from recent findings in our labs about variable access to different sources of predictive information, in young children (Lidz et al. 2014) and in adult electrophysiology (Chow et al. 2014). A Summer Camp on this topic could involve implementing models of human predictive abilities, which would benefit human and computational researchers alike.

Further Themes. We have identified candidate themes for research teams and future Summer Camps, which go beyond available space. These include research on the development of intelligent tutoring systems for language, of great interest to faculty and students in CASL and the School of Languages, and involving a partnership with IBM. A Summer Camp in this area could focus on efficient ways of diagnosing learner states, building on the results of themes #1-#3. Another topic involves development of flexible clinical diagnostic tools, via collaboration with "psycholinguistic fieldwork" experts. This project would use evidence from language processing challenges in diverse languages to predict likely markers of specific clinical conditions in any given language.

4e. Broader Impacts

The NRT program will have many broader impacts, reflecting both the Education/Training and the Research goals of the project. These are addressed elsewhere in the proposal, but summarized here.

Education/Training: Our training plans are designed to influence a wide range of individuals, extending far beyond the individuals whose training is funded by NRT. First, our experience with IGERT shows that we have the ability to enroll around double the number of NRT-funded trainees [(4h-i) below], and that it is possible to sustain activities beyond NSF funding. Second, our students are explicitly trained for the role of leading related efforts in their future careers, and other institutions recruit them for that purpose. Third, we have a track record of spreading training innovations beyond our program, and concrete plans for doing so with NRT, extending across our institution (cf. letter from Grad School dean), internationally (cf. letter from VP for Research and Head of International Affairs), and across career stages (high school, undergraduate, and early career faculty; cf. (4b), (4g), (4h)).

Our efforts to create more successful interdisciplinary scientists via public-facing activities (outreach, policy initiatives) are broadly transferable. Washington area universities are proud of the national resources on their doorstep, but it is rare for graduate training to systematically engage students in policy issues [cf. (4c)]. We expect that our assessment activities, engaging students with leaders in research on

graduate and early career development will make our innovations more visible and more credible [cf. (4g)]. And by targeting our diversity-related efforts at multiple stages of the pipeline, from high school through new faculty, rather than merely competing for PhD recruits, we hope to have a more valuable impact on engagement in STEM careers, including participation of women in computer science [cf. (4h)].

Research: Our research addresses critical needs, nationally and internationally, which affect society, economy, and peace/security. Flexibility in technology is essential for tools involving the vast majority of the languages of the world, and for tools that generalize across speakers of individual languages. Flexibility in adult learners is essential for the modern workforce, in which international needs and opportunities change far more quickly than in the past. For child learners who are held back by socioeconomic, family, or health-related challenges, more effective learning of English or other dominant languages is essential for their ability to successfully participate in the workforce. The tools that our project will help to develop for working with multi-scale language data, such as *Langscape*, will serve as a valuable resource for researchers, the public, and for government and NGOs alike. Finally, by demonstrating the value of ambitious team-based research efforts, we hope to raise the bar for research in fields where this is less common.

4f. Organization and Management

Why it's hard, and how to fix this: Creating long-term change in a diverse academic community is hard: faculty are loathe to change direction for something that lasts only 5 years; community-building strategies that work within a single department or building do not readily scale up to physically-disconnected groups, and sending emails or creating a website does not fix this; important organizational structures can seem like 'administrative noise' to students; and structures that rely on a single individual are not sustainable. Our organizational principles for NRT are designed to address these challenges. (i) Student agency and 'ownership' of the program and their individual progress is essential for their commitment. (ii) The 5-year training grant is not an end in itself, but rather is part of a long-term strategy, for which graduate training is a catalyst. This greatly improves buy-in from faculty and administrators. (iii) New leaders (students or faculty) do not want to just implement their predecessors' ideas: they need room to make their own mark. (iv) Planning and assessment are a part of student training.

Specific Structures and Roles: The NRT program will be housed within the Maryland Language Science Center (LSC), which provides space and staff. NRT leadership will come from separate Student and Faculty Executive Committees, which will oversee different program functions separately or jointly, and will oversee specific student or faculty teams. The Faculty EC will primarily oversee functions relating to course programming and student progress, including admissions and feedback on program applications to the program. The Student EC will play a central role in the program, coordinating a series of student committees that have responsibility for specific activities, such as Winter Storm, Language Science Day, outreach, and weekly student talks. All students will be expected to contribute to these committees for at least 2 years. The two ECs will jointly select Summer Camp themes, plan the annual advisory/review meeting, and agree on program policies. Separate joint student/faculty teams will take responsibility for each Summer Camp, and will coordinate the policy training activities. The policy team will include representatives from two UMD centers that have strong government/policy connections.

The PI and Program Coordinator (PC) will manage day-to-day operations for the program, including finances, communication to university administration, and reporting and communications with NSF. The PC will coordinate with student groups, and will provide extensive logistical support for NRT events, including the annual Summer Camp. The PC will also play a central role in communications to the community.

A key organizational goal for the PI will be to mentor new leaders who can assume his role in the future.

Communication and Community: Fostering a sustainable community requires that we make it clear from Day 1 that the program is not synonymous with a specific NSF award. Rather, the NSF funding should be seen as a catalyst for long-term plans. This strategy contributed to the success of our IGERT: faculty saw that they were committing to a long-term community, and not just to a transient program. Many faculty now identify with the language science community as strongly as with their home department. NRT program communications will take advantage of the language science website, the student wiki, and community will be strengthened via events such as Language Science Day, weekly lunch talks, Winter Storm, and the annual advisory board meeting (which students and faculty find

energizing!). Department chairs and university leaders will learn about NRT activities via regular news blasts (via our blog) and via meetings with the external advisory board. Creation of the LSC has greatly improved the legibility of the university-wide community to senior administrators, and this will facilitate communication of NRT activities.

4g. Performance Assessment/Project Evaluation

Goals: Our IGERT experience converted us from assessment skeptics to true believers. Our formative assessment activities led to dramatic changes in our program and our intellectual culture; and we made extensive use of our external advisory committee (EAC). This process provided clear annual goals, forced regular reflection into otherwise busy schedules, and allowed students and faculty alike to gain an overview that they might otherwise miss. We found that the effectiveness of assessment activities was increased by student agency and ownership: for student-led activities, the student groups designed and analyzed assessment tools, with our evaluation experts serving as ‘coaches’.

However, despite our own and our EAC’s strong sense that we had made a difference, and increasing measures of our students’ success, we had little concrete evidence on what worked and why. For the NRT program we address this limitation by working with leading researchers on doctoral training who can help us to design research-grade assessments, leading to measurable and publishable outcomes. We will pay particular attention to the expanded set of competencies that we are targeting for NRT, and also to the broader impacts of our efforts across our institution and across our discipline(s).

Team: We are happy to partner with KerryAnn O’Meara as our primary evaluator. Prof O’Meara is a leading expert in career development at the doctoral and early faculty level; her interests in enablers for agency and interdisciplinarity are especially relevant to our goals. She also spearheads UMD’s NSF-ADVANCE Program for Inclusive Excellence, which focuses on career development for women faculty (many of the women faculty in our team have directly benefited from this program), and so is already connected to efforts to translate best practices in individual programs into institutional change. We think that the benefits of O’Meara’s institutional expertise far outweigh the downsides of her being UMD-based. But we have also enlisted the support of Ann Austin as “evaluation auditor”. Dr. Austin is Professor of Higher Education at Michigan State U., a past president of the Association for the Study of Higher Education, and she is co-PI of the 22-university Center for the Integration of Research, Teaching, and Learning (CIRTL). Her research directly overlaps with our training goals, making her ideally suited to this role. The 5 members of our IGERT EAC have agreed to continue to serve; all are distinguished figures in their respective fields, with leadership experience relevant to our goals: Susan Gass (language education: Michigan State); Alec Marantz (linguistics & neurosci., NYU); Mitch Marcus (CompSci, UPenn); Mabel Rice (language disorders: Kansas); Paul Smolensky (computational cognitive science: Johns Hopkins). The third key part of our evaluation team is the students themselves.

Approach & Schedule. Our framework for assessing progress toward NRT objectives is interdisciplinary, drawing on social science theory regarding individual student competencies in addition to measures of program success and its impact within and beyond our institution (Colbeck, O’Meara & Austin 2008, Kezar 2014, Weidman et al 2001). For individuals, the competencies are (i) individual interdisciplinarity -- not only broad skills, but the ability to go beyond one’s comfort zone; (ii) engagement and entrepreneurship -- the ability to improve and change scientific communities; (iii) flexible communication skills -- the ability to speak to and write for diverse audiences, whether policymakers, public, or experts in other areas; and (iv) the ability to effectively work in, and manage, a diverse team. For the program, our primary goals are sustainability and transferability -- the ability of our innovations to last beyond our NRT funding and spread beyond our program.

Our assessment activities will proceed on an annual cycle, starting with goal setting at the onset of each year and culminating with the visit of the EAC and assessment auditor in late spring. We will employ activity-specific surveys (2-3/year), plus focus groups and exit interviews at the end of the PhD program. Students’ semesterly self-assessment surveys will also provide data on programmatic goals.

Measures. We will use mixed methods in our assessment design including cross-sectional surveys, experience sampling, matched cohorts and content analysis of vitas and measures of productivity (Creswell & Plano-Clark 2011; Larson & Csikszentmihalyi 1983). A consistent challenge for measuring the impacts of small-sample innovations is to find a suitable comparison group. We will compare our trainees with a sample of 50 students from PhD programs in related fields, using regular surveys and exit interviews (with budgeted incentives); we will take advantage of the CIC, the academic arm of the Big10 sports conference, which UMD recently joined; these universities have similar size, profile, and breadth of

language science departments, but show much variation in the extent of cross-department training. A second comparison cohort is our own IGERT graduates. These are offset in time, but ideally suited to identifying the impact of NRT-specific innovations.

Regarding institutional change, we utilize social network analysis as applied to higher education organizations to understand how change in graduate education through our program might influence change in other graduate programs, the intellectual community, and students and faculty on campus (Kezar 2014). We hope to utilize institutional records to understand change over time in the number of students and faculty that are connected to each other on campus via tangible projects, or outcomes (such as grants submitted and awarded, presentations, publications, dissertation committees).

Regarding change in our field(s), we will analyze the social networks and field contributions of both IGERT graduates and NRT participants with regard to (a) the number of interdisciplinary presentations, publications, grant funded or pro-bono projects and team-taught interdisciplinary courses and programs created (b) the nature of professional contacts (c) diversity of funding sources and (d) related productivity measures. We will compare NRT participants to the two comparison groups on these measures annually.

Spreading the word. We are eager to learn from others' best practices, and to share what we have learned. To this end, we will continue our practice of making all our non-individual assessment materials - both good and bad -- freely available via our website. A number of groups that are developing new programs have found these useful. We have made efforts to publish/present the results of our IGERT via disciplinary channels, e.g., our outreach program has led to a journal paper (Lidz & Kronrod, 2014) and we are helping to coordinate symposia at two upcoming conferences. With our new evaluation team, we now also aim to publish findings in the higher education research literature. Just as important are our efforts to generalize best practices across our institution. Our EAC will meet annually with college deans, and the LSC's programs are all reviewed annually, more closely than regular academic programs. We have arranged to partner with the Graduate School and individual colleges to translate best practices into institutional change (cf. dean's letter.)

4h. Recruitment, Mentoring, and Retention

Preliminaries and Goals: In our IGERT program 20% of fellows were African American or Hispanic, well above disciplinary norms, though behind the national population. 60% of our trainees were women: this is consistent with disciplinary norms for participating fields. Among students with a computational focus, 40% were women, and this is well above disciplinary norms. We made extra efforts in recruiting minority PhD applicants, and attended some specific recruiting events. We took some standard steps, and the results weren't bad

More generally, science careers are risky. They are not obvious paths to socioeconomic advancement, and language science certainly ranks low in that regard. Embarking on unusual interdisciplinary paths is even riskier. So it is unsurprising that these fields are overrepresented by students from wealthier or more educated family backgrounds: the safety net is stronger, and peer appreciation of science careers is greater. Other undergraduates or high schoolers who we have worked with, especially those from immigrant backgrounds, have told us that they really like the science, but their parents are discouraging them from pursuing it.

Simply vying to recruit a diverse pool of PhD students does not address the problem at its roots. And in our field we have seen little evidence that it works. Early in our IGERT we visited HBCUs, but found that it was rare to even find students with language science interests. Our successes have come from different strategies: (i) we work on expanding the pipeline of scientists at all levels, and (ii) we focus on making interdisciplinary language science less risky, through intensive mentoring and creating a safety net that might not be available otherwise.

IGERT Data: Among our students, 30% of Americans were minorities (incl. Asian/Pacific); 60% were women; 30% were international. The retention rate is 98% among students who joined the program, not counting 2 students who moved with their advisor and remain in PhD study. The 6-year completion rate is

92%. Placements to date consist of 19 in academia, 1 in industry, 2 in government research, and 1 in medical school.

Lowering the Risks: Recruitment and Mentoring within NRT: We will not recruit direct to NRT. Rather, we will work closely with all participating programs to sell the overall interdisciplinary opportunities to recruits. Recruitment specifically to NRT will be an extended process: students get involved in program activities (talks, Winter Storm, Language Science Day, outreach), then apply after they are already engaged in the community. The program application is a demanding experience for 1st year PhD students, but the planning process improves chances of long-term success, by mapping out a feasible plan and receiving detailed feedback from mentors, other faculty, and experienced students. Retention involves successful (co-)mentoring, but it depends equally on engagement in a strong community of peers. Students who are closely connected to other students have a far higher likelihood of success, and this is especially true for students from disadvantaged backgrounds. The strong community that results from student ownership of the program and from activities like the outreach program therefore plays an important role in our retention strategy, despite the additional demands on student time. It is equally important to prepare students to survive as interdisciplinary scientists after they leave the supportive nest, and our program will include specific activities designed to help students in the critical post-PhD years.

Expanding the Pipeline: We strongly believe that it is important to address diversity concerns by expanding the pool of potential scientists, and by lowering the risks of a career in science, rather than simply fighting for the few students who have already chosen a scientific career. In that regard, we are fortunate to have an diverse local population and a remarkably diverse undergraduate population. Thanks to student leadership, outreach has become a core value of our community, and in NRT participation will be a requirement for all faculty, in addition to students. Each year our trainees reach hundreds of middle- and high-school students via our partnerships and via broader science career fairs. A series of local high-school partnerships bring many students into our labs for internships, and several interns who took part in IGERT-led research have gone on to undergraduate programs in Language Science. Moving to the university level, our new PULSAR program for undergraduates seeks to expand participation by extending many features of our IGERT to undergraduates, including outreach and recruitment. We hope this program will help to build the pool of future prospective graduate students -- whether for our own programs or others.

A separate focus of our diversity efforts involves increasing participation of women in computational research. Naomi Feldman plays a key role in these efforts, for students at all levels, as a role model for female students, as a bridge between cognitive research (where women are well represented) to computational research, and as instructor for a recently introduced core course that provides a gateway into computational research for students from other fields. We are simultaneously using investment in new faculty positions to target women hires in computer science.

4i. Recent Student Training Experiences

As described in (4b), the NRT proposal is our third 'experiment' in graduate education. The first experiment involved a transformation of the curriculum in a single department (Linguistics), in order to promote breadth of training from Day 1. The second experiment was our IGERT program, which focused on preparing individual interdisciplinary researchers, in the context of a broad community. This provides the foundation for Experiment 3, the NRT program, which focuses on team-based approaches to complex problems, flexible oral and written communication skills, and training students to link research to societal problems via a science policy program.

Our previous efforts have been highly successful. Experiment 1 led to a dramatic change in our student body; 10-12 years on, students from the early cohorts are now emerging as leaders, achieving tenure, winning grants, and starting to feature as keynote speakers. The IGERT program was unusually successful, relative to similar programs. The degree of involvement was very high: 50 students pursued the full program, double the number receiving NSF funding. The additional students were mostly international students, or students with other sources of support. Around 40 faculty from 10 departments contributed to the program. Importantly, the IGERT helped to attract and develop a cohort of young faculty for whom interdisciplinary engagement is the "new normal". The NRT team relies extensively on this new generation, including many not listed among the 10 "core personnel". Student graduation and placement is proving successful: all but 1 student completed the PhD in 4-6 years; students were offered tenure-track positions at UMass, Northwestern, William & Mary, University College London, Utah, Mich.

St.; many strong postdocs in the US and abroad; 3 positions in industry and government. Students brought new approaches to their research that would not have been possible before.

Beyond the specific individual outcomes, the IGERT had a transformative effect on our research community. It taught us about key enablers for collaboration. Students created lasting partnerships between co-mentors, leading to some of the NRT research themes. We learned how outreach activities make us better interdisciplinary researchers. Most importantly, we learned the importance of student ownership and leadership in all program activities. The IGERT led to sustainable institutional change, as reflected in new faculty hires, elevation of Language Science to an institutional priority and creation of a new center, and creation of a new undergraduate program, PULSAR, that aims to create an IGERT-style community at the undergraduate level. As one department chair commented: “this toothpaste is not going back in the tube”. Also, our students’ innovations inspired students in neighboring programs to develop new initiatives, e.g., a new outreach program and significant changes in student leadership in UMD’s neuroscience program.

Examples of individual student successes: (i) Annie Gagliardi (PhD 2012) integrated approaches from psychology, linguistic fieldwork, and computation in her research on language learners in an endangered language of Dagestan. This led her first to a postdoc in fieldwork at Harvard and now to a postdoc in computer science at Edinburgh. (ii) Shannon Barrios and Dan Parker now hold tenure-track positions based primarily on work in their IGERT breadth area. (iii) Anna Chrabaszcz, Eric Pelzl, Yuichi Suzuki, and Giovanna Morini all brought new approaches into their departments’ portfolios, and have inspired other students to follow suit. (iv) Many students won university-wide awards for their impressive leadership activities: Shevaun Lewis, Alexis Wellwood, Giovanna Morini, and Yakov Kronrod. These four now have a tenure-track position (Northwestern) or postdocs (Johns Hopkins, UPenn, Delaware).

The IGERT also taught us that some changes are more difficult than others. Bridging the research cultures in computational and behavioral/educational/clinical fields proved harder than expected. Consistently fostering team-based projects requires more sustained management. And developing the ability to flexibly speak and write for diverse audiences requires more systematic training. These are all priorities for our NRT program.

4j. Results from Prior NSF Support

Colin Phillips’ most relevant recent NSF support is the IGERT project (DGE-0801465) that laid the groundwork for the current proposal. The results from the IGERT are described throughout this proposal. Phillips also received support via BCS-0848554 for research on sentence comprehension, at the intersection of linguistics, psychology, and cognitive neuroscience. This project generated 33 papers and 127 presentations to date, and has uncovered important new findings about how speakers rapidly encode and navigate structured mental representations. Phillips was also co-PI on a Major Research Instrumentation award (MRI-0922985) that led to creation of the Maryland Neuroimaging Center in 2011.

Rochelle Newman joined the IGERT as co-PI in Year 3, so this is also her most relevant NSF support. She is currently PI on a project (BCS-1152109) that investigates early language development in bilinguals, and that also is developing BITTSy, an open-source experiment control package that will serve the international community of researchers who study infant cognitive abilities. She is also PI or co-PI on 2 DDRGs for PhD students who have successfully completed their degree and are in postdoc positions.

Hal Daumé has been PI on three NSF grants: IIS-0712762 (Cross Task Language Learning with Small Data Sets), IIS-0916372 (Statistical Linguistic Typology) and IIS-0940112 (Computational Thinking Olympiad: Brainstorming Workshop); and co-PI one two more: Of these, IIS-0916372 (Statistical Linguistic Typology) is most closely aligned with the current proposal. In this project he developed methods for automatically inferring linguistic regularities---across thousands of languages---based on noisy, incomplete typological databases, as well as inferring linguistic phylogenies that take into account areal effects. He used these insights to build some of the first unsupervised models of syntactic structure that use typological features (this has since become standard practice), and also to build transliteration models (across hundreds of languages) that obey typological properties.

Bill Idsardi has been PI on BCS-1124877 (Neuromagnetic Correlates of American Dialect Perception). This research has uncovered the behavioral and neural correlates of early, automatic responses to changes in dialect and other paralinguistic speaker characteristics (gender, geographic dialects, racially-affiliated dialects). Robert DeKeyser was PI for BCS-1024081, a DDRG to Sunyoung Lee-Ellis (PhD 2012) that conducted pioneering psycholinguistic research on speech perception, syntactic, and semantic processing in ‘heritage speakers’, i.e., speakers whose first language is not their dominant language.

5. References Cited

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- Lidz, J., Waxman, S., & Freedman, J. (2003). What infants know about syntax but couldn't have learned. *Cognition*, 89, B65-B73.
- Lidz, J., White, A., & Baier, R. (2014). The role of incremental parsing in syntactically conditioned word learning. Submitted.

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- Phillips, C., Lidz, J., Lau, E., F., Heffner, C., Dudley, R. (2015). How linguistic outreach makes us better linguists. Symposium at the Linguistic Society of America Annual Meeting, Portland, OR.
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Colin Phillips
Biographical Sketch

A. Professional Preparation

Oxford University	Modern Languages	BA, 1990
Massachusetts Institute of Technology	Linguistics	PhD, 1996
Massachusetts Institute of Technology	Cognitive Neuroscience	Postdoc, 1996

B. Academic Appointments

1997-2000	Assistant Professor, Linguistics, University of Delaware
2000-	Assistant-Associate-Full Professor, Linguistics/NACS, University of Maryland
2009-	Associate Director, Neuroscience & Cognitive Science (NACS) Program
2011-	Distinguished Scholar-Teacher, University of Maryland
2013-	Director, Maryland Language Science Center

C. Selected Publications (selected from 90 publications):

5 recent publications related to the current proposal:

- Omaki, A., Davidson White, I., Goro, T., Lidz, J., & Phillips, C. (2014). No fear of commitment: Children's incremental interpretation in English and Japanese wh-questions. *Language Learning and Devt.*
- Phillips, C. (2012). Individual variation and constraints on language learning. *Linguistic Approaches to Bilingualism*, 2, 281-286.
- Sprouse, J., Wagers, M., & Phillips, C. (2012). A test of the relation between working memory capacity and syntactic island effects. *Language*, 88, 82-123.
- Stroud, C. & Phillips, C. (2012). Examining the evidence for an independent syntactic analyzer: An ERP study in Spanish. *Brain and Language*, 120, 108-126.
- Aoshima, S., Yoshida, M., & Phillips, C. (2009). Incremental processing of coreference and binding in Japanese. *Syntax*, 12, 93-134.

5 additional recent publications:

- Xiang, M., Dillon, B., & Phillips, C. (2009). Illusory licensing effects across dependency types: ERP evidence. *Brain and Language*, 108, 40-55.
- Lau, E., Phillips, C., & Poeppel, D. (2008). A cortical network for semantics: (de)composing the N400. *Nature Reviews Neuroscience*, 9, 920-933.
- Kazanina, N., Phillips, C., & Idsardi, W. (2006). The influence of meaning on the perception of speech sound contrasts. *Proceedings of the National Academy of Sciences*, 103, 11381-11386.
- Phillips, C. & Wagers, M. (2007). Relating structure and time in linguistics and psycholinguistics. In: M. G. Gaskell (ed.), *Oxford Handbook of Psycholinguistics*. Oxford University Press, pp. 739-756.
- Phillips, C. (2006). The real-time status of island phenomena. *Language*, 82, 795-823.

D. Synergistic Activities

- Led expansion of interdisciplinary training in language at Maryland as PI of the NSF-IGERT training program "Biological and Computational Foundations of Language Diversity" (2008-2013), which has 40+ participating faculty and 50+ PhD students from 10 departments; students are trained in multiple fields, and engage in leadership, outreach, and infrastructure building activities.
- Extensively engaged in building interdisciplinary research capacity. Developed Maryland Neuroimaging Center (2009-2012), seeded by NSF major instrumentation award. Currently establishing Maryland Language Science Center (2013-), which brings together language experts from 17 departments and centers to link basic science to applications in technology, education, and health; combines research, interdisciplinary training, extensive outreach, international partnerships.
- As part of an NSF CAREER award, developed teaching materials for hands-on lab-based courses in psycholinguistics and introductory linguistics courses; freely available on the internet, and used at a number of other universities; on-line course materials named to "Top 100 Open Courseware Projects" in 2007 (Online Education Database, oedb.com)
- Editorial Board: *Syntax*, *Journal of Linguistics*, *Journal of Semantics*, *Linguistic Inquiry*, *Language Acquisition*, *Journal of Neurolinguistics*. Reviewer for 40 journals, agencies, and publishers in linguistics, psychology, and cognitive neuroscience. Review panels and study sections at NIH and

NSF (2003-2013). Elected to Linguistic Society of America executive committee (2013-2016), and AAAS Language Science section steering committee (2012-2015).

- Frequently invited as speaker/lecturer, for the purpose of either making psycholinguistics or cognitive neuroscience more accessible for linguists, or for representing linguistics to cognitive neuroscientists, including mini-courses in Japan, Spain, Norway, Holland, Hong Kong, and US, an invited plenary talk at the 2011 meeting of the American Association for the Advancement of Science, an NSF Distinguished Speaker lecture, and many other general audience talks.

E. Collaborators and other Affiliations

a. Collaborators in Past 48 months (graduate students and postdocs are listed in (c) below)

NRT Faculty: Ellen Lau University of Maryland
 Jeffrey Lidz University of Maryland
 Maria Polinsky Harvard University/University of Maryland
 Robert Slevc University of Maryland

Other Faculty: Roni Katzir Tel Aviv University
 Andrew Nevins University College, London
 Roumyana Pancheva University of Southern California
 Jon Sprouse University of Connecticut
 Suiping Wang South China Normal University

b. Own Graduate & Postdoctoral Advisor

Alec Marantz New York University

c. Graduate Theses and Postdoc Supervision

Graduate Supervision (*indicates co-advisor); total = 28: all U of Maryland unless noted
 David Schneider PhD, U. of Delaware (1999). Comp. Ling. at *Cycorp Inc.*, Austin, TX
 Meesook Kim PhD, U. of Delaware (1999). Associate Professor, Sangji University, Korea
 Douglas de Lorenzo MA, U. of Delaware (1999). *Rhodes Scholarship*, Oxford University
 Thomas Pellathy MA, U. of Delaware (2000). *Rhodes Scholarship*, Oxford University
 Sachiko Aoshima* PhD 2003. Language specialist, US Government
 Ana Gouvea* PhD 2003. Assistant Professor, Florida Intl. Univ. (Comm. Sci.)
 Nina Kazanina PhD 2005. Senior Lecturer (tenured), Univ. of Bristol, UK (Psychology)
 Leticia Pablos PhD 2006. Research Associate, University of Leiden, Holland
 Masaya Yoshida PhD 2006. Associate Professor, Northwestern University
 Chun-Chieh Hsu* PhD 2006. Assistant Professor, National Tsinghua U., Taiwan
 Takuya Goro PhD 2007. Associate Professor, Tsuda College, Japan
 Matthew Wagers PhD 2008. Associate Professor, UC Santa Cruz
 Clare Stroud PhD 2008. Program Officer, National Academy of Sciences
 Ellen Lau PhD 2009. Assistant Professor, University of Maryland
 Akira Omaki PhD 2010. Assistant Professor, Johns Hopkins University
 Brian Dillon* PhD 2011. Assistant Professor, UMass Amherst
 Shevaun Lewis PhD 2013. Postdoc, Johns Hopkins University.
 Wing-Yee Chow PhD 2013. Lecturer (tenure-track), University College London.
 Dave Kush* PhD 2013. Postdoc, Haskins Labs/Yale University.
 Dan Parker PhD 2014. Assistant Professor, College of William & Mary.
 María Sol Lago PhD 2014. Postdoc, University of Potsdam.
 Dustin Chacón* PhD expected 2015: syntax, psycholinguistics
 Shota Momma PhD expected 2016: psycholinguistics, neurolinguistics
 Lara Ehrenhofer* PhD expected 2018: psycholinguistics, neurolinguistics, phonology
 Allyson Ettinger* PhD expected 2018: psycholinguistics, semantics
 Anton Malko PhD expected 2018: psycholinguistics, syntax

Postdoc Supervision:

Ryuichiro Hashimoto 2003-4, PhD, U. of Tokyo; Associate Professor, Tokyo Metropolitan U
 Ming Xiang 2005-7, PhD, Mich St U.; Assistant Professor, U. of Chicago

HAL DAUMÉ III

Biographical Sketch

A. Professional Preparation

Carnegie Mellon University, Pittsburgh, PA, Mathematical Sciences, B.S., 2001

University of Southern California, Los Angeles, CA, Computer Science, M.S., 2003

University of Southern California, Los Angeles, CA, Computer Science, Ph.D., 2007

B. Appointments

Associate Professor, Computer Science, University of Maryland, College Park, 2013–Present

Co-director of Computational Linguistics & Information Processing Lab, 2011–2012

Assistant Professor, Computer Science, University of Maryland, College Park, 2010–2013

Assistant Professor, School of Computing, University of Utah, 2006–2010

Research Intern, Machine Learning and Applied Statistics, Microsoft Research, Summer 2003

Research Assistant, Information Sciences Institute, University of Southern California, 2001–2006

C. Related Publications (selected from a total of 109)

He He, **Hal Daumé III** and Jason Eisner. *Dynamic Feature Selection for Dependency Parsing*. 2013. Conference on Empirical Methods in Natural Language Processing (EMNLP).

Ann Irvine, John Morgan, Marine Carpuat, **Hal Daumé III** and Dragos Munteanu. *Measuring Machine Translation Errors in New Domains*. 2013. Transactions of the Association for Computational Linguistics (TACL).

Jordan Boyd-Graber, Brianna Satinoff, He He and **Hal Daumé III**. *Besting the quiz master: crowdsourcing incremental classification games*. 2012. Conference on Empirical Methods in Natural Language Processing (EMNLP).

Jagadeesh Jagarlamudi and Hal Daumé III. *Low-dimensional Discriminative Reranking*. 2012. Conference on North American Chapter of the Association for Computational Linguistics (NAACL).

Jesse Dodge, Amit Goyal, Xufeng Han, Alyssa Mensch, Margaret Mitchell, Karl Stratos, Kota Yamaguchi, Yejin Choi, Hal Daumé III, Alexander C. Berg and Tamara L. Berg. *Detecting Visual Text*. 2012. North American Chapter of the Association for Computational Linguistics (NAACL).

Other Selected Publications

Jiarong Jiang, Adam Teichert, Hal Daumé III and Jason Eisner. *Learned Prioritization for Trading Off Accuracy and Speed*. 2012. Conference on Neural Information Processing Systems (NIPS).

He He, Hal Daumé III and Jason Eisner. *Imitation Learning by Coaching*. 2012. Conference on Neural Information Processing Systems (NIPS).

Hal Daumé III, John Langford and Daniel Marcu. *Search-based Structured Prediction*. 2009. Machine Learning Journal (MLJ).

Hal Daumé III. *Unsupervised Search-based Structured Prediction*. 2009. International Conference on Machine Learning (ICML).

Percy Liang, Hal Daumé III and Dan Klein. *Structure Compilation: Trading Structure for Features*. 2008. International Conference on Machine Learning (ICML).

D. Synergistic Activities

- Developed two interdisciplinary courses, Bayesian Nonparametrics and Linguistic Prediction, taught collaboratively with faculty from the Linguistics Department (Naomi Feldman, Ellen Lau) and the iSchool (Jordan Boyd-Graber); wrote a Machine Learning free online textbook (<http://ciml.info>); many offerings of course in computational linguistics, machine learning and artificial intelligence.
- Broad cross disciplinary involvement in computer science, linguistics, and information science through conference and journal service: *Executive Board Chair* North American Association for

Hal Daumé, co-PI: Central in computational group, data science, machine learning, interdisciplinary training

Computational Linguistics (2014–2016); *Executive Board Member* North American Association for Computational Linguistics (2007–2009); *Program Co-chair* North American Chapter of the Association for Computational Linguistics (NAACL); *Senior PC*: International Conference on Machine Learning (2011, 2012), Neural Information Processing Systems (2010, 2011, 2012), Conference on Artificial Intelligence and Statistics (2010, 2012), Association for Computational Linguistics (2008) and Empirical Methods for Natural Language Processing (2007). *Editorial boards*: Computational Linguistics Journal (2011–2013), Machine Learning Journal (2008–2012), ACM Transactions on Speech and Language Processing (2008–2010), Journal of Artificial Intelligence Research (2010–2013).

- Engagement in outreach and mentoring junior researchers: program co-chair of an NSF-sponsored Olympiad in computational thinking; Mentored three undergraduate honors students for research projects; Mentored local high school student summer research project.
- Research community building beyond the university of Maryland: *Organizer*: AI brown bag lunch, *Five workshops organized* at ICML, NAACL and NIPS; *Conference chair roles*: sponsorship (ICML 2010–2011), publicity (COLING 2010), publications (ICML 2009–2010), publicity (ACL 2008); *Research blog*: Natural Language Processing <http://nlpers.blogspot.com> (2006–Present). *Tutorials given*: From Structured Prediction to Inverse Reinforcement Learning (ACL 2010, AAAI 2011), Beyond Structured Prediction: Inverse Reinforcement Learning (ACL 2011), Domain Adaptation (ICML 2010, with John Blitzer).

E. Collaborators & Other Affiliations

NRT Faculty: Naomi Feldman (UMD, Linguistics), Ellen Lau (UMD, Linguistics), Philip Resnik (UMD, Linguistics)

Other collaborators: Alex Berg (UNC, CS), Tamara Berg (UNC, CS), Jordan Boyd-Graber (UMD, iSchool), Marine Carpuat (NRC Canada), Yejin Choi (Stony Brook, CS), Jason Eisner (JHU, CS), Lise Getoor (UC Santa Cruz, CS), Samir Khuller (UMD, CS), John Langford (Microsoft Research), Dragos Munteanu (SDL LanguageWeaver), Alexandru Niculescu-Mizil (NEC), Doug Oard (UMD, iSchool), Jeff Phillips (UC Santa Cruz, CS), Chris Quirk (Microsoft Research), Ellen Riloff (U Utah, CS), Suresh Venkatasubramanian (U Utah, CS).

Own Ph.D. Supervisor: Daniel Marcu (USC, ISI)

Thesis advisees (total = 8 PhD, 1 MS, 1 BS)

Current Students: Snigdha Chaturvedi (Ph.D.), He He (Ph.D.), Jiarong Jiang (Ph.D.).

Past Students: Amit Goyal (Ph.D., Research Scientist at Yahoo!), Abhishek Kumar (Ph.D., Research Scientist at IBM Research), Jagadeesh Jagarlamudi (Ph.D., Research Scientist at IBM Research), Piyush Rai (Ph.D., Postdoc at Duke), Arvind Agarwal (Ph.D., Research Scientist at Xerox Labs), Scott Alfeld (BS, now Ph.D. student at UW Madison), Adam Teichert (MS, now Ph.D. student at JHU).

Robert DeKeyser
Biographical Sketch

A. Professional Preparation

University of Leuven, Romance Philology, B.A. (summa cum laude), 1979
University of Leuven, Diploma of Spanish Studies (summa cum laude), 1979
University of Leuven, Certificate of Specialization in Psycholinguistics, 1980
University of Leuven, Teaching Credential (French), 1980
Stanford University, Master of Arts in Education, 1982
Stanford University, Doctor of Philosophy in Education, (minor in Linguistics), 1986

B. Academic Appointments

Professor, School of Languages, Literatures, and Cultures, University of Maryland, 2005-
Associate Professor of Linguistics, University of Pittsburgh, 1997-2005
Assistant Professor of Linguistics, University of Pittsburgh, 1991-1997
Visiting Assistant Professor of Linguistics, University of Pittsburgh, 1988-1991

C. Products (selected from 53 publications):

5 publications most closely related to the current proposal:

- DeKeyser, R. (2012). Interactions between individual differences, treatments, and structures in SLA. *Language Learning*, 62: S2, 189-200.
- DeKeyser, R. (2012). Aptitude. In P. Robinson (ed.), *Routledge Encyclopedia of Second Language Acquisition*. London: Routledge, pp. 27-31.
- DeKeyser, R. & Koeth, J. (2011). Cognitive aptitudes for L2 learning. In E. Hinkel (ed.), *Handbook of Research in Second Language Teaching and Learning*, Volume II. London: Routledge.
- DeKeyser, R., Alfi-Shabtay, I., Ravid, D. (2010). Cross-linguistic evidence for the nature of age effects in second language acquisition. *Applied Psycholinguistics*, 31(3), 413-438.
- DeKeyser, R. (2009). Cognitive-psychological processes in second language learning. In M. Long & C. Doughty (eds.), *Handbook of Second Language Teaching*. Oxford: Blackwell, 2009, pp. 119-138.

5 additional recent publications:

- DeKeyser, R., & Prieto Botana, G. (2014). Acquisition of grammar by instructed learners. In K. Geeslin (ed.), *The Handbook of Spanish Second Language Acquisition*. Wiley-Blackwell, pp. 449-465.
- DeKeyser, R. (2013). Age effects in second language learning: Stepping stones toward better understanding. *Language Learning*, 63(1): 52-67.
- Monner, D., Vatz, K., Morini, G., Hwang, S.-O., DeKeyser, R. (2013) Neural network models to distinguish effects of cognitive maturation from crosslinguistic interference in L2 gender acquisition. *Bilingualism, Language, and Cognition*, 16(2): 246-265.
- DeKeyser, R. (2012). Individual differences in native language attainment and their implications for research on second language acquisition. *Linguistic Approaches to Bilingualism*, 2: 260-263.
- DeKeyser, R. (2012). Age effects in second language learning. In S. Gass & A. Mackey (eds.), *Handbook of Second Language Acquisition*. New York: Routledge, pp. 442-460.

D. Synergistic activities

- Facilitated and mentored multidisciplinary working student groups spanning 4 different departments – Linguistics, Second Language Acquisition, Computer Science and Hearing and Speech Sciences. The group on critical period issues (IGERT), 2009-2012 resulted in the publication Monner, D., Vatz, K., Morini, G., Hwang, S.-O., DeKeyser, R. (2013) Neural network

models to distinguish effects of cognitive maturation from crosslinguistic interference in L2 gender acquisition. *Bilingualism, Language, and Cognition*, 16(2): 246-265.

- Service to the field of second language learning and bilingualism: Editor of *Language Learning*, 2005-2010; associate editor of *Bilingualism: Language and Cognition*, 2013- present, co-editor of book series: *Studies in Bilingualism* (Benjamins) 2009 - 2013; member of the board of directors of *Language Learning*, 2010-present. Regular manuscript reviewer for at least a dozen journals; grant reviewer for NSF, SSHCC, and equivalent agencies in Belgium, The Netherlands, Singapore, and others. Board member of *ITL Review of Applied Linguistics*.
- Engaged in outreach activities by giving a series of presentations on careers in linguistics to local high school students.
- Involved in design and implementation of successful interdisciplinary graduate training programs through participation on the Admissions and Executive Committee of the NSF – IGERT program in Language Sciences at the University of Maryland.
- Served as academic advisor for students organizing the Second Language Research Forum, a major annual international conference in the field of Second Language Acquisition hosted at the University of Maryland in 1993 and 2010.

E. Collaborators and other affiliations

Collaborators in past 48 months (13)

Goretti Prieto Botana (Director of the Spanish Writing Center, Franklin and Marshall College), Rod Ellis (University of Auckland, New Zealand), Kimberly Geeslin (Indiana University), Gisela Granena (Universitat Oberta de Catalunya), Jan Hulstijn (University of Amsterdam), So-One Hwang (Post-doc, UCSD), Joel Koeth (US government), Shaofeng Li (University of Auckland, New Zealand), Derek Monner (Software Engineer, Google), Giovanna Morini (Post-doc, University of Delaware), Lourdes Ortega (Georgetown University), Raquel Criado Sánchez (Universidad de Murcia), Natsuko Shintani (University of Singapore), Bill VanPatten (Michigan State University), Karen Vatz (University of Vermont), Jessica Williams (University of Illinois at Chicago), Richard Young (University of Wisconsin)

Own graduate and postdoctoral advisor

Shirley Heath (Professor emeritus, Stanford University)

Graduate Theses and Postdoc supervision (total = 10 PhD, 19 MA)

UMD PhD students advised:

Sunyoung Lee (PhD 2012, Foreign Service Institute), Jihye Moon (PhD 2012, Montgomery College), Charles Mueller (PhD 2012, Associate Professor at Fuji Women's University, Hokkaido, Japan), Katie Nielson (PhD 2012, Voxy - educational technology company), Goretti Prieto (PhD 2013, Franklin and Marshall College), Karen Vatz (PhD 2009, Univ. of Vermont)

University of Pittsburgh PhD students advised:

Sonia Lenk (Department of Hispanic Languages and Literatures, graduated 2007); Donald Peckham (Department of Linguistics, graduated in 2000); Marina Saiz (Department of Hispanic Languages and Literatures, graduated 2007); Tianwei Xie (School of Education, Dept. of Instruction and Learning, graduated 1992)

University of Pittsburgh MA students advised:

David Anderson, graduated 1994; Tamar Bernfeldt, graduated 2004; Jeanette Courson, graduated 1989; Hosney El-Daley, graduated 1989; Nicole Garcia, graduated 2005; Jennifer Goldschneider, graduated 1998; Donna Guardino, graduated 2000; Marcie Herman, graduated 2001; Susan Iannuzzi, graduated 2000; Jill Kinkade, graduated 1995; Veronica Lifrieri, graduated 2005; Jeffrey Micher, graduated 2000; Jesse Montgomery, graduated 2001; M. Christine O'Neill, graduated 1993; Donald Peckham, graduated 1995; Kim Pradhan, graduated 2000; Karl Sokalski, graduated 1995; Doris Strouse, graduated 1997; Robert Vazzo, graduated 1993

Naomi Feldman. Role: bridges computer science and cognitive science; human/machine learning

Naomi Feldman

A. Professional Preparation

University of Chicago	Biological Sciences, Linguistics	B.A., 2003
University of Vienna	Linguistics	M.A. (Mag.Phil.), 2005
Brown University	Cognitive Science	Ph.D., 2011

B. Appointments

2011-present Assistant Professor, Department of Linguistics, University of Maryland
Affiliate appointments in Program in Neuroscience and Cognitive Science (2011-present)
and Department of Computer Science (2013-present)

C. Selected Publications (selected from a total of 17)

(*=student project from introductory computational modeling course)

5 recent publications related to the current proposal

- Feldman, N. H., Griffiths, T. L., Goldwater, S., & Morgan, J. L. (2013). "A role for the developing lexicon in phonetic category acquisition." *Psychological Review*, 120, 751-778.
- Jansen, A., Dupoux, E., Goldwater, S., Johnson, M., Khudanpur, S., Church, K., Feldman, N., Hermansky, H., Metze, F., Rose, R., Seltzer, M., Clark, P., McGraw, I., Varadarajan, B., Bennett, E., Borschinger, B., Chiu, J., Dunbar, E., Fourtassi, A., Harwath, D., Lee, C., Levin, K., Norouzzian, A., Peddinti, V., Richardson, R., Schatz, T., & Thomas, S. (2013). "A summary of the 2012 JHU CLSP workshop on zero resource speech technologies and early language acquisition." *Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing*.
- *Orita, N., McKeown, R., Feldman, N. H., Lidz, J., & Boyd-Graber, J. (2013). "Discovering pronoun categories using discourse information." In M. Knauff, M. Pauen, N. Sebanz, & I. Wachsmuth (Eds.), *Proceedings of the 35th Annual Conference of the Cognitive Science Society* (pp. 3193-3198). Austin, TX: Cognitive Science Society.
- *Gagliardi, A., Feldman, N. H., & Lidz, J. (2012). "When suboptimal behavior is optimal and why: Modeling the acquisition of noun classes in Tsez." In N. Miyaki, D. Peebles, & R. P. Cooper (Eds.), *Proceedings of the 34th Annual Conference of the Cognitive Science Society* (pp. 360-365). Austin, TX: Cognitive Science Society.
- *Kronrod, Y., Coppess, E., & Feldman, N. H. (2012). "A unified model of categorical effects in consonant and vowel perception." In N. Miyaki, D. Peebles, & R. P. Cooper (Eds.), *Proceedings of the 34th Annual Conference of the Cognitive Science Society* (pp. 629-634). Austin, TX: Cognitive Science Society.

5 additional recent publications

- Frank, S., Feldman, N. H., & Goldwater, S. (2014). "Weak semantic context helps phonetic learning in a model of infant language acquisition." *Proceedings of the Association for Computational Linguistics*.
- Elsner, M., Goldwater, S., Feldman, N. H., & Wood, F. (2013). "A joint learning model of word segmentation, lexical acquisition, and phonetic variability." *Proceedings of the Conference on Empirical Methods in Natural Language Processing*.
- Feldman, N. H., Myers, E. B., White, K. S., Griffiths, T. L., & Morgan, J. L. (2013). "Word-level information influences phonetic learning in adults and infants." *Cognition*, 127, 427-438.
- Shi, L., Griffiths, T. L., Feldman, N. H., & Sanborn, A. N. (2010). "Exemplar models as a mechanism for performing Bayesian inference." *Psychonomic Bulletin & Review*, 17, 443-464. **(Best Article of the Year Award)**
- Feldman, N. H., Griffiths, T. L., & Morgan, J. L. (2009). "The influence of categories on perception: Explaining the perceptual magnet effect as optimal statistical inference." *Psychological Review*, 116, 752-782.

Naomi Feldman. Role: bridges computer science and cognitive science; human/machine learning

D. Synergistic Activities

- Developed and Co-taught with faculty from the Computer Science Department and the iSchool two interdisciplinary IGERT graduate seminars: Bayesian Nonparametrics (with Hal Daume, CS, and Jordan Boyd-Graber, ISchool) and Linguistic Prediction (with Hal Daume III, CS and Ellen Lau, Linguistics). Enrollment in these courses included students from computer science, linguistics, neuroscience and cognitive science, applied math, and information science
- Invited speaker at conferences spanning three disciplines: psychology (Association for Psychological Science), computer science (Cognitive Models and Computational Linguistics), and linguistics (Phonology) in 2014
- Participant in CLSP summer workshop on Zero Resource Speech Technologies and Models of Early Language Acquisition (summer 2012) and Fred Jelinek Memorial Workshop on Meaning Representations in Language and Speech Processing (summer 2014)
- Outreach service through conference organizing for *Mayfest: The Role of Computational Models in Linguistic Theory* and *Northeast Computational Phonology Workshop*, two workshops on computational methods in linguistics that were held in 2012 at the University of Maryland
- Program committee member for *Cognitive Models and Computational Linguistics* and *Psychocomputational Models of Language Acquisition*; ad-hoc reviewing includes *Cognition*, *Cognitive Science*, *Cognitive Psychology*, *Psychological Review*, Association for Computational Linguistics, Cognitive Science Society, Neural Information Processing Systems

E. Collaborators & Other Affiliations

NRT Faculty:

Hal Daume III (University of Maryland, Computer Science); Ellen Lau (University of Maryland, Linguistics), Jeff Lidz (University of Maryland, Linguistics); Rochelle Newman (University of Maryland, Hearing & Speech)

Other Faculty Collaborators:

Jordan Boyd-Graber (University of Maryland, School of Information Sciences); Micha Elsner (Ohio State University, Dept. of Linguistics); Stella Frank (University of Edinburgh, School of Informatics); Sharon Goldwater (University of Edinburgh, School of Informatics); Aren Jansen (Johns Hopkins University, CLSP/HLTCOE); Rebecca McKeown; Emily Myers (University of Connecticut, Dept. of Communication Sciences); Adam Sanborn (University of Warwick, Dept. of Psychology); Lei Shi (McKinsey & Company); Katherine White (University of Waterloo, Dept. of Psychology); Frank Wood (University of Oxford, Dept. of Engineering)

Own Graduate Advisors:

James Morgan (Brown University, Dept. of Cognitive, Linguistic, & Psychological Sciences)
Tom Griffiths (University of California, Berkeley, Dept. of Psychology)

Graduate Supervision: (*=secondary advisor with primary responsibility for computational methods)

Total = 5 PhD students

*Annie Gagliardi (Ph.D. 2012; Post-doc, Harvard University, Dept. of Linguistics)
*Shannon Barrios (Ph.D. 2013; Assistant Professor, University of Utah, Dept. of Linguistics)
Yakov Kronrod (Ph.D. expected 2014)
*Naho Orita (Ph.D. expected 2015)
Rachael Richardson (Ph.D. expected 2016)

Post-baccalaureate and Undergraduate Research Supervision:

Erin Bennett (2011-2012; Research assistant, Stanford University, Dept. of Psychology); Anna Bonnet (2012-2013; Research assistant, University of Maryland, Dept. of Linguistics); Lawrence Chen (2012-2013; Ph.D. student, McGill University, Neuroscience Program); Emily Coppess (2011-2012; Ph.D. student, University of Chicago, Dept. of Linguistics); Myles Dakan (2011); Josh Falk (2012-2013; Ph.D. student, University of Chicago, Dept. of Linguistics); Caitlin Richter (2013-present); Eliana Vornov (2013-present)

Yi Ting Huang

Biographical Sketch

A. Professional preparation

Northwestern University	Psychology, Economics	B.A.	2003
Harvard University	Developmental Psychology	A.M.	2005
Harvard University	Developmental Psychology	Ph.D.	2009
University of North Carolina at Chapel Hill	Cognitive Psychology	Post-doc	2009 – 2011

B. Appointments

2011 – present	Assistant Professor	University of Maryland College Park <i>Department of Hearing and Speech Sciences; Program in Neuroscience and Cognitive Science</i>
2009 – 2011	Postdoctoral Fellow	University of North Carolina at Chapel Hill <i>Department of Psychology</i>
2008 – 2009	Visiting Scholar	University of North Carolina at Chapel Hill <i>Department of Psychology</i>

C. Selected publications (from a total of 11)

Five publications most closely related to the current proposal:

- Huang, Y., Zheng, X., Meng, X., & Snedeker, J. (2013). Assignment of grammatical roles in the online processing of Mandarin passive sentences. *Journal of Memory and Language*, 69, 589-606.
- Huang, Y. & Snedeker, J. (2013). The use of referential context in children's on-line interpretation of scalar adjectives. *Developmental Psychology*, 49, 1090-1102.
- Huang, Y. & Gordon, P. (2011). Distinguishing the time-course of lexical and discourse processes through context, co-reference, and quantified expressions. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 37, 966-978.
- Huang, Y. & Snedeker, J. (2011). Cascading activation across levels of representation in children's lexical processing. *Journal of Child Language*, 38, 644-661.
- Huang, Y. & Snedeker, J. (2009). Semantic meaning and pragmatic interpretation in five-year-olds: Evidence from real time spoken language comprehension. *Developmental Psychology*, 45, 1723-1739.

Five other significant publications

- Huang, Y., Hopfinger, J., & Gordon, P. (2014). Distinguishing word- versus discourse-level processing using event-related potentials. *Memory and Cognition*, 42, 275-291.
- Huang, Y., Spelke, E., & Snedeker, J. (2013). What exactly do number words mean? *Language Learning and Development*, 9, 105-129.
- Huang, Y. & Pinker, S. (2010). Lexical semantics and irregular inflection. *Language and Cognitive Processes*, 25, 1411-1461.
- Huang, Y., Spelke, E., & Snedeker, J. (2010). When is 'four' far more than 'three'? Children's generalization of newly acquired number words. *Psychological Science*, 21, 600-606.
- Huang, Y. & Snedeker, J. (2009). On-line interpretation of scalar quantifiers: Insight into the semantics-pragmatics interface. *Cognitive Psychology*, 58, 376-415.

All publications available at: <http://languageandcognition.umd.edu/Publications.html>

D. Synergistic activities

- Mentoring students in interdisciplinary and cross-departmental research activities as a faculty advisor (2012 – present), language science community at University of Maryland. Lab rotations have led to successful projects including one examining socioeconomic differences in syntactic development (several conference presentations, two publications in preparation, grant submitted) and another examining processing abilities in second language learners (several conference submissions, grant submitted). Member of 5 cross-department dissertation committees and reviewer of student applications for the Language Science Center Graduate Fellows Program.
- Member (2012 – present), University of Maryland Infant and Child Studies Consortium. Collaboration between the departments of Hearing and Speech Sciences, Linguistics, Psychology, and Human Development. The main goals of this consortium are to recruit children to participate in experiments on cognitive and linguistic development and to publish an annual newsletter to parents that reports on its scientific activities.
- Service as a reviewer (2009 – present) for 15+ journals, 4 conferences, and National Science Foundation (Perception, Action, & Cognition; Linguistics).
- Editorial board member (2012 – present), Journal of Experimental Psychology: Learning, Memory, and Cognition; Archives of Scientific Psychology
- Founder/Organizer (2009 – 2011), Psychology of Language University of North Carolina Group

E. Collaborators and other affiliations

a. Collaborators in the last 48 months (excluding students)

NRT Faculty (UMD unless otherwise noted):

Matthew Goupell, Valentine Hacquard, Jeffrey Lidz, Rochelle Newman, Jared Novick, Meredith Rowe (Harvard)

Other collaborators

Jennifer Arnold	<i>University of North Carolina at Chapel Hill</i>
Gennaro Chierchia	<i>Harvard University</i>
Amy Geojo	<i>Harvard University</i>
Peter C. Gordon	<i>University of North Carolina at Chapel Hill</i>
Noemi Hahn	<i>Yeshiva University</i>
Joseph Hopfinger	<i>University of North Carolina at Chapel Hill</i>
Manizeh Khan	<i>Harvard University</i>
Xiangzhi Meng	<i>Peking University</i>
Daniele Panizza	<i>University of Geneva</i>
Steven Pinker	<i>Harvard University</i>
Jesse Snedeker	<i>Harvard University</i>
Elizabeth Spelke	<i>Harvard University</i>
Xiaobei Zheng	<i>Peking University</i>

b. Own graduate advisors and postdoctoral sponsors

Jesse Snedeker	<i>Harvard University</i>
Elizabeth Spelke	<i>Harvard University</i>
Peter C. Gordon	<i>University of North Carolina at Chapel Hill</i>
Joseph Hopfinger	<i>University of North Carolina at Chapel Hill</i>

c. Thesis and postgraduate advisees

Alix Kowalski	<i>University of Maryland College Park (PhD expected 2017)</i>
Manaar Zuhurudeen	<i>University of Maryland College Park (MA received 2013)</i>
Total number:	2

Bill Idsardi. Role: co-PI. Key bridge between neural, computational, and linguistic approaches.

William J. Idsardi
Biographical Sketch

A. Professional Preparation

University of Toronto	Mathematical Linguistics	BA, 1988
Massachusetts Institute of Technology	Linguistics	PhD, 1992

B. Appointments

University of Maryland	Linguistics	Chair	2012 –
University of Maryland	Linguistics, NACS	Professor	2011 –
University of Maryland	Linguistics, NACS	Associate Professor	2005 – 2011
York University	DLLL	Fulbright Distinguished Chair	2006
University of Delaware	Linguistics	Chair	2002 – 2005
University of Delaware	Linguistics	Acting Chair	2000 – 2002
University of Delaware	Linguistics	Associate Professor	1998 – 2005
University of Toronto	Linguistics	Fulbright Associate Professor	1999
University of Delaware	Linguistics	Assistant Professor	1992 – 1998
Bell-Northern Research		Voice Interfacing Group	1988
ESP: Educational Software Products		Product Manager, English 1	1985 – 1988

C. Selected Publications (selected from 89 publications)

Five recent publications most closely related to the current proposal:

Scharinger, M., and Idsardi, W. J. (2014) Sparseness of vowel category structure: Evidence from English dialect comparison. *Lingua* 140:35-51.

Heinz, J., and Idsardi, W. J. (2013) What complexity differences reveal about domains in language. *Topics in Cognitive Science*. 5(1): 111-131. PMID: 23335576.

Dillon, B., Dunbar, E., and Idsardi, W. J. (2013) A single stage approach to learning phonological categories: Insights from Inuktitut. *Cognitive Science*. 37(2): 344-377. PMID: 23137418.

Scharinger, M., Idsardi, W. J. and Poe, S. (2011). A Comprehensive Three-dimensional Cortical Map of Vowel Space. *Journal of Cognitive Neuroscience*. 23(12):3972-3982. 2011 May 13. Epub ahead of print. PMID: 21568638

Heinz, J., and Idsardi, W. (2011). Sentence and Word Complexity. *Science*. 333(6040): 295-297. PMID: 21764736

Five additional recent publications:

Bergelson, E., Shvartsman, M., and Idsardi W. J. (2013). Differences in mismatch responses to vowels and musical intervals: MEG evidence. *PLoS One*. 15:8(10):e76758. PMID: 24143193

Winn, M. B., Rhone, A., Chatterjee, M. and Idsardi, W. J. (2013). The use of auditory and visual context in speech perception by listeners with normal hearing and listeners with cochlear implants. *Frontiers in Psychology* 5(4):824. PMID: 24204359.

Winn, M. B., Chatterjee, M., and Idsardi, W. J. (2013) Roles of voice onset time and F0 in stop consonant voicing perception: Effects of masking noise and low-pass filtering. *Journal of Speech, Language and Hearing Research*. 56(4):1097-107. PMID: 23785185.

Scharinger, M., Monahan, P. J., and Idsardi, W. J. (2011). You had me at "Hello": Rapid extraction of dialect information from spoken words. *Neuroimage*. 56(4): 2329-2338. PMID: 21511041

Scharinger, M., Merickel J., Riley J., and Idsardi, W. J. (2011). Neuromagnetic evidence for a featural distinction of English consonants: Sensor- and source-space data. *Brain and Language*. 116(2):71-82. PMID: 21185073

D. Synergistic Activities

- Member of the Executive Committee of the NSF IGERT Biological and Computational Foundations of Language Diversity, University of Maryland, 2010 – present.
- PI (2011-2012) of Maryland Industrial Partnership funded project, developing Corpus for Advanced Speech Recognition—an annotated spoken-word corpus with applications in the development of speech recognition software.
- Chair (2013 –) of UMD Arts and Humanities Committee for First Year Research Experiences.

Bill Idsardi. Role: co-PI. Key bridge between neural, computational, and linguistic approaches.

- 2012 – present, PI, Neuromagnetic Correlates of American Dialect Perception, NSF BCS-1124877; and 2007 – 2012, co-PI, Cortical Mechanisms in Speech Perception: MEG Studies, NIH R01-DC005660-07.
- Fulbright awards in 1999 (U. of Toronto) and 2006 (Distinguished Chair Award, York U.)

E. Collaborators and other affiliations

a. Collaborators in Past 48 months (excluding students and postdoctoral researchers)

NRT faculty (UMD unless otherwise noted)

Carol Espy-Wilson, Norbert Hornstein, Ellen Lau, Jeffrey Lidz, Rochelle Newman, Colin Phillips, Maria Polinsky (Harvard/UMD), Philip Resnik, Jonathan Simon, Juan Uriagereka, Min Wang

Other collaborations:

Pedro Alcocer (Maryland), Peter Avery (York), Rebecca Baier (Maryland), Erika Bergelson (Rochester), Robert Berwick (MIT), Alan Braun (NIH), Monita Chatterjee (Boys' Town), Anna Chrabaszcz (Maryland), Anna Maria di Sciullo (UQÀM), Brian Dillon (Massachusetts), Karthik Durvasula (MSU), Michael Garr (Translate TV), Ken Grant (Walter Reed Hospital), John Halle (Bard), Virginia Heiner (Minnesota), Jeffrey Heinz (Delaware), Erin Ingvalson (Catholic University of America), Chuchu Li (Maryland), Candice Lin (Maryland), Anna Lukyanenko (Maryland), Jennifer Merickel (Rochester), Andrew Nevins (UCL), Samantha Poe (Maryland), David Poeppel (NYU), Charles Reiss (Concordia), Jerzy Rubach (Iowa/Warsaw), Shihab Shamma (Maryland), Michael Shvartsman (Michigan), Bert Vaux (Cambridge), Matthew Winn (Wisconsin)

b. Own Graduate Advisor

Morris Halle (Massachusetts Institute of Technology)

c. Graduate Thesis Supervision (total = 31, all Ph.D.; * indicates co-advisor)

Current students: *Lara Ehrenhofer, Chris Neufeld, *Chris Heffner, *Peter Enns, *Rachael Richardson, *Yakov Kronrod, *Nuria Abdul-Sabur

Ewan Dunbar	2013 (UMD)	Postdoc, LSCP, Paris
*Shannon Barrios	2013 (UMD)	Assistant Professor, University of Utah,
So-One Hwang	2012 (UMD)	Postdoc, UCSD
Joshua Riley	2011 (UMD)	Student, University of Kentucky School of Medicine
Ariane Rhone	2011 (UMD)	Postdoc, University of Iowa
*Greg Cogan	2011 (UMD)	Postdoc, NYU
*Karthik Durvasula	2010 (UDel)	Assistant Prof, Michigan State
*Philip Monahan	2009 (UMD)	Assistant Prof, U. Toronto
Ngeethai Yap	2006 (UDel),	Associate Prof, Universiti Putra Malaysia
Sun-Ah Son	2005 (UDel),	Hoseo University, Korea
*Eun-Kyung Sung	2003 (UDel)	Cyber University of Foreign Studies, Korea
Baris Kabak	2003 (UDel)	Professor, U. Würzburg
Woohyeok Chang	2003 (UDel)	Dankook University, Korea
Patcharee Imsri	2003 (UDel)	Walailak University, Thailand
*Stephanie Baker	2002 (UDel)	Sign Language Interpreter, Washington DC
Eric Raimy	1999 (UDel)	Associate Professor, U Wisconsin, Madison
Sun-Hoi Kim	1999 (UDel)	Chungang University, Korea
Thomas Purnell	1997 (UDel)	Associate Professor, U Wisconsin, Madison
Guangsheng Zhang	1996 (UDel)	

d. Postdoctoral Supervision (total = 5)

Mathias Scharinger	2009-2011, Researcher, MPI Frankfurt
Bridget Samuels	2009-2011, Senior Editor, Center for Craniofacial Molecular Biology, USC
Kristine Yu	2011-2012, Asst. Prof, UMass Amherst
Michael Key	2012-2014
Regine Lai	2013-2014

Rochelle Newman. Role: co-PI. Program direction, outreach & policy, bridge to clinical research

Rochelle Newman

<http://hesp.umd.edu/facultyprofile/Newman/Rochelle>

A. Professional Preparation

Northwestern University	Communication Science & Disorders	BSS	1991
State University of NY at Buffalo	Psychology	MS	1995
State University of NY at Buffalo	Psychology	PhD	1997

B. Appointments

2013 – present	Associate Director, Maryland Language Science Center
2013 – present	Professor, Dept. of Hearing & Speech Sciences, UMD
2014 – present	Chair, Dept. of Hearing & Speech Sciences, UMD
2012 – 2014	Director of Graduate Studies, Program in Neuroscience & Cognitive Science
2008 – 2014	Director of Graduate Studies, Dept. of Hearing & Speech Sciences
2007 – 2013	Associate Professor, Dept. of Hearing & Speech Sciences, UMD
2005 – 2007	Research Asst Professor, Center for Advanced Study of Language, UMD
2001 – 2007	Assistant Professor, Dept. of Hearing & Speech Sciences, UMD
1997 – 2001	Assistant Professor, Dept. of Psychology, University of Iowa

C. Selected publications (selected from over 40 publications)

5 recent publications related to the current proposal

- Newman, R. S., Morini, G. & Chatterjee, M. (2013). Infants' name recognition in on- and off-channel noise. *Journal of the Acoustical Society of America*, 133(5), EL377-EL383.
- Newman, R., Sawusch, J. R. & Wunnenberg, T. (2011). Cues and cue interactions in segmenting words in fluent speech. *Journal of Memory and Language*, 64(4), 460-476.
- Newman, R. S. (2009). Infant's listening in multitalker environments: Effect of the number of background talkers. *Attention, Perception & Psychophysics*, 71, 822-836. PMID: 19429961
- Newman, R.S. (2008). The level of detail in infants' word learning. *Current Directions in Psychological Science*, 17(3), 229-232.
- Newman, R. S., Bernstein Ratner, N., Jusczyk, A. M., Jusczyk, P. W. & Dow, K. A. (2006). Infants' early ability to segment the conversational speech signal predicts later language development: A retrospective analysis. *Developmental Psychology*, 42(4), 643-655.

5 additional recent publications

- Newman, R. S. & Chatterjee, M. (2013). Toddlers' recognition of noise-vocoded speech. *Journal of the Acoustical Society of America*, 133(1), 483-494.
- Panneton, R. & Newman, R. S. (2012). Development of speech perception. In R. Fay, A. Popper & L. Werner (Eds.), *Human Auditory Development*, Springer Handbook of Auditory Research.
- Michael, S., Bernstein Ratner, N., & Newman, R. S. (2012). Verb comprehension and use in children and adults with Down syndrome. *Journal of Speech, Language, and Hearing Research*, 55(6), 1736-1749.
- Newman, R. (2011). 2-year-olds' speech understanding in multi-talker environments. *Infancy*, 16(5), 447-470.
- Newman, R. S. & Sawusch, J. R. (2009). Perceptual normalization for speaking rate III: Effects of the rate of one voice on perception of another. *J. Phonetics*, 37(1), 46-65. PMID: 20046904

Synergistic activities

- Associate Director, Maryland Language Science Center and Co-PI, NSF IGERT Training Program in language science, bringing together the diverse elements of language science, and connecting students and faculty from across the U of Maryland; founder, PULSAR program, which extends interdisciplinary training and engagement in language science to undergraduate level
- Co-Founder, University of Maryland Autism Research Consortium, bringing together faculty working in the domain of autism research from across the MD campus

Rochelle Newman. Role: co-PI. Program direction, outreach & policy, bridge to clinical research

- Development of infant participant databases used by a variety of researchers, and co-Director of the Maryland Infant & Child Studies Consortium (10 participating labs).
- Reviewer for over a dozen different journals and funding agencies in the past 5 years; prior Associate Editor for the *Journal of the Acoustical Society of America*
- Research mentor for over 150 undergraduate students (currently 15 per semester) through a variety of research experience programs, and regular mentor for 3 different programs designed specifically to broaden the participation of groups underrepresented in science, and regular mentor for High School Research Interns

E. Collaborators and other affiliations

Collaborators in past 48 months (excluding students)

NRT Faculty (all UMD):

Naomi Feldman; Matt Goupell; Yi Ting Huang; Bill Idsardi; Jeff Lidz; Jared Novick; Colin Phillips; Nan Bernstein Ratner; Elizabeth Redcay; Kristin Slawson; Bob Slevc; Min Wang; Andrea Zukowski

Other collaborators:

Anthony Boemio (NIH); Monita Chatterjee (BoysTown National Research Hospital), Diane German (National Louis University), Ana Gouvea (Florida International University), David Gow (Mass. General Hospital), Prahlad Gupta (University of Iowa), Adriana Hanulikova (Albert-Ludwigs-Universität Freiburg), Esther Janse (Utrecht University), Alexandra Jesse (Univ. of Mass., Amherst), Elizabeth Johnson (University of Toronto), Gerald Kidd (Boston University), Kristin King (University of Tennessee), Kristine Onishi (McGill University), Shannon Ross-Sheehy (East Tennessee State University), Larissa Samuelson (University of Iowa), James R. Sawusch (University at Buffalo), Ruth Tincoff (Bucknell University), Frank Wijnen (Utrecht University), Amanda Woodward (University of Chicago), Grace Yeni-Komshian (University of Maryland)

Graduate advisors:

James Sawusch (main) & Paul Luce	State University of NY at Buffalo
Peter Jusczyk	late of Johns Hopkins University

*Graduate Thesis Supervision (all UMD unless otherwise indicated; * indicates co-advisor)*

Brittan Barker	MA (U of Iowa) 1999, Faculty, Louisiana State University
Andrea Krcmar & Lisa Loder	MA 2006
Stephanie Weinberg & Peitzu Tsai	MA 2007
Emily Singer, Elizabeth Blayney,	
Sarah Stimley, Sarah Haszko	MA 2008
Judith Segal	MA 2010
Sabrina Panza, Lisa Tuit	MA 2011
Megan Janssen, Anna Miller	MA 2012
Amelie Bail	MA 2013
Catherine Eaton*	PhD 2014, Asst. Professor, Rockhurst University
Giovanna Morini	PhD 2014, Postdoc, University of Delaware
Chris Heffner*, Melissa Stockbridge*	PhD expected 2017
Amritha Mallikarjun*, Brittany Jaekel*	PhD expected 2019

Total number of PhD students advised or co-advised: 6

Total number of Masters students advised: 15

Postdoctoral Supervision (total = 1)

Whitney Goodrich-Smith	postdoc, 2010-2012
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Maria Polinsky
Biographical Sketch

A. Professional Preparation

Moscow University	Philology	BA, 1979
Russian Academy of Sciences, Moscow	Linguistics	MA, 1983
Russian Academy of Sciences, Moscow	Linguistics	PhD, 1986

B. Academic Positions

2006- present	Professor, Harvard University, Linguistics
1997–2007	Assoc–Full Prof, UC San Diego, Linguistics
2003–2007	Director, Center for Research in Language, UC San Diego
1999–2003	Chair, Linguistics, UC San Diego
1995–1997	Asst-Assoc. Professor, Univ. of Southern California, Linguistics
1983-1988	Senior Researcher, Institute for Linguistics, Soviet Academy of Sciences

C. Selected Publications (selected from 153 publications)

5 recent publications related to the current proposal:

- Polinsky M, Clemens LE, Morgan AM, Xiang M, Heestand D. (2013). Resumption in English. In: Experimental syntax and Island effects, ed. Jon Sprouse. Cambridge University Press; pp. 341-360.
- Benmamoun E, Montrul S, Polinsky M. (2013). Heritage languages and their speakers: Opportunities and challenges for linguistics. *Theoretical Linguistics*. 2013;39:129-181
- Kwon N, Kluender R, Kutas M, Polinsky M. (2013). Subject/object processing asymmetries in Korean relative clauses: Evidence from ERP data. *Language*, 89, 537-585.
- Polinsky M, Gallo CG, Graff P, Kravtchenko E, Morgan AM, Sturgeon A. (2013) Subject islands are different. In: Experimental syntax and Island effects, ed. Jon Sprouse. Cambridge University Press; 2013. pp. 286-309.
- Viswanath A, Polinsky M. (2012). A look at Heritage English. In: Formal Approaches to Heritage Languages. Amherst, MA: UMass Amherst.

5 additional recent publications:

- Polinsky, M. (under contract). Heritage Languages: Incomplete Acquisition and First Language Loss. Cambridge University Press.
- Polinsky, M. (in press). Raising and control. In Marcel den Dikken (ed.), *The Cambridge Handbook of Generative Syntax*. Cambridge University Press.
- Bahadir G, Polinsky M. (2012) Is Structural Priming Sensitive to the Phrase-Clause Distinction? Concealed Question NPs versus Embedded Interrogatives and Declaratives. *CogSci* 2012.
- Polinsky, M., Gomez-Gallo, C., & Kravtchenko, E. (2012). Subject preference and ergativity. *Lingua*, 122, 267-277.
- Polinsky, M. (2011). Reanalysis in adult heritage language: A case for attrition. *Studies in Second Language Acquisition*, 33: 305–328.

D. Synergistic Activities

- Director, National Heritage Language Institute (2007–present) and co-Director for Research, National Heritage Language Research Center (UCLA), engaging in extensive research in heritage languages and application of research to pedagogical approaches for heritage language learners
- Visiting professorships in the past 5 years at UCLA, UC Berkeley, École Normale Supérieure (Paris), University of Hamburg, Utrecht University, Stanford University
- Served as advisory board member for: Child Bilingualism Center, Chinese University of Hong Kong (2009–); University of Maryland IGERT in language science (2010–2014); International

Centre for Language Revitalization, National Maori Language Institute, New Zealand (2011-);
Zentrum für allgemeine Sprachwissenschaft, Berlin (2007-2013)

- Associate Editor for *Natural Language and Linguistic Theory* (2007-), and for *Language* (1998-2001). Member of editorial boards of: *Linguistic Inquiry*, *Heritage Language Journal*, *Linguistic Approaches to Bilingualism*, *Oxford Bibliographies Online (Linguistics)*, *Journal of Slavic Linguistics*, *Empirical Approaches to Linguistic Theory*, *Studies in Language*, *Linguistic Discovery*, *Language and Linguistics Compass*, *Theoretical Linguistics*, *University of California Publications in Linguistics*, *Handbooks in Linguistics*, *Linguistic Discovery*, *Linguistics*
- Member of Executive Committee, Linguistic Society of America (2010-2013); and Expert Panel on Linguistics, National Science Foundation, 2002-2005;

E. Collaborators and other Affiliations

a. Collaborators in Past 48 Months (graduate students and postdocs are listed in (c) below)

NRT Faculty:

Norbert Hornstein	U of Maryland (syntactic theory)
Jeff Lidz	U of Maryland (child language acquisition)
Colin Phillips	U of Maryland (psycholinguistics)
Omer Preminger	U of Maryland (syntactic theory)

Other Collaborators:

Nicoleta Bateman	CSU, San Marcos (Romanian morphology)
Elabbas Benmamoun	University of Illinois at Urbana-Champaign (heritage language)
Bernard Comrie	Max Planck Institute for Evolutionary Anthropology (lang. typology)
Peter Gordon	U of North Carolina (psycholinguistics)
Steven Matthews	U of Hong Kong (language typology)
Philip Monahan	Basque Center on Cognition, Brain and Language (Korean syntax)
Olga Kagan	UCLA (heritage language education)
Marta Kutas	UCSD (cognitive neuroscience)
Silvina Montrul	University of Illinois at Urbana-Champaign (heritage lang. acquisition)
Eric Potsdam	University of Florida (syntactic theory)

b. Own Graduate & Postdoctoral Advisor

Prof. Georgy Klimov, Russian Academy of Sciences, Institute for Linguistics

c. Graduate Theses and Postdoc Supervision

Doctoral students supervised (total = 5)

Lauren Eby Clements	PhD. in progress	Harvard University
Peter Jenks	Ph.D. 2011, Harvard	Asst. Prof., UC Berkeley
Shinichiro Fukuda	Ph.D. 2009, UCSD	Asst. Prof., University of Hawaii
Nayoung Kwon	Ph.D. 2008, UCSD	Asst. Prof., Nanyang Tech. U. of Singapore
Ezra van Everbroeck	Ph.D. 2007, UCSD	Dir. Social Sciences Computing Facility, UCSD

Postdocs supervised within last 5 years (total = 6)

Ann Gagliardi	post-doc, 2012-present	
Pedro Mateo Pedro	post-doc, 2010-present	(plans to direct res. center in Guatemala)
Omer Preminger	post-doc, 2010-2012	Asst. Prof., Syracuse University
Carlos Gomez Gallo	post-doc, 2009-2011	post-doc, University of Miami
Jessica Coon	post-doc, 2010-2011	Asst. Prof., McGill University
Ming Xiang	post-doc, 2007-2009	Asst. Prof., University of Chicago

Rebecca Silverman. Role: bridge to applications of science in education, specialist in study of diverse groups

Rebecca Silverman

A. Professional Preparation

George Washington University, Washington, DC, English, B.A., 1998

Harvard Graduate School of Education, Cambridge, MA, Human Development & Psychology, EdM, 2001

Harvard Graduate School of Education, Cambridge, MA, Human Development & Psychology, EdD, 2005

B. Appointments

Director, Maryland Language and Literacy Research Center, University of Maryland (UMD), 2014-present

Associate Professor, Dept of Counseling, Higher Education, and Special Education, UMD, 2012-present

Assistant Professor, Dept. of Special Education, UMD, 2006-2012

Director, Jeanne Chall Reading Lab, Harvard Graduate School of Education, 2005-2006

C. Publications (selected out of 34 publications)

Related publications

Silverman, R.D., Coker, D.L. Proctor, C.P, Harring, J.R., Piantedosi, K., & Meyer, A.G. (in press). The relationship between language skills and writing outcomes for linguistically diverse students in upper elementary school. *Elementary School Journal*.

Ritchey, K.D., Silverman, R.D., Schatschneider, C., & Speece, D.L. (in press). Prediction and stability of reading problems in middle childhood. *Journal of Learning Disabilities*. Silverman, R.D., Proctor, C.P., Harring, J.R., Doyle, B., Mitchell, M.A., & Meyer, A.G. (2014) Teachers' instruction and students' vocabulary and comprehension: An exploratory study with English monolingual and Spanish-English bilingual students in grades 3-5. *Reading Research Quarterly*, 49, 31-60.

Silverman, R. (2013). Investigating video as a means to promote vocabulary for at-risk children. *Contemporary Educational Psychology*, 38(3), 170-179.

Proctor, P., Silverman, R., Harring, J. R., & Montecillo, C. (2012). The role of vocabulary depth in predicting reading comprehension among English monolingual and Spanish-English bilingual children in elementary school. *Reading and Writing: An Interdisciplinary Journal*, 25(7), 1635-1664.

Silverman, R. & Hines, S. (2009). The effects of multimedia enhanced instruction on the vocabulary of English language learners and non-English language learners in pre-kindergarten through second grade. *Journal of Educational Psychology*, 101(2), 305-314.

Other recent publications

Silverman, R. D. & Meyer, A. G. (in press). Developing vocabulary and oral language in young children. New York, NY: Guilford Press.

Silverman R., Speece, D. L., Harring, J. R., & Ritchey, K. (2013). Fluency has a role in the Simple View of Reading. *Scientific Studies of Reading*, 17(2) 108-133.

Silverman, R., Crandell, J., & Carlis, L. (2013). Read Alouds and Beyond: The Effects of Read Aloud Extension Activities on Vocabulary in Head Start Classrooms. *Early Education and Development*, 24(2), 98-122.

Ritchey, K. D., Silverman, R. D., Montanaro, E. A., Speece, D. L., & Schatschneider, C. (2012). Effects of a Tier 2 supplemental reading intervention for at-risk fourth grade students. *Exceptional Children*, 78(3), 318-334.

Silverman, R. & Crandell, J. (2010). Vocabulary strategies in pre-kindergarten and kindergarten classrooms. *Reading Research Quarterly*, 45(3), 318-340.

D. Synergistic Activities

- Director, Maryland Language and Literacy Research Center, which brings together language and literacy researchers (faculty and students) interested in studying these constructs in educational contexts.
- PI or Co-PI on six federally-funded grants (2 National Institutes of Health research grants, 3 Institute of Education Sciences research grants, and 1 Institute of Education Sciences training

Rebecca Silverman. Role: bridge to applications of science in education, specialist in study of diverse groups

grant) bringing together groups of researchers and research assistants (graduate and undergraduate students) to study problems of language and literacy in school settings.

- Editorial Board member of the following journals: *Reading Research Quarterly*, *Elementary School Journal*, *Journal of Literacy Research*, *Contemporary Educational Psychology*, *Reading Psychology*, and *Reading and Writing Quarterly*.
- Content Director of *Martha Speaks*, an educational television show produced by WGBH Boston.
- Advisor on the federally-funded Ready to Learn grant from the Institute of Education Sciences/Department of Education to the Public Broadcasting Service and Corporation for Public Broadcasting.

E. Collaborators

Collaborators in the past 48 months:

NRT faculty: Meredith Rowe (Harvard University),

Other faculty collaborators:

Lydia Carlis (Apple Tree Institute)
Shannon Daniel (Vanderbilt University)
Amanda Goodwin (Vanderbilt University)
Jeffrey Harring (University of Maryland);
Michael Keiffer (New York University);
Melinda Martin-Beltran (University of Maryland)
Catherine Michener (UC Irvine)
Elizabeth Montanaro (Catholic University)
Megan Peercy (University of Maryland);
Yaacov Petchser (Florida State University)
Patrick Proctor (Boston College);
Kristen Ritchey (University of Delaware);
Deborah Speece (Virginia Commonwealth University);
Christopher Schatschneider (Florida State University)
Young Suk-Kim (Florida State University)
Ana Taboada Barber (University of Maryland);
Jade Wexler (University of Maryland);

Doctoral and Postdoctoral advisees (total = 7 PhD, 1 post-doc)

Past Students:

Dawn Jacobs (Ph.D., 2010, Notre Dame University of Maryland)
Lydia Carlis (Ph.D., 2010, Apple Tree Institute for Early Learning)
Elizabeth Montanaro (Ph.D., 2012, Catholic University);

Current Students:

Kimberly Palombo (Ph.D. expected in 2015)
Christine Goode (Ph.D. expected in 2015)
Brie Doyle (Ph.D. expected in 2015)
Anna Meyer (Ph.D. expected in 2017)
Stephanie Guthrie (Post-Doctoral Student 2013-2016)

Own Ed.D. Advisor:

Catherine Snow (Harvard Graduate School of Education)

KerryAnn O'Meara
Biographical Sketch

A. Professional Preparation

Loyola College	English	B.A., 1993
Ohio State University	Higher Education Administration	M.A., 1995
University of Maryland, College Park	Education Policy	Ph.D., 2000

B. Appointments

- Co-Director (2011 to present) and Co-PI (2010 to present), University of Maryland ADVANCE Grant for Inclusive Excellence.
- Associate Professor, Department of Counseling, Higher Education & Special Education, College of Education, University of Maryland. August 2007 to present.
- Faculty Affiliate of the Women Studies Program and University of Maryland's Consortium on Race, Gender, and Ethnicity (CRGE). May 2011 to present.
- Associate Professor (June-August 2007) and Assistant Professor (August 2001 to May 2007), Department of Education Policy, Research, and Administration, School of Education, University of Massachusetts Amherst.
- Project Coordinator, Harvard Project on Faculty Appointments (now COACHE), Graduate School of Education, Harvard University, April 1999 to July 2001.

C. Selected Publications (from a total of 113)

5 recent publications most closely related to the current proposal

O'Meara, K. (2013). Advancing Graduate Student Agency. *Higher Education in Review*, 10, 1-10.

O'Meara, K., Knudsen, K., & Jones, J. (2013). The role of emotional competencies in faculty-doctoral student relationships. *Review of Higher Education*, 36(3), 315-348.

O'Meara, K. (2011). *Faculty Civic Engagement: New Training, Assumptions, and Markets needed for the Engaged American Scholar*. (pp. 177-198) John Saltmarsh and Matt Hartley, (Eds). "To serve a larger purpose:" Engagement for Democracy and the Transformation of Higher Education. Philadelphia, PA: Temple University Press.

Colbeck, C.L., O'Meara, K. & Austin, A. (eds). (2008). Educating Integrated Professionals: Theory and Practice on Preparation for the Professoriate. *New Directions for Teaching and Learning*, Volume 113.

O'Meara, K. (2008). *Graduate education and community engagement*. P. 27-43. In Colbeck, C.L., O'Meara, K. & Austin, A. (eds). (2008). Educating Integrated Professionals: Theory and Practice on Preparation for the Professoriate. *New Directions for Teaching and Learning*, Volume 113.

5 additional recent publications

Niehaus, E. & O'Meara, K. (in press). Invisible but Essential: The Role of Professional Networks in Promoting Faculty Agency in Career Advancement. *Innovative Higher Education*, 40(2).

Campbell, C., & O'Meara, K. (2013). Faculty agency: Departmental contexts that matter in faculty careers. *Research in Higher Education*, 54(4), 49-74.

Terosky, A., & O'Meara, K. (2011) Assuming agency: The power of strategy and networks in faculty professional lives. *Liberal Education*, 97(3/4), 54-59.

O'Meara, K. (2007). Stepping Up: How one faculty learning community influenced faculty members' understanding and use of active learning methods and course design. *Journal on Excellence in College Teaching*. 18 (2), 97-118.

O'Meara, K. (2005). The courage to be experimental: How one faculty learning community influenced faculty teaching careers, understanding of how students learn, and assessment. *Journal of Faculty Development*, 20(3), 153-160.

D. Synergistic Activities

- Co-PI and Co-Director of University of Maryland ADVANCE Program for Inclusive Excellence, supervising internal evaluation and leading the project's social science research, including university-wide faculty work environment survey, exit interviews, and studies of gender and disciplinary differences in support of professional growth and agency at every career stage. See: <http://www.advance.umd.edu/research>.
- Co-director (with Dr. Kimberly Griffin) of social science research studies on the effect of University of Maryland System NSF-funded AGEP Promise program on under-represented minority graduate student persistence, professional growth, and career choice.
- Supporting interdisciplinary and engaged research teams, grant writing and strategic communications training via ADVANCE program seed grants of \$20,000. This model has resulted in over 5 million in external grants funded in subsequent related projects.
- Served as an external evaluator and /or researcher for the UMass STEMTEC program, College Board, Kettering Foundation, Luce Foundation, former AAHE, AASCU, and Teagle Foundation.
- Served on the interdisciplinary subcommittee of the university-wide promotion and tenure taskforce at the University of Maryland (2012-2014).

E. Collaborators & Other Affiliations.

a. Collaborators in the last 48 months.

Betsy Beise	University of Maryland, Associate Provost for Academic Planning and Programs
Darryll Pines	University of Maryland, Dean of the Clark School of Engineering
Corbin Campbell	Teachers College, Columbia University
Audrey Jaeger	North Carolina State University
Anna Neumann	Teachers College, Columbia University
Elizabeth Niehaus	University of Nebraska, Lincoln
Aimee Terosky	Teachers College, Columbia University

b. Own Graduate and Postdoctoral Advisors.

Robert Birnbaum (now Emeritus, University of Maryland).

c. Graduate Theses and Postdoctoral supervision

Doctoral students advised (8 graduated, 9 in progress)

Regina Kaufman (Ph.D., UMass Amherst 2007). Professor, Springfield College.

Claudine Keenan (Ph.D., UMass Amherst 2007). Dean of Education, Richard Stockton College of NJ.

Kathy Mangano (Ph.D., UMass Amherst 2007). Associate Professor, Springfield College.

Alan Bloomgarden (Ph.D., UMass Amherst 2008). Coordinator, Community Based Learning, Mt. Holyoke.

Richard Satterlee (Ph.D., UMD 2009). Vice President for Student Affairs, Manhattan College.

Corbin Campbell (Ph.D., UMD 2012). Assistant Professor, Teachers College, Columbia University.

Amy Martin (Ph.D., UMD 2013). Associate Director of Residence Life, University of Maryland.

Helen Schurke Frasier (Ph.D., UMD 2013). Director of Analysis and Policy, Graduate School, UC Davis.

Current UMD doctoral students: Jessica Bennett (co-advisor), Kelly Cowdery, Jennifer Eliason, Amilcar Guzman, Andrew Louder, Neruh Ramirez, Mark Rivera.

UMD MA students (12 graduated, 4 in progress)

Cynthia Eichele, MA 2010; Alexis Janda, MA 2010; Katrina Knudson, MA 2010; Robyn Baylor, MA 2011; Christina Colasanto, MA 2011; Eric Johnson, MA 2011; Amy Levine, MA 2011; Chelsea Bente, MA 2012; Laura Lilly, MA 2012; Chelsea Waugaman, MA 2012; Anna Haller, MA 2014; Matthew Wootten, MA 2014.

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION				FOR NSF USE ONLY		
University of Maryland College Park				PROPOSAL NO.		DURATION (months)
						Proposed
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Colin Phillips				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer
				CAL	ACAD	SUMR
1. Colin Phillips - Professor and Director				1.00	0.00	0.00
2. Summer Camp Faculty - Rotating Co-PIs				0.00	0.00	2.00
3. KerryAnn O'Meara - Lead Assessment Evaluator				0.00	0.00	1.20
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)				1.00	0.00	3.20
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				9.00	0.00	0.00
3. (1) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (0) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ 160,000						
2. TRAVEL 30,000						
3. SUBSISTENCE 11,820						
4. OTHER 114,801						
TOTAL NUMBER OF PARTICIPANTS (10) TOTAL PARTICIPANT COSTS						
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 52.0000, Base: 173090)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PD NAME Colin Phillips				FOR NSF USE ONLY		
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION		
				Date Checked	Date Of Rate Sheet	Initials - ORG

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR **2**

ORGANIZATION				FOR NSF USE ONLY			
University of Maryland College Park				PROPOSAL NO.		DURATION (months)	
						<div style="display: flex; justify-content: space-between;"> Proposed Granted </div>	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Colin Phillips				AWARD NO.			
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	
				CAL	ACAD	SUMR	Funds granted by NSF (if different)
1. Colin Phillips - Professor and Director				1.00	0.00	0.00	19,279
2. Summer Camp Faculty - Rotating Co-PIs				0.00	0.00	2.00	24,480
3. KerryAnn O'Meara - Lead Assessment Evaluator				0.00	0.00	1.20	15,164
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)				1.00	0.00	3.20	58,923
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				9.00	0.00	0.00	59,551
3. (1) GRADUATE STUDENTS							12,240
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							130,714
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							22,980
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							153,694
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							4,010
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 160,000							
2. TRAVEL 30,600							
3. SUBSISTENCE 11,938							
4. OTHER 116,285							
TOTAL NUMBER OF PARTICIPANTS (10) TOTAL PARTICIPANT COSTS							318,823
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							5,500
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							1,428
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							18,528
H. TOTAL DIRECT COSTS (A THROUGH G)							495,055
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 52.0000, Base: 176232)							
TOTAL INDIRECT COSTS (F&A)							91,641
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							586,696
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							586,696
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Colin Phillips				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION				FOR NSF USE ONLY		
University of Maryland College Park				PROPOSAL NO.		DURATION (months)
						Proposed Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Colin Phillips				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer
				CAL	ACAD	SUMR
1. Colin Phillips - Professor and Director				1.00	0.00	0.00
2. Summer Camp Faculty - Rotating Co-PIs				0.00	0.00	2.00
3. KerryAnn O'Meara - Lead Assessment Evaluator				0.00	0.00	1.20
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)				1.00	0.00	3.20
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				9.00	0.00	0.00
3. (1) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (0) OTHER						
TOTAL SALARIES AND WAGES (A + B)						133,329
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						23,439
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						156,768
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						4,010
2. FOREIGN						0
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ 160,000						
2. TRAVEL 31,212						
3. SUBSISTENCE 12,058						
4. OTHER 117,804						
TOTAL NUMBER OF PARTICIPANTS (10) TOTAL PARTICIPANT COSTS						321,074
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						5,500
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						1,457
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						0
TOTAL OTHER DIRECT COSTS						18,659
H. TOTAL DIRECT COSTS (A THROUGH G)						500,511
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 52.0000, Base: 179436)						
TOTAL INDIRECT COSTS (F&A)						93,307
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						593,818
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						593,818
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PD NAME Colin Phillips				FOR NSF USE ONLY		
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION		
				Date Checked	Date Of Rate Sheet	Initials - ORG

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION				FOR NSF USE ONLY			
University of Maryland College Park				PROPOSAL NO.		DURATION (months)	
						Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Colin Phillips				AWARD NO.			
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Colin Phillips - Professor and Director				1.00	0.00	0.00	20,058
2. Summer Camp Faculty - Rotating Co-PIs				0.00	0.00	2.00	25,469
3. KerryAnn O'Meara - Lead Assessment Evaluator				0.00	0.00	1.20	15,777
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)				1.00	0.00	3.20	61,304
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				9.00	0.00	0.00	61,957
3. (1) GRADUATE STUDENTS							12,734
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							135,995
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							23,908
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							159,903
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							4,010
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 160,000							
2. TRAVEL 31,836							
3. SUBSISTENCE 12,178							
4. OTHER 119,359							
TOTAL NUMBER OF PARTICIPANTS (10) TOTAL PARTICIPANT COSTS							323,373
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							5,500
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							1,486
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							18,792
H. TOTAL DIRECT COSTS (A THROUGH G)							506,078
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 52.0000, Base: 182704)							
TOTAL INDIRECT COSTS (F&A)							95,006
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							601,084
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							601,084
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Colin Phillips				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION				FOR NSF USE ONLY		
University of Maryland College Park				PROPOSAL NO.		DURATION (months)
						Proposed
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Colin Phillips				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer
				CAL	ACAD	SUMR
1. Colin Phillips - Professor and Director				1.00	0.00	0.00
2. Summer Camp Faculty - Rotating Co-PIs				0.00	0.00	2.00
3. KerryAnn O'Meara - Lead Assessment Evaluator				0.00	0.00	1.20
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)				1.00	0.00	3.20
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				9.00	0.00	0.00
3. (1) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (0) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ 160,000						
2. TRAVEL 32,473						
3. SUBSISTENCE 12,300						
4. OTHER 120,951						
TOTAL NUMBER OF PARTICIPANTS (10) TOTAL PARTICIPANT COSTS						
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 52.0000, Base: 186038)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PD NAME Colin Phillips				FOR NSF USE ONLY		
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION		
				Date Checked	Date Of Rate Sheet	Initials - ORG

5 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION University of Maryland College Park				FOR NSF USE ONLY		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Colin Phillips				PROPOSAL NO.		DURATION (months)
				Proposed		Granted
AWARD NO.						
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer
				CAL	ACAD	SUMR
1. Colin Phillips - Professor and Director				5.00	0.00	0.00
2. Summer Camp Faculty - Rotating Co-PIs				0.00	0.00	10.00
3. KerryAnn O'Meara - Lead Assessment Evaluator				0.00	0.00	6.00
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)				5.00	0.00	16.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				45.00	0.00	0.00
3. (5) GRADUATE STUDENTS						62,448
4. (0) UNDERGRADUATE STUDENTS						0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6. (0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)						666,903
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						117,242
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						784,145
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						20,050
2. FOREIGN						0
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ 800,000						
2. TRAVEL 156,121						
3. SUBSISTENCE 60,294						
4. OTHER 589,200						
TOTAL NUMBER OF PARTICIPANTS (50) TOTAL PARTICIPANT COSTS						1,605,615
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						27,500
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						7,286
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						0
TOTAL OTHER DIRECT COSTS						93,306
H. TOTAL DIRECT COSTS (A THROUGH G)						2,503,116
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
TOTAL INDIRECT COSTS (F&A)						466,701
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						2,969,817
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						2,969,817
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PD NAME Colin Phillips				FOR NSF USE ONLY		
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION		
				Date Checked	Date Of Rate Sheet	Initials - ORG

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Budget Justification

Senior Personnel. Funds are budgeted for 1 month of salary per year for the PI, who will be involved in all aspects of the management and leadership of the program. An additional 2 months of senior faculty salary support per year are budgeted to cover planning, organizing, and leading the 4-week long Summer Camp intensive research workshop and to facilitate the development of new courses and training activities. These costs have been estimated using average summer salaries for senior faculty on the NRT team. Program assessment activities will be carried out by a senior faculty member with research expertise in evaluation (KerryAnn O'Meara) and will be funded for six months over five years (budgeted at 1.2 months/year). A 2% inflation rate is used for years 2-5 to cover expected University of Maryland cost-of-living increases.

Other Personnel. A Program Coordinator (75% FTE) will be responsible for the day-to-day management and coordination of NRT activities, including trainee recruitment, tracking trainee progress, assessment and evaluation support and guidance, ensuring the overall active participation of trainees and faculty in program activities, organizing and implementing the annual Summer Camp workshop, and overseeing new trainee research efforts that are developed via NRT program activities. The coordinator is also responsible for program communications, budgeting and financial management, establishing and maintaining partnerships, and program reporting. A half-time 12-month Graduate Assistant will work with the program evaluation lead (Dr. O'Meara) on all aspects of program assessment, contributing to research on the impact of NRT activities.

Fringe Benefits. UMCP does not have a fringe benefit rate, actual costs are charged accordingly. The PI's fringe benefits are 16% of direct costs based on his 12-month appointment. For the two senior faculty and the assessment lead 8% of direct costs covers summer fringe benefits, based on their 9/9.5 month appointments. For the Program Coordinator we have budgeted 25% of the monthly base salary. The Graduate Assistant (assessment) is budgeted at 15% of their half time RA appointment.

Travel. This category includes registration costs for the NRT annual meeting for the PI, the Program Coordinator and one trainee (3*\$170 per year). No travel funds for the NSF conference are included due to our proximity to Washington DC. This budget line also includes travel costs associated with the annual External Advisory Board visit to UMD which is a two day & one night meeting including 5 Board Members for whom we estimate \$1000 lodging (5 x \$200/person per night) and an average of \$2500 for travel (5 x \$500/person).

Participant Support

STIPENDS. Each of the NRT stipend-funded trainees (5 trainees in Years 1- 5) will be supported for 12 consecutive months by \$32,000, as specified by NSF. All trainees, whether funded by an NRT stipend or another source, will join the NRT program after submission of a training plan in their first year at UMD, and they will be regarded as an NRT trainee for the remainder of their graduate career. All trainees are expected to participate in one Summer Camp workshop during their graduate career, with the specific year guided by the student's research focus. All trainees are expected to participate in the Winter Storm workshop each year from when they join the NRT program until their penultimate PhD year. The NRT program will cover full stipends for 25 trainees over the lifetime of the project, but based on our NSF-IGERT experience, we anticipate that the total number of NRT trainees will be closer to 50.

NRT STUDENT TRAVEL. Travel support is budgeted at \$1500 per trip, intended to cover the cost of travel, accommodation, and registration at meetings where the trainee gives a presentation based on his/her collaborative/interdisciplinary NRT research projects. Example: Cognitive Neuroscience meeting in San Francisco: \$650 flight/ground transportation + \$650 accommodation/meals + \$200 registration = \$1500 total. Typical meeting costs are less expensive than this in some disciplines, e.g., Linguistics, and more expensive in others, e.g., Computer Science. We budget 20 trainee trips per year, intended to cover trainees who are currently supported by an NSF stipend and trainees who are not, either because they are beyond the stipend year, or because they have other funding. Trainees will be working on collaborative interdisciplinary projects and it is important that they learn to communicate this research effectively to audiences that are closer and further from their 'home' area. We anticipate 10 new trainees in the program each year, and at peak capacity there will be 30-40 NRT trainees simultaneously in the program, so the estimate of 20 trips per year is conservative. 2% inflation is budgeted for years 2-5.

Budget Justification

RESEARCH SUPPORT. \$25,000 is budgeted to partially defray trainees' NRT-related research expenses. These are for costs of research that is directly related to students' training, and not covered by existing research grants in the student's home lab. It is intended to facilitate the development of new collaborative / interdisciplinary initiatives, primarily student-led, that could lead to independent grant applications in the future. Project proposals will emerge from Summer Camps, from Winter Storm working groups, and from NRT seminars. Funds for research initiatives will not be guaranteed, and trainees or teams will submit brief applications for research support. In some instances, trainees will be given seed/pilot funding for a preliminary study, and then invited to apply for further support based on the initial outcomes. Typical costs will include experimental participant fees, equipment usage (e.g., for electrophysiology studies), or electronic corpora or other materials for computational research. A 2% inflation rate budgeted for in years 2-5.

TUITION & HEALTH CARE. The program covers full-time graduate tuition, fees, and health insurance corresponding to the NRT-funded trainees' 12 months of funding. Per UMD guidelines, tuition is exempt from facilities and administrative costs.

SUMMER CAMP. "Summer Camp" is the name for an annual 4 week intensive research workshop that will serve NRT trainees, UMD faculty, and selected external participants. Summer Camp is not a summer school or instructional activity. It is intended as an incubator for collaborative research. Summer camp costs are budgeted under "Participant Support – Other" and "Participant Support – Subsistence".

Teams of students and faculty will work closely together on one interdisciplinary research theme per year, and NRT trainees will be expected to participate in one Summer Camp workshop during their PhD program, with the specific year determined based on the student's interests. In order to increase the success and the impact of the workshops, funds are budgeted to bring 3 external faculty and 4 external students each year. These funds will be assigned competitively.

External students are budgeted at \$2,535 each for a month (\$1275 for lodging in a UMD student residence, \$1260 subsistence, based on UMD per diem rate). 1% inflation is assumed for years 2-5.

External faculty are budgeted at \$5,210 each for a month (\$1700 for UMD temporary housing, \$1260 subsistence, based on UMD per diem rate, \$750 travel and \$1500 honorarium). The external faculty are included as participants because they will be involved as researchers who collaborate with NRT trainees and faculty. They will not be involved as workshop organizers (that role will be handled collaboratively by NRT faculty and trainees), and they will not be involved in an instructional capacity. NRT trainees will benefit from working closely with leaders or future leaders in their field, and we expect this to lead to further collaborations beyond the Summer Camp. Especially in fields where faculty have many opportunities for funding from grants, contracts, and industry consulting, such as computer science, it is not easy to recruit faculty to devote substantial time to an interdisciplinary research workshop of this kind. The small honoraria are included in recognition of this challenge. 1% inflation is assumed for years 2-5.

\$4500 each year is budgeted to provide for research expenditures associated with Summer Camp (experimental participant fees, informants, translators, etc).

WINTER STORM & LANGUAGE SCIENCE DAY. Winter Storm and Language Science Day are two key events in the year for NRT trainees. Funds for these events are included under "Participant Support – Other" and "Participant Support – Subsistence". A 1% inflation rate is assumed in years 2-5.

Winter Storm is an annual 2-week intensive workshop, student led, focused on skills training, interdisciplinary seminars and professional development. It is held during UMD's January winter session. Based on past experience, we anticipate around 100 participants per year, consisting of 40-50 current or prospective NRT trainees and around 10 additional students who participate in all Winter Storm activities, plus around 40 faculty and other students who participate in some of the activities. Winter Storm is a key component of trainee preparation, and is also a primary recruitment tool for the program. \$1500 is

Budget Justification

budgeted to cover the costs of room and equipment rentals, and costs for experimental design, participant fees, and data as needed.

Language Science Day is a one day event held at the start of each academic year, generally on a Friday in September. It will be a key event for recruiting participants to NRT, for synthesizing previous year outcomes and goals for the new year, for fostering broad commitment to the goals of the NRT program, and for communicating to a diverse interdisciplinary audience. We anticipate 150-200 participants each year. \$500 is budgeted to partially cover the costs of room rentals and supplies for the event.

PARTICIPANT SUPPORT – SUBSISTENCE

Events. Winter Storm will include a daily working lunch session featuring interdisciplinary talks, discussions, and planning activities for NRT trainees. \$1500 is budgeted to cover 9 days (\$165/day). Language Science Day will include a working lunch for NRT trainees, NRT recruits, and NRT faculty, focused on planning for the upcoming year's activities. \$1000 is budgeted as partial support for this activity. The annual External Advisory Board meeting includes a student focus group meeting with the advisory board, held during lunchtime (NRT faculty will meet separately during that time period). \$500 is budgeted as partial support for this activity. Summer Camp Participants. The 7 external participants in Summer Camp will receive subsistence support at the UMD per diem rate (\$1260/month), \$8820 for each month-long Summer Camp workshop.

PARTICIPANT SUPPORT – OTHER

Break-out of Year 1 costs

NRT Trainee/Team Research Seed Funds	\$25,000
Summer Camp (excl. subsistence)	\$21,450
4 External student participants (\$1275/ea.)	
3 External faculty participants (\$3950/ea.)	
NRT Training Events (excl. subsistence)	\$2,000
Winter Storm (\$1500)	
Language Science Day (\$500)	
Tuition, Fees, & Health (\$13,270/trainee)	\$66,351

Other

MATERIALS AND SUPPLIES. A variety of materials and supplies will be needed to run Winter Storm, the Summer Camp, seminars, courses, and other activities specific to the NRT program. \$3,500 is budgeted each year to cover such materials and supplies associated directly with program activities. Additionally, we budget \$2000 per year for costs associated with program assessment, to cover the cost of participation incentives (Amazon gift cards) for students in a comparison group at peer institutions.

PUBLICATION AND DISSEMINATION. Funds in this category are exclusively for materials associated with recruitment and promotion of the project's activities including web design and brochure printing and mailing. A 2% inflation rate is budgeted for years 2-5.

HONORARIUM-ADVISORY BOARD. The five members of the External Advisory Board will receive a \$500 honorarium each year (total \$2500).

CONSULTANT SERVICES. Dr. Ann Austin of Michigan State University will serve as the program's evaluation "auditor", as required by NRT guidelines.

ASL INTERPRETING. \$5,000/year is budgeted for American Sign Language interpreting services. This will make NRT program activities accessible to deaf students from nearby Gallaudet University. A 2% cost increase is budgeted for years 2-5.

Indirect costs. The current UMD F&A rate is 52% on modified total direct costs. Participant support costs, per NSF policies, are exempt from F&A.

BIOGRAPHICAL SKETCH

Not Applicable

BIOGRAPHICAL SKETCH

Not Applicable

BIOGRAPHICAL SKETCH

Not Applicable

BIOGRAPHICAL SKETCH

Not Applicable

BIOGRAPHICAL SKETCH

Not applicable

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.			
Investigator: Colin Phillips	Other agencies (including NSF) to which this proposal has been/will be submitted.		
<p>Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title: IGERT: Biological and Computational Foundations of Language Diversity</p> <p>Source of Support: NSF</p> <p>Total Award Amount: \$ 3,002,614 Total Award Period Covered: 07/15/08 - 06/30/15</p> <p>Location of Project: University of Maryland</p> <p>Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 0.00 Sumr: 1.00</p>			
<p>Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title: Structure Generation in Language Comprehension</p> <p>Source of Support: NSF</p> <p>Total Award Amount: \$ 517,026 Total Award Period Covered: 07/01/09 - 06/30/15</p> <p>Location of Project: University of Maryland</p> <p>Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 0.00 Sumr: 1.00</p>			
<p>Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title: Doctoral Dissertation Research: Interactions between Language Experience and Cognitive Abilities in Word Learning and Word Recognition</p> <p>Source of Support: NSF</p> <p>Total Award Amount: \$ 18,240 Total Award Period Covered: 09/01/13 - 08/31/15</p> <p>Location of Project: University of Maryland</p> <p>Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 0.00 Sumr: 0.00</p>			
<p>Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title:</p> <p>Source of Support:</p> <p>Total Award Amount: \$ Total Award Period Covered:</p> <p>Location of Project:</p> <p>Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:</p>			
<p>Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title:</p> <p>Source of Support:</p> <p>Total Award Amount: \$ Total Award Period Covered:</p> <p>Location of Project:</p> <p>Person-Months Per Year Committed to the Project. Cal: Acad: Summ:</p>			

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.	
Investigator: Hal Daume	Other agencies (including NSF) to which this proposal has been/will be submitted.

Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: RI: Medium: Learned Dynamic Priorization
Source of Support: Johns Hopkins University/NSF Total Award Amount: \$ 415,132 Total Award Period Covered: 08/15/10 - 07/31/14 Location of Project: JHU and UMD Person-Months Per Year Committed to the Project. Cal:0.40 Acad: 0.00 Sumr: 0.00

Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: RI: Small: Bayesian Thinking on Your Feet - Embedding Generative Models in Reinforcement Learning for Sequentially Revealed Data
Source of Support: NSF Total Award Amount: \$ 500,000 Total Award Period Covered: 08/01/13 - 07/31/16 Location of Project: UMD Person-Months Per Year Committed to the Project. Cal:0.50 Acad: 0.00 Sumr: 0.00

Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: NRI: Collaborative: ATLASS: Attention through Language, Action, Sights and Sounds or a Co-robot
Source of Support: NSF Total Award Amount: \$ 1,020,172 Total Award Period Covered: 09/01/14 - 08/31/17 Location of Project: Person-Months Per Year Committed to the Project. Cal:1.00 Acad: 0.00 Sumr: 0.00

Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: CRONOS: Cognitive Robots that Go and Fetch Objects
Source of Support: NSF Total Award Amount: \$ 800,000 Total Award Period Covered: 08/01/14 - 07/31/17 Location of Project: Person-Months Per Year Committed to the Project. Cal:0.25 Acad: 0.00 Sumr: 0.00

Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title:
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Summ:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.			
Investigator: Robert DeKeyser	Other agencies (including NSF) to which this proposal has been/will be submitted.		

Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support	Project/Proposal Title: Not Applicable
Source of Support: N/A Total Award Amount: \$ 0 Total Award Period Covered: 01/01/00 - 01/01/00 Location of Project: N/A Person-Months Per Year Committed to the Project. Cal: 0.00 Acad: 0.00 Sumr: 0.00	

Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support	Project/Proposal Title:
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:	

Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support	Project/Proposal Title:
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:	

Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support	Project/Proposal Title:
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:	

Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support	Project/Proposal Title:
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Summ:	

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.			
Investigator: William Idsardi	Other agencies (including NSF) to which this proposal has been/will be submitted.		
<p>Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title: Neuromagnetic correlates of American dialect perception</p> <p>Source of Support: NSF</p> <p>Total Award Amount: \$ 164,700 Total Award Period Covered: 09/01/11 - 02/28/15</p> <p>Location of Project: UMD</p> <p>Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 0.00 Sumr: 0.00</p>			
<p>Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title: Neurophysiological measures of phonological and auditory processing</p> <p>Source of Support: NSF</p> <p>Total Award Amount: \$ 423,336 Total Award Period Covered: 09/01/14 - 08/31/16</p> <p>Location of Project: UMD</p> <p>Person-Months Per Year Committed to the Project. Cal:1.00 Acad: 0.00 Sumr: 0.00</p>			
<p>Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title:</p> <p>Source of Support:</p> <p>Total Award Amount: \$ Total Award Period Covered:</p> <p>Location of Project:</p> <p>Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:</p>			
<p>Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title:</p> <p>Source of Support:</p> <p>Total Award Amount: \$ Total Award Period Covered:</p> <p>Location of Project:</p> <p>Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:</p>			
<p>Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title:</p> <p>Source of Support:</p> <p>Total Award Amount: \$ Total Award Period Covered:</p> <p>Location of Project:</p> <p>Person-Months Per Year Committed to the Project. Cal: Acad: Summ:</p>			

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.	
Investigator: Rochelle Newman	Other agencies (including NSF) to which this proposal has been/will be submitted.

Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Doctoral Dissertation Research Grant: Interactions between language experience and cognitive abilities in word learning
Source of Support: NSF Total Award Amount: \$ 12,000 Total Award Period Covered: 09/01/13 - 08/31/15 Location of Project: University of Maryland Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 0.00 Sumr: 0.00

Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Why does musical training affect second language learning
Source of Support: Grammy Foundation Total Award Amount: \$ 20,000 Total Award Period Covered: 06/01/14 - 05/30/15 Location of Project: University of Maryland Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 0.00 Sumr: 0.00

Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: New tools for new questions: A multi-site approach to studying the development of selective attention in crib bilinguals
Source of Support: NSF Total Award Amount: \$ 462,751 Total Award Period Covered: 07/01/12 - 06/30/16 Location of Project: University of Maryland Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 0.00 Sumr: 1.00

Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: How Autism affects understanding in multitalker environments
Source of Support: DoD CDMRP Total Award Amount: \$ 100,000 Total Award Period Covered: 10/01/12 - 09/30/14 Location of Project: University of Maryland Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 0.00 Sumr: 0.00

Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: IGERT: Biological and Computational Foundations of Language Diversity
Source of Support: NSF Total Award Amount: \$ 3,002,614 Total Award Period Covered: 07/15/08 - 06/30/15 Location of Project: University of Maryland Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 0.00 Summ: 0.00

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.	
Investigator: Summer Camp Faculty	Other agencies (including NSF) to which this proposal has been/will be submitted.

Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Not Applicable
Source of Support: Total Award Amount: \$ 0 Total Award Period Covered: 01/01/00 - 01/01/00 Location of Project: Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 0.00 Sumr: 0.00

Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title:
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title:
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title:
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title:
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Summ:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

(See GPG Section II.D.8 for guidance on information to include on this form.)

Other agencies (including NSF) to which this proposal has been/will be submitted.

Person-Months Per Year Committed to the	Cal:	Acad: .45	Sumr: .15
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Person-Months Per Year Committed to the	Cal:	Acad:	Sumr: 1.2
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Person-Months Per Year Committed to the	Cal: 2.00	Acad:	Sumr:
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Person-Months Per Year Committed to the Project.	Cal:	Acad:	Sumr:
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Person-Months Per Year Committed to the Project.	Cal:	Acad:	Sumr:
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NSF Form 1239 (10/99)

9. Facilities, Equipment, and other Resources

Facilities and Instrumentation Available for Training Purposes. Trainees have access to a wealth of resources that allow them to conduct interdisciplinary research on learning from multi-scale data.

1. Physical resources.

- The Maryland Neuroimaging Center is an 8000sf shared facility that includes a Siemens Trio 3T MRI scanner, and a 160-channel whole-head magneto-encephalography scanner. Members of the language science group played key roles in establishing this new center; Phillips was co-PI.
- The Cognitive Neuroscience of Language Lab is a 5000sf suite of labs, containing shared electro-encephalography, 2 eye-trackers, an infant testing suite, behavioral testing facilities, offices and meeting spaces. Although housed in Linguistics, the lab is widely used by others.
- The University of Maryland Institute for Advanced Computing Studies (UMIACS) provides state-of-the-art infrastructure that can support the computational aspects of the NRT program.
- The Language Science Center has 2000sf of shared space suitable for collaboration, meetings, events, and testing. LSC will move to a renovated 4000sf space in Y2 of the project, providing a hub for NRT activities, including the Summer Camp workshops.

2. Human resources.

- The Center for Advanced Study of Language and the National Foreign Language Center provide unique bridges between academia and government research needs relating to language.
- The Infant and Child Studies Network, managed by LSC, provides resources to support the recruiting of ~2000 children per year for participation in research studies at the university.
- The Washington DC metro area provides extensive resources relating to language diversity (local communities and foreign embassies) and to science policy, via partnerships with national and international professional organizations.
- UMD is home to a large, integrated community of language scientists (well beyond the 10 “core” faculty members; this will enhance student opportunities for training, collaboration, and mentoring.

Institutional Plans that Address Facilitation of the Traineeship. The University of Maryland is committed to interdisciplinary language science as a university-wide priority. As described in the Provost’s letter, this provides staff, shared space, and additional faculty, with hires targeted at interdisciplinary scientists.

- Trainees’ engagement in international research activities is greatly facilitated by the support of the Office of International Affairs and the Vice President for Research (see joint support letter).
- The viability of interdisciplinary teaching is facilitated by strong support from deans for cross-college seminars.
- Access to training in science policy is facilitated by the support of UMD’s federal liaison, Rae Grad, and by the deep language policy ties of Richard Brecht (special assistant to VP for Research)

How Successful Approaches, Policies, and Infrastructure will be Sustained. Multiple strategies will ensure the sustainability of new activities introduced via NRT. All focus on creating culture change throughout a community. The successful sustainment of IGERT activities shows our ability to bring about such changes -- a cohort of 9 “post-IGERT” students, all unfunded, recently joined our new interdisciplinary program.

- Engaging large numbers of faculty in program activities and leadership creates a sustainable community; the Language Science Center serves to facilitate this long-term synergy.
- Involvement of unfunded trainees from the start of the program highlights the intrinsic benefits of participation, making the transition beyond NSF support more feasible.
- Sustainability requires a broad and multi-generational leadership base: we nurture newer faculty for leadership roles, and will encourage mid-career faculty to participate in leadership development programs, such as offered by the NSF-ADVANCE program.
- Transmission of best practices within and across institutions contributes to the sustainability of the model: addressed in support letters from Graduate School and Vice President for Research.

Data Management Plan

Data types and materials

The project will generate and make use of data in two broad categories: (1) research data; and (2) assessment data.

(1) Research data: Given the range of disciplines, research activities and collaborations involved, this project will yield a wide variety of research data types. Trainees, faculty and other participants will collect and create experimental psycholinguistic and neuroimaging data, language corpora, computational models and tools, language documentation and analysis, survey, behavioral and clinical data, among other types of data.

(2) Assessment data. Assessment activities are a key component of the project, and assessment data will include: survey data from faculty, trainees and other participants in our programs; reports on project activities; advisory board review; focus groups; and PhD program exit interviews.

Responsibility

The NRT project PI is responsible for management of program-related data that is generated through assessment activities or program-specific workshops such as Winter Storm. Faculty PIs of specific research projects are responsible for the management of data from those projects, including data resulting from the work of trainee researchers under their supervision.

Discussion and review of data management and data dissemination will form part of the annual review process undertaken by the internal executive committee.

Data formats, storage and access

Data will be stored in a variety of formats appropriate to the specific data types. During the project, some types of data will be collected and stored in proprietary formats; however, we encourage the use of openly available formats for long-term data preservation wherever possible.

Data may be initially collected and stored on local machines, but will then be transferred and stored in secure locations (e.g. servers or cloud storage, including department, college and University of Maryland Division of IT servers, which include extensive backup and security measures). Data stored in these locations will be accessible to researchers directly involved with data collection and analysis. The PIs of individual research projects will determine access to such data.

In addition, sensitive data (e.g. HIPAA-protected data) will be de-identified where possible and/or will have appropriate security protections which are approved by the University's Institutional Review Board.

Dissemination of data

We are committed to broad and timely dissemination of results from both research and assessment activities.

We will be generating a range of data types, and the path from collection to curation to distribution will vary as a function of the data type and source. Some data can be made publicly available immediately (such as language or mapping data suitable for inclusion in *Langscape*); other data will be tied to publication cycles. We expect that one of the valuable student training outcomes will be familiarity with different disciplinary practices in data dissemination.

We expect that trainees and other participants will be actively involved in sharing the results of their research activities as a central part of their participation in this project. Specific outlets and mechanisms for this dissemination will be appropriate to the relevant disciplines. The project supports open access publication, and student publications in high quality open access outlets will be considered an appropriate use of project funds. While research data will primarily be reported in journals and at conference presentations, de-identified non-aggregate data (including behavioral data, computational modeling outcomes, and stimulus recordings) will be made available to other researchers upon written request.

As part of training in effective outreach, science communication, and the application of research results to issues in education, technology and health, participants will also share results of their work with diverse audiences beyond the academic community.

We have made all assessment reports from our previous IGERT project publicly available and downloadable from our website. We plan to continue this practice as part of our commitment to identifying and developing effective training practices and allowing others to make use of what we have learned.

Ethics and Privacy

Data from research involving human subjects—including assessment data—will be collected, managed and stored in compliance with all requirements of the University's Institutional Review Board and under guidelines of appropriate professional organizations in the participating disciplines (e.g. ASHA, APA, LSA). Data will generally be reported in aggregate in journals and at conference presentations, but may be presented in a de-identified non-aggregate form for some purposes (e.g., individual quotes that come from focus groups).

As noted above, sensitive data (e.g. HIPAA-protected data) will be de-identified where possible and/or will have appropriate security protections approved by the IRB. For example, fMRI data will be stored in compliance with detailed guidelines that have been developed by the Maryland Neuroimaging Center and approved by the University of Maryland IRB.

Training related to data management

Since responsibility for research data management lies with individual PIs, the accessibility of data is at their discretion and is guided by best practices and ethical standards in their various fields; however, as part of student training related to the data theme of this project, we will include training sessions on accessible data management.

Beyond their formal research and data management training, trainees and other participants will have access to faculty with diverse and significant expertise in collecting and managing a variety of language data and related data types. For example, faculty expertise in field linguistics (Maria Polinsky, Omer Preminger, among others) enables us to provide detailed training concerning sustainable language documentation, culturally sensitive language data and other potential issues in research on minority and endangered languages. Faculty and researchers in our large and well-established Infant and Child Studies Consortium (10 faculty, including Rochelle Newman, Jeffrey Lidz, Naomi Feldman) contribute extensive experience in collecting, maintaining and sharing child language and developmental data, and several faculty (particularly Nan Bernstein Ratner) have extensive experience submitting and interacting with child corpora data in the CHILDES (Child Language Data Exchange System) Archive, part of the TalkBank system (www.talkbank.org).

Intellectual property rights

Individual PIs and their institutions will retain intellectual property rights to data generated by their research activities.

Archiving

Identification of data which have long-term value and require archival protection will be determined by individual PIs at the completion of each specific research project. We will consult with the University of Maryland Division of Information Technology and the University of Maryland Libraries to identify appropriate methods of preserving such data.

Where data generated in the course of this project can be integrated as part of a larger, ongoing data collection effort (such as the *Langscape* database and tools), long-term data storage will be addressed by the ongoing project.



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OFFICE OF THE SENIOR VICE PRESIDENT AND PROVOST

June 24, 2014

Colin Phillips
Professor & Director
Maryland Language Science Center
University of Maryland
College Park, MD 20742

Dear Colin,

I am writing to express the strong support of the University of Maryland for the NRT proposal Flexibility in Language Processes and Technology: Human and Global Scale.

This initiative is shared by 6 colleges of the university: the College of Arts & Humanities; the College of Behavioral & Social Sciences; the College of Computational, Mathematical, & Natural Sciences; the College of Education; the A. James Clark School of Engineering; and the College of Information Studies. It includes over 50 faculty members from 17 departments and centers. If funded, the project will train graduate students to be entrepreneurial, interdisciplinary scholars who can work in diverse teams, communicate broadly, and relate science to policy.

As described in the proposal, this project represents a new experiment in innovative graduate education that builds upon a highly successful IGERT award. In 2007 the corresponding institutional support letter stated that the university and colleges will use the IGERT as a catalyst for their long-term development efforts related to language. I am happy to report that this is exactly what happened. The grassroots language science community has undergone a lasting transformation: it is now broader and deeper, it has attracted much new talent and created sustainable change in the intellectual culture of the university, which is reflected in the 2013 launch of the Maryland Language Science Center (LSC) as a major priority of the university that supports the goals of the NRT program in many ways:

- A Tier III Major Research Initiative award supports LSC's infrastructure, providing staff support for interdisciplinary research and coordination of cross-department initiatives.
- Many hires in language science support the programs' goals, including recent interdisciplinary hires in 8 departments since the start of IGERT, plus 4 new senior hires associated with the LSC; the first of these is Maria Polinsky, whose upcoming move from Harvard adds key strength in heritage languages and in the integration of lab-based techniques with fieldwork.
- Dedicated space for the LSC: temporary space is already heavily used, and new dedicated space is planned for Y2 of the proposed project;
- Recent creation of the Maryland Neuroimaging Center, providing combined MRI and MEG technologies, provides a valuable resource for NRT trainees.
- Individual colleges and the Division of Research are supporting interdisciplinary language science efforts via IT, development, and communications infrastructure.
- Program technical needs are supported in part by a full-time RA who works with Colin Phillips, and via portable eye-tracking and electrophysiology equipment that will be acquired in connection with the Polinsky appointment.

The university supports interdisciplinary research and training via multiple mechanisms particularly relevant to young faculty who are often the primary role models for doctoral students in the NRT program.

- The university recognizes the substantial benefits of co-taught courses involving faculty from different colleges or departments. My office and the deans are committed to removing institutional barriers to this kind of collaboration.
- The university's new promotion and tenure guidelines include specific provisions to recognize interdisciplinary scholarship.
- We are committed to reducing barriers to interdisciplinary scholarship in graduate program structures.
- A task force is currently devising plans for a new interdisciplinary Brain and Behavior Institute.

The NRT programs' plans for public engagement via outreach and via training in science-policy connections aligns perfectly with one of the university's core values. The university takes seriously its Land Grant status, as evidenced by the annual Maryland Day open house, which in 2014 brought around 80,000 members of the public to the university to enjoy the university's rich scientific, artistic, and athletic resources for a day. The university also aims to make the most of its fortunate situation as the largest research university in the Washington DC metro area by engaging with the many national and international organizations that are on our doorstep.

The University of Maryland is strongly committed to diversity and inclusion in all of its activities and is proud of the diversity of its student body. In recent years more minority PhDs received bachelor's degrees at Maryland than at almost any other non-HBCU in the country, reflecting the talent present in the undergraduate population. The colleges offer various forms of support for recruiting minority graduate students, plus programs that support the transition from undergraduate to graduate study, such as McNair Scholars, the NSF-AGEP program for graduate students, and the summer scholars program in the College of Behavioral and Social Sciences. The NSF-ADVANCE program, led by core NRT team member KerryAnn O'Meara, supports the career development of women and minority scholars, and its activities have directly supported many of the NRT faculty. Additionally, the university's participation in the Washington DC consortium of universities is especially valuable for allowing deaf students from Gallaudet University to participate in language science activities, as it ensures access to quality sign language interpreting services, via the university's Disabilities Support Services (DSS).

Finally, as required by NRT guidelines, I can confirm that NRT trainees on stipend in the program will not be personally charged for tuition, health insurance, or required fees. [cf. nsf14548.pdf, p. 12] Thank you for considering support for this outstanding project.

Sincerely yours,

A handwritten signature in cursive script, reading "Mary Ann Rankin".

Mary Ann Rankin, Ph. D.
Senior Vice President and Provost



UNIVERSITY OF MARYLAND

THE GRADUATE SCHOOL
Office of the Dean

2125 Lee Building
College Park, Maryland 20742-5121
301.405.0358 TEL 301.314.9305 FAX

June 22, 2014

Dear Colin,

It was a pleasure to meet with you and Rochelle Newman to discuss ways in which the Graduate School can partner with your NRT training program to ensure institution-wide benefits from NSF's investment in your "experiment in graduate education." Let me speak below to some of the specifics we discussed.

The Graduate School collaborates with its partners to identify and disseminates best practices across the university. Difficult to achieve in a top-down fashion, we have adopted a number of strategies to enhance communications. Since students are very responsive to ideas and values that come from peers and mentors, we focus on programs that prepare faculty and student role models, such as programs in our own NSF-funded AGE. In our principal Graduate Student Writing initiative, for example, faculty nominate skilled graduate students as Writing Fellows, who we then train to provide one-on-one writing consultation to other students in our Graduate Writing Center.

Following this overall strategy, the Graduate school could combine existing and new activities to maximize the impact of programs like yours. We currently disseminate best practices via the large, elected University Graduate Council, regular meetings with College Associate Deans for Graduate Education (CADGE) and with over 100 campus Directors and Coordinators of Graduate Studies, plus, of course, a robust website and numerous mailing lists. We would be very interested in advancing the NRT program, and several possibilities present themselves.

- Creating initial awareness by having you and representatives from other successful training programs make presentations to meetings of the groups mentioned above.
- Building on the initial awareness by collaborating on more intensive workshops targeted at the faculty highly receptive to innovation, those faculty involved in initiating new graduate programs or revising current programs. Program leaders like yourself could play a key role in these workshops.
- Finally, engaging outstanding interdisciplinary students to develop and transmit new ideas across programs. You report success with this in your IGERT program, and we have seen similar success with our Society of Flagship Fellows, International Graduate Research Fellows, and other similar programs. I would welcome the opportunity to work with you in extending this approach to a university-wide model that recruits and enables interdisciplinary students to help build academic and institutional bridges between traditionally disconnected units.

The Graduate School can also support this proposal through our Student Success programs, including our Writing and our Preparation for Multiple Career Paths initiatives. We provide student travel grants to support both conference attendance and research, and we have initiated several campus-wide awards to provide recognition that help students as they begin their careers. Students from your IGERT program have been particularly successful in these competitions, particularly with regards to university leadership and scholarship. This is a clear sign of the excellence and engagement of students in your training programs, and a record of success I fully expect will continue.

Sincerely,

Charles Caramello
Associate Provost and Dean



UNIVERSITY of MARYLAND
RESEARCH

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College Park, Maryland 20742-5125
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OFFICE OF THE VICE PRESIDENT & CHIEF RESEARCH OFFICER

June 23, 2014

Colin Phillips
Professor & Director
Maryland Language Science Center
1413 F Marie Mount Hall
Campus Zip 7311

Dear Colin,

We would like to convey our enthusiastic support for your graduate training program *NRT-DESE: Flexibility in Language Processes and Technology: Human and Global Scale*. The Division of Research is already a strong supporter of Maryland's Language Science efforts, but here we would like to specifically address how we can support the international reach of your program. Language Science is a key component of the university's international research strategy. It is a unique interdisciplinary strength of the university; it is an area that is necessarily global, and it is globally necessary. Our offices do not offer graduate support, but we can do much that will enhance the experience of trainees in your program.

We are already supporting your efforts to create a global research network in Language Science. Jointly or individually, we have recently visited Language Science groups in Tel Aviv, Edinburgh, and Lund, with a view to fostering international collaborations, and we have committed resources to strengthening those connections. We have also hosted visits by university leaders from Tübingen and Leiden, allowing us to develop further links with strong groups in Language Science. As you know, the University of Maryland is a member of the Universitas21 global consortium of research universities, and we are working with you to develop Language Science as a signature theme for U21. Together with you, we have recently been able to marshal support from 20 of the 27 U21 universities, from Presidents and Vice Chancellors to individual faculty. This includes many institutions with significant interdisciplinary strengths in language, such as Edinburgh, Melbourne, McGill, Hong Kong, Singapore, Connecticut, Ohio State, Lund, Amsterdam, and Auckland. The goals of the international network align with your NRT program's goals in many regards:

- The U21 network will collaborate on public-facing initiatives in language science, adding an international dimension to your work in outreach and science-policy links. In particular, the Division of Research will help to coordinate a global summit linking language scientists with international policymakers, similar to a recent national event on brain trauma research that we organized on Capitol Hill.
- The Office of International Affairs is committed to forging needed connections between research and student mobility ('Study Abroad'), and we hope that these efforts will create opportunities for mentoring and collaboration for graduate students in your NRT program.
- Our Global Classrooms Initiative supports classes and seminars that bring together students from different universities for joint, project-based, international, virtual learning experiences, which can allow further enrichment of your program's interdisciplinary seminar offerings.
- The Division of Research currently provides development support for the Langscape global mapping project, which provides a valuable focus for your data collection and curation efforts.

We firmly believe that an international orientation will enrich your trainees' education, and will also contribute to the dissemination of your innovations in graduate training.

Sincerely,

Patrick G. O'Shea
Vice President for Research

Ross D. Lewin
Associate Vice President for International Affairs

June 22, 2014

Dear Colin,

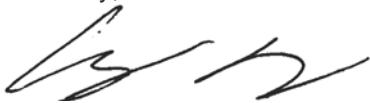
The Center for Advanced Study of Language (CASL) enthusiastically supports your NRT proposal. CASL is already a major partner in the University of Maryland's language science initiative, and the goals of your NRT program align closely with CASL's expertise and objectives. Founded in 2003, CASL is the first and only national resource dedicated to addressing government research needs in the area of language. September 11, 2001 caused a dramatic shift in government priorities and needs in many areas, including in language. In particular, it highlighted the need to shift from maintaining expertise in a handful of target languages to a focus on building flexible expertise that be applied to any language of the world, at short notice. CASL's staff currently includes 50 PhD-level scientists, drawn from multiple areas of language science, plus a broad array of research assistants and external collaborating faculty from the University of Maryland and elsewhere. Although CASL scientists typically have security clearance, allowing them to better understand client needs, all are regular UMD research faculty who conduct unclassified research and publish in standard peer-reviewed outlets.

CASL can enrich your NRT training program in at least the following ways:

- CASL's research mission is directly aligned with your NRT program. Your focus on flexibility in human learners and in language technology is directly relevant to the most urgent language needs of government and industry.
- CASL is therefore ideally suited to support your trainee's preparation for non-academic careers. Students who partner with CASL researchers can see a direct link between their academic research and career opportunities involving research outside the traditional professorial track.
- CASL can leverage its rich network of government partnerships to enhance the NRT program's policy efforts. For example, CASL will guide students in their search for internships with government organizations that are tasked with moving innovative language learning approaches from the lab into practice.
- CASL sponsors an annual summer internship program that brings students from around the country to work in language science labs at CASL and throughout the University of Maryland. This provides collaboration and mentoring opportunities for your trainees.
- CASL researchers provide valuable expertise in many of the research areas that your program targets, including learner modeling via data science, less commonly-taught languages, computational tools for low-resource languages, and heritage languages.

On a personal note, I was a co-PI on your IGERT project, and throughout my career I have been dedicated to building bridges between computer science and linguistics/psychology. I am strongly invested in the continued success of your program, and firmly believe that CASL can help to realize your goals.

Sincerely,



Amy Weinberg
Executive Director



UNIVERSITY OF MARYLAND

COLLEGE OF EDUCATION
*Department of Counseling, Higher Education
and Special Education*

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June 19, 2014

Dear Colin,

I am pleased to work with you on the program assessment for your graduate training program *NRT-DESE: Flexibility in Language Processes and Technology: Human and Global Scale*. I have enjoyed discussing your past and future plans, and I believe that my experience and current position make me well-suited to achieving NSF's two goals for the assessment: first, to evaluate the effectiveness of your program for its trainees; second, to assess the broader impacts of the program on our institution and beyond.

I am currently Associate Professor of Higher Education in the College of Education. In my research I focus on academic career development at the faculty and doctoral level. I am particularly interested in agency, civic engagement, and interdisciplinarity. All of these relate closely to the goals of your training program. I am also currently Co-Director of the university's NSF-ADVANCE Program for Inclusive Excellence, a program that aims to lead AAU/Big10 universities in women's representation, retention, satisfaction, and professional growth. ADVANCE focuses on enablers of success in early career faculty, as well as leadership development in more advanced faculty. We also serve faculty of color and faculty development more broadly. In light of the institutional changes that ADVANCE has already brought about for faculty development, I am well positioned to advise your group on how to link research to institutional change in graduate education. The other members of the ADVANCE leadership team include the Provost, Associate Provosts, Dean of Engineering, and many other senior officials.

I look forward to working with Dr. Ann Austin, Professor of Higher Education at Michigan State University in her role as the external evaluation "auditor" for the project. Dr. Austin is a leading expert on organizational change in higher education and in doctoral education reform, a former President of the Association for the Study of Higher Education (ASHE), and she is currently co-PI of the nationwide NSF-CIRTL network (*Center for the Integration of Research, Teaching, and Learning*). It would be hard to think of a person better qualified to oversee our efforts.

As described in more detail in the proposal, the evaluation process will extend throughout the program, and will include formative and summative assessment of the program's direct impact on individual trainees, and on the program's broader impact on the institution and on your discipline(s). We will seek to engage a comparison group of students in related fields at similar institutions, in an effort to better understand the effectiveness of your 'experiment' in graduate training. Also, I have seen that in your prior program evaluation you engaged students in the formative assessment of their own program, with the rationale that this increases their agency and 'ownership' of the program, leading to greater investment in change, and greater understanding of how to build interdisciplinary programs. I am happy to continue to engage students in this process, as it contributes to their training.

Sincerely,

Kerry Ann O'Meara

Associate Professor of Higher Education & Co-Director
NSF-ADVANCE Program for Inclusive Excellence

MICHIGAN STATE UNIVERSITY

June 19, 2014

Dear Colin,

I would like to confirm my willingness to serve in the role of external assessment auditor for your project *Flexibility in Language Processes: Human and Global Scale*. It is my understanding that in this role I will work with your local evaluation lead, Dr. KerryAnn O'Meara. KerryAnn and I have written together on preparing graduate students for the professoriate, and she served on my advisory board for a recent NSF-funded ADVANCE PAID project on organizational change in higher education. Thus, I am confident that I can work effectively with her. You are in good hands with having KerryAnn lead your evaluation team as she brings significant expertise in graduate education, faculty careers and interdisciplinary research, and program evaluation. I understand that I will visit your university for your annual external advisory committee meetings, to meet with your students, faculty, and advisory board, and that I will be in touch with KerryAnn or your team at other times via phone or email.

The project that you describe in your proposal sounds very interesting and related to my areas of expertise, which include doctoral student development, and program evaluation. I am currently Professor of Higher, Adult, and Lifelong Education at Michigan State University, where I hold the Erickson Distinguished Chair. My research concerns faculty careers and professional development, teaching and learning in higher education, the academic workplace, and organizational change. In the area of doctoral education, my research has examined the training of future faculty to be integrated professionals, the role of advisors, preparing doctoral students for shifting expectations in their future faculty careers, and reform in institutional practices. I am a Past-President of the Association for the Study of Higher Education (ASHE), and I am PI of an NSF-funded ADVANCE PAID grant to study organizational change strategies that support the success of women scholars in STEM fields. Of particular relevance to your project, I am Co-PI of the Center for the Integration of Research, Teaching, and Learning (CIRTL), funded by NSF. CIRTL seeks to improve undergraduate STEM education by preparing future faculty who are able to more effectively integrate teaching with research. I lead the research and evaluation team for the CIRTL network, which now spans 22 research universities across the country.

Good luck with your submission, and I look forward to working with you in the future.

Sincerely,



Ann E. Austin
Mildred B. Erickson Professor of Higher, Adult, and Lifelong Education



**COLLEGE OF
EDUCATION**
Department of
Educational
Administration

HALE Program
K-12 Program

620 Farm Lane, Room 418
East Lansing, MI 48824

517-355-4538
Fax: 517-884-1392



AMERICAN
PSYCHOLOGICAL
ASSOCIATION

June 17, 2014

Dr. Rochelle Newman
Maryland Language Science Center
0100 Lefrak Hall
University of Maryland
College Park, MD 20742

Dear Dr. Newman,

The American Psychological Association (APA) is pleased to submit this letter of commitment in support of the University of Maryland Language Science Center's proposal for *NRT-DESE: Flexibility in language processes and technology: Human- and Global-Scale*.

If this NRT proposal is funded, APA will work with the University of Maryland Language Sciences Center to provide innovative experiences in broader communication for doctoral students in the program, while simultaneously advancing APA's mission of promoting research in psychology. These experiences would provide students with an opportunity to acquire experience communicating basic science to policy-makers, and might include briefings on how psychological science affects public policy issues, visits to Capitol Hill, shadowing lobbyists, development and execution of advocacy messages, and similar activities.

The American Psychological Association (APA) is the largest scientific and professional organization representing the field of psychology in the United States. APA is the world's largest association of psychologists, with nearly 130,000 researchers, educators, clinicians, consultants and students among its membership.

Our mission is to advance the creation, communication and application of psychological knowledge to benefit society and improve people's lives. A top priority of APA's strategic plan is to promote a broad public understanding of psychology as a STEM discipline. As such, APA's activities include translating psychological findings for policy-makers and government officials, and offer an excellent opportunity for the doctoral students in your program.

We look forward to working with the University of Maryland on this new experiment in graduate education; please feel free to contact me should further information be needed at this time.

Sincerely,

A handwritten signature in black ink that reads "Steven J. Breckler".

Steven J. Breckler

750 First Street, NE
Washington, DC 20002-4242
(202) 336-5938
(202) 336-5953 Fax

Steven J. Breckler, Ph.D.
Executive Director for Science
sbreckler@apa.org
www.apa.org/science



June 20, 2014

Colin Phillips
Maryland Language Science Center
0121 Taliaferro Hall, University of Maryland
College Park, MD 20742

Dear Colin:

Thank you for providing the LSA with a draft of your proposal for training graduate students in linking science and policy, *Flexibility in Language Processes and Technology: Human and Global Scale*. The Society would be pleased to partner with your group on this, as we share many of the same goals regarding communicating the value of linguistics research to a broader audience.

If this program is funded, the LSA will work with the Maryland Language Science Center to provide innovative experiences to doctoral students, while serving the LSA's mission of advancing the scientific study of language. Students could participate in such activities as helping to prepare materials that explain language science findings to policy makers, shadowing LSA staff, developing policy briefing materials, or integrating findings from different fields relating to the scientific study of language.

The LSA is the world's largest organization representing the scientific study of language, serving 4000 members from the United States and around the world. The LSA plays a critical role in supporting and disseminating linguistic scholarship both to professional linguists and to the general public. It also serves as the primary voice of linguists in policy discussions relating to language, addressing such issues as multilingualism, minority language rights, language in education, and public funding for linguistic research.

The LSA also partners with a diverse array of other organizations and coalitions on its policy agenda, such as the Consortium of Social Science Associations, the American Council of Learned Societies, and the Coalition for National Science Funding. I am pleased to learn that a number of other organizations are involved in your proposed program, and this presents enhanced opportunities for collaboration across groups.

We hope that we will have the opportunity to work further with the University of Maryland on this promising initiative.

Sincerely,

Executive Director



AMERICAN
SPEECH-LANGUAGE-
HEARING
ASSOCIATION

June 18, 2014

To Whom It May Concern:

The American Speech-Language-Hearing Association (ASHA) is pleased to submit this letter of commitment in support of the University of Maryland Language Sciences Center NRT-DESE proposal: Flexibility in language processes and technology: Human- and Global-Scale. ASHA is the national professional, scientific and credentialing association for over 173,000: audiologists; speech-language pathologists; and speech, language, hearing scientists; as well as student, international and support personnel affiliates. ASHA's national office, with a staff of 270 is located in Rockville, Maryland and we have a Capitol Hill office located in the Hall of States building on North Capital Street, two blocks from the Capitol.

If this grant is funded ASHA will be pleased to work with the University of Maryland Language Sciences Center to provide opportunities for doctoral students to have an array of possible experiences that might include briefings on public policy issues, Hill visits, shadowing lobbyists, development and execution of advocacy messages, etc.

Please feel free to contact me or George Lyons, Jr., JD-MBA, ASHA's Director of Government Relations and Public Policy should further information be needed at this time.

Sincerely,

Arlene A. Pietranton, PhD, CAE
Chief Executive Director



SCIENCE OF LEARNING CENTER
VISUAL LANGUAGE
AND VISUAL LEARNING: VL2

June 20, 2014

Dr. Colin Phillips
Professor of Linguistics
Director, Maryland Language Science Center
University of Maryland, College Park

Dear Drs. Phillips, Newman, Daumé, DeKeyser, Idsardi:

We write to offer our full support for your NSF NRT/DESE proposal, **Flexibility in Language Processes and Technology: Human- and Global-Scale**, to support the training of PhD students using interdisciplinary methods that promise new discoveries, advancing our understanding of the impact of variable dataset size on how machines and humans learn. As Co-PIs of the interdisciplinary NSF-funded Science of Learning Center on Visual Language and Visual Learning (VL2), and Directors of the newly established Ph.D. in Educational Neuroscience (PEN) program at Gallaudet University, we bring many resources to your excellent proposal. Our scientific interests are well matched to your proposal given your focus on language learning at "varying scales." Our eight years of Center based research, assembled a variety of small and large datasets from multiple domains of inquiry in multiple formats, which may be ideally suited to support training of PhD students with variable dataset sizes. Of particular relevance are your questions regarding the "impact of limited language experience for humans," such as the children from low SES backgrounds and adults with second-language. We have significant data on diverse children with minimal language exposure and its impact on language acquisition and higher cognition.

At VL2, we have developed a sophisticated protocol for the ethical sharing of Center data, and therefore already have a mechanism in place that can facilitate your students' access to our data, as appropriate to their individual interests. Furthermore, VL2 researchers and students would be inspired by the possibilities of student interactions both locally between members of the NRT grant and Gallaudet (both locally and nationally at VL2's affiliated universities) for exchanges at both the scientific and the leadership levels. As part of this training, they receive support from dedicated mechanisms for advancing leadership activities, and our students would also be excited to share their ideas and experiences on a regular basis and at your proposed annual Summer Camps.

Our PEN program trains our PhD students in investigations of cognitive neuroscience that are directed toward improving the educational lives of visual learners. They receive formal training in cognitive neuroscience, communication, translational research, and policy—similar to your proposal, and we are inspired by the possibility of yet another potential synergistic connection between our students and your teams in this important aspect of research training.

We wish you great success with your application and we hope it will provide a strong avenue to further support the collaboration that we have shared over the past five years with your recent IGERT grant.

Sincerely,

A handwritten signature in black ink, reading "LA Petitto".

Dr. Laura-Ann Petitto
VL2 Co-PI and Science Director
Chair, PEN Steering Committee
Director, Brain and Language Lab

A handwritten signature in black ink, reading "Thomas E. Allen".

Dr. Thomas E. Allen
VL2 Co-PI
Program Director, PEN
Director, Early Education Literacy Lab





COMBATING TERRORISM TECHNICAL SUPPORT OFFICE

4800 Mark Center Drive, Suite 13E13
Alexandria, VA 22350-2600

Dear Amy,

I am pleased to submit this letter of commitment in support of the University of Maryland Language Science Center's proposal for *NRT-DESE: Flexibility in language processes and technology: Human- and Global-Scale*.

If this NRT proposal is funded, our Language Program that is focused on Human Language Technology innovation and transition, will work with the University of Maryland Language Sciences Center to provide advanced research experiences for doctoral students in the program and or/inform doctoral students in the program about research requirements, the relationship between research and policy or mission, and offer opportunities for service in a research or policy capacity in the Federal government. This will be accomplished through participation in conferences, lecture series, and other outreach activities sponsored by the Center. Our program aligns itself closely with the research and the mission of the University's Center for Advanced Study of Language, whose researchers form an integral part of the Language Sciences Center.

Founded in 2003, CASL is the first and only national resource dedicated to addressing government research needs in the area of language. CASL's staff currently includes 50 PhD-level scientists, plus a broad array of research assistants and external collaborating faculty from the University of Maryland and elsewhere. These personnel have training from departments of linguistics, cognitive and neural science, computer science, and psychology programs; all of which are collaborating on this NRT. In addition, as a UARC (government sponsored University Affiliated research Center), CASL is optimally positioned to act as a facilitator of research and personnel transfer between the University and the Federal Government, which will ensure the broader impact of this proposal by informing research mentors and students of US government research requirements and opportunities for service, and by developing a direct pipeline for research and personnel transfer.

Sincerely Yours,

Kathleen B. Egan, Ph.D
DoD/CTTSO/TSWG
Language Program Manager
4800 Mark Center
Alexandria, VA 22350-2600

NATIONAL SECURITY AGENCY



CENTRAL SECURITY SERVICE

Defending Our Nation. Securing The Future.

Dear Amy,

I am excited to submit this letter of commitment in support of the University of Maryland Language Science Center's proposal for *NRT-DESE: Flexibility in language processes and technology: Human- and Global-Scale*.

The Research Directorate at the NSA has an enduring interest in advancing language science both internally and through its partnerships with the University of Maryland. In particular, we serve as the Executive Agent for the **Center for Advanced Study of Language at the University of Maryland**. Founded in 2003, CASL is the first and only University Affiliated Research Center (UARC) dedicated to the area of language. CASL's staff includes 50 PhD-level scientists, plus a broad array of research assistants and external collaborating faculty. These personnel have training from departments of linguistics, cognitive and neural science, computer science, second language acquisition, and psychology.

I am particularly supportive of CASL's work in developing measures in language aptitude, in brain fitness, the description of less commonly taught languages, and its computational approaches to speed resource acquisition. This work directly benefits the Federal Government. Even more, it informs and harvests research both on and beyond the UMD campus.

CASL houses an undergraduate summer intern program which combines the talents of campus and CASL researchers and exposes students to basic and applied research in language science in service to the Nation. It also already supports graduate students at UMD through its graduate fellowship and graduate assistant programs. If this NRT proposal is funded, the Research Directorate will work with the University of Maryland Language Sciences Center to expand the program with additional innovative research experiences for doctoral students. In addition, our scientists will participate in seminars and lecture series to inform students in the program about federal research requirements, the relationship between research and policy or mission, and opportunities for service in the Federal government.

In short, NSA understands the importance of research in the language sciences and we dedicate significant resources to the University of Maryland to help us solve language-related problems. This proposal fits exactly into our strategic plan to build and strengthen the pipeline of our nation's linguistic talent.

Michael A. Wertheimer

Research Director, National Security Agency



HARVARD GRADUATE SCHOOL OF EDUCATION

June 15, 2014

Dear Professor Colin Phillips,

It is with great enthusiasm that I write in support of your proposal titled “NRT-DESE: Flexibility in language processes and technology: Human and Global Scale” for the NRT competition at NSF. I am thrilled to be included as an external faculty member on this endeavor. As you know, my research is focused on understanding the role of parent and family factors in children’s language development. Much of my work has examined the predictors and consequences of SES differences in parent input to children and more recently I have begun some intervention projects designed for low-income parents to boost children’s early language learning. Thus, my work aligns nicely with your proposal’s theme of multi-scale data and I look forward to the opportunities this program will bring for continued collaborations with Maryland faculty and students on this topic.

During my time at Maryland in the Human Development department, I was fortunate to be involved in the vibrant interdisciplinary language science community. There were several collaborations that greatly influenced my thinking related to the theme of learner input. First, in the Spring of 2012 I co-taught an interdisciplinary IGERT course on “Input and Outcomes in Language Acquisition” with Jeff Lidz from the Linguistics Department. This was a great opportunity to delve into issues related to input and learning from different theoretical perspectives. More importantly, this course sparked further collaborations and conversations among faculty from different departments that are still ongoing. Further, I was a mentor to students on various related projects including a study investigating the role of language processing skill as a mediating factor between input and children’s syntax skills (with Yi Ting Huang and student Katie Leech), and a project investigating SES differences in parents’ uses of attitude verbs (with Jeff Lidz, Valentine Hacquard and student Rachel Dudley). Drs. Huang, Lidz, Hacquard and I all bring diverse expertise and perspective to this issue and I would welcome the opportunity to engage in a ‘Summer Camp’ on the topic to continue our work in this area and to bring in perspectives from others as well.

As I noted above, I am currently doing some more applied/intervention work in this area, and there are other colleagues of mine here at Harvard, as well as folks in Education at Maryland engaged in this type of work as well. Closing the achievement gap is a national priority and there is increased understanding that the gap starts early before children even get to school. However, our ability to design useful and appropriate interventions hinges on our understanding of input variations and the specific links between input and children’s language learning. We still have a lot to learn in this area, thus, I am excited about the progress that can come from working with you on this project.

Sincerely,

Meredith Rowe
Associate Professor
Harvard University, Graduate School of Education
meredith_rowe@gse.harvard.edu