# HHMI Faculty Research Award (FRA)

## Cover Sheet

<table>
<thead>
<tr>
<th>Title</th>
<th>Oxytocin Receptor Gene (OXTR) as a Candidate Gene for Apathy among Persons with Alzheimer Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of PI</td>
<td>Emilie J. Dykstra Goris, PhD, RN</td>
</tr>
<tr>
<td>Department of PI</td>
<td>Nursing</td>
</tr>
<tr>
<td>Name(s) of collaborators</td>
<td>1. Dr. Maria Burnatowska-Hledin (Professor of Biology &amp; Chemistry, Hope College)&lt;br&gt;2. Dr. Debra Schutte (Associate Professor, Wayne State University College of Nursing)</td>
</tr>
<tr>
<td>Undergraduates Associated with Project: (Give names if known or simply numbers if students are not yet identified)</td>
<td>Current: Katherine Ansel (Senior Nursing Student)&lt;br&gt;Future: Not yet identified, 2-3 undergraduate Nursing/Biology students</td>
</tr>
<tr>
<td>Projected start date</td>
<td>August 15, 2014</td>
</tr>
<tr>
<td>Projected end date</td>
<td>May 15, 2015</td>
</tr>
<tr>
<td>Total Budget Requested</td>
<td>$15,000</td>
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</tbody>
</table>
ABSTRACT (keep the abstract under ½ of a page)

Apathy, defined as a disorder of motivation with deficits in behavioral, emotional, and cognitive domains, is a prevalent behavioral symptom among persons with Alzheimer Disease (AD). Apathy occurs across the disease trajectory and is associated with serious complications, including physical deconditioning, uncooperativeness with care, and social isolation. Despite the high prevalence and negative sequela associated with apathy, little is known about characteristics of persons with AD, including biologic factors, that contribute to the presence and/or severity of apathy. Variations in the Oxytocin Receptor gene (OXTR) are hypothesized to be candidate modifiers of apathy in persons with AD. A DNA variant within OXTR (rs53576) significantly predicted 19.4% of the variance in apathy severity as measured by the Apathy subscale of the Neuropsychiatric Inventory (NPI-Apathy) (F=3.379, p=.027), while controlling for cognitive status and number of Apolipoprotein E (APOE) e4 alleles in a sample of 66 individuals with AD. The AA genotype was associated with more severe apathy. A novel collaboration between the Nursing and Biology Departments at Hope College will be established to further explore the extent to which DNA variations in OXTR are associated with apathy in persons with AD as measured by the NPI-Apathy, while cross-training 2-3 nursing and/or biology students in nursing research and molecular genetic techniques. The extent to which variations within OXTR are associated with apathy in persons with AD will be further examined by identifying additional tagging SNPs in and around OXTR with subsequent genotyping. Additionally, this work will aid in the establishment of an infrastructure for ongoing work in the nursing faculty wet lab by establishing protocols and laboratory manuals that will be utilized as part of a larger future project.
1. Project Description (Keep section one to four pages or less.)
1.1 Background & Significance of Work

Alzheimer Disease (AD). Alzheimer Disease (AD) is an irreversible dementia that progressively destroys cognitive and daily functioning and is frequently accompanied by challenging behavioral symptoms. About 5.4 million Americans currently suffer from AD (Alzheimer’s Association, 2012). By 2050, the Alzheimer’s Association (2012) estimates that the number of individuals with AD may reach 16 million.

Classifications for AD include mild, moderate, and severe. The average duration of AD is eight to ten years, with a range from 1-25 years (Bird, 2010). The disease most often manifests after age 60, impacting nearly every facet of daily life (National Institute on Aging [NIA], 2013). AD is initially characterized by subtle and often poorly recognized memory failure. It becomes increasingly severe and eventually incapacitating (Aderinwale, Ernst, & Mousa, 2010; Bird, 2010). The disease progressively destroys neurons in the cortex and limbic structures of the brain, impacting areas responsible for learning, memory, behavior, emotion, and reasoning (Aderinwale et al., 2010). Common behavioral symptoms in AD include sleeplessness, agitation, wandering, anxiety, apathy, anger and depression (Lyketsos et al., 2002; Mega, Cummings, Fiorello, & Gornbein, 1996; NIA, 2013).

Apathy. Apathy, defined as a disorder of motivation with deficits in behavioral, emotional, and cognitive domains, is a prevalent behavioral symptom among persons with AD, reportedly occurring in over 90% of persons with AD across the disease trajectory with varying severity (Benoit et al., 2008; Mega et al., 1996). While common, apathy is often an under-recognized neuropsychiatric behavior in persons with AD (Landes, Sperry, Strauss, & Geldmacher, 2001; Lerner, Strauss, & Sami, 2007; Mega et al., 1996; Monastero et al., 2006; Robert, Mullin, Mallea, & David, 2010).

In addition to its high prevalence, the consequences of apathy for persons with AD are substantial. A longitudinal study reported that apathy was a significant predictor of accelerated cognitive, functional, and emotional decline in persons with AD (Starkstein, Jorge, Mizrahi, & Robinson, 2006). Apathy has a negative impact on several functional health outcomes and has been associated with poor functional performance among persons with questionable dementia, as well as in persons diagnosed with AD (Lam et al., 2010; Lam, Tam, Chiu, & Lui, 2008). Specific consequences of apathy for persons with dementia include physical deconditioning, failure of rehabilitation, decreased performance of activities of daily living, uncooperativeness with care, and social isolation (Politis et al., 2004). Persons with AD who experience apathy may therefore require increased support and management, and caregivers of apathetic dementia patients report significant levels of distress and caregiver burden (Kaufer et al, 1998; Sanders, Ott, Kelber & Noonan, 2008). Increased care needs due to the cognitive, emotional, and behavioral deficits associated with apathy may result in more rapid institutionalization of these individuals, contributing to increased healthcare costs and utilization.

Genetic Risk Factors. Genetics play a role in the risk for AD (Corder et al., 1993; Pericak-Vance et al., 1991) and variability in clinical symptoms (Monastero et al., 2006; Schutte, Reed, DeCranes, & Ersig, 2011). The cause of AD is likely a complex combination of genetic influences and environmental exposures that have accumulated over the lifespan (Gatz, Reynolds, Finkel, Pedersen, & Walters, 2010). When one considers both epidemiologic and clinical studies over the past two decades, the only robust and undisputed risk factors for AD are age and carrying the Apolipoprotein E (APOE) e4 allele (Corder et al., 1993; Dartigues & Feart, 2011). Monastero and colleagues (2006) conducted a study examining the association between...
the APOE4 genotype and neuropsychiatric symptoms in persons with AD. APOE4 carriers showed a higher frequency of apathy than non-carriers, suggesting a relationship between the APOE4 allele and apathy in persons with AD (Monastero et al., 2006). In a study by Schutte and colleagues (2011), single polymorphisms within the Saitohin and APOE genes demonstrated association with increased cognitive and functional impairment. The APOE4 allele was also associated with increased baseline levels of agitation in this longitudinal repeated measures investigation of symptom variability among institutionalized persons with AD (Schutte et al., 2011).

Oxytocin (OT) is another candidate gene particularly relevant to the study of apathy. Multiple theories regarding OT exist, but OT may influence social behavior by promoting increased gaze to the eye region of the human face, promoting trust, or serving a role in social memory (Averbeck, 2010; Campbell, 2010). Studies have begun to consider a possible role of pathological OT signaling in psychiatric disorders like schizophrenia (Averbeck, 2010), autism spectrum disorders (Lerer et al., 2008) and Attention Deficit Hyperactivity Disorder (Park et al., 2010). Evidence from both human and animal studies provides strong rationale for exploring the extent to which deoxyribonucleic acid (DNA) variations within the Oxytocin Receptor (OXTR) gene influence the presence and severity of apathy in persons with AD.

**Problem Statement.** Despite the high prevalence and negative sequela associated with apathy, little is known about characteristics of persons with AD, including biologic factors, that contribute to the presence and/or severity of apathy in persons with AD.

**Research Platform.** One aim of the PI’s dissertation work was to examine the extent to which variations in OXTR are associated with apathy in persons with AD as measured by the Neuropsychiatric Inventory Apathy Subscale (NPI-Apathy), while controlling for cognitive status and number of Apolipoprotein E (APOE) e4 alleles (Goris, 2013). Sixty-six participants were recruited as part of a larger project to examine apathy, genetics and functional status among persons with AD. The majority of participants (69.7%, n=46) were female, age 59 to 101 years, with a mean of 85.83 (SD=7.35) years. Cognitive characteristics of the sample suggested moderate impairment, as evidenced by a mean total Severe Impairment Battery (SIB) score of 50.66 (SD=39.09; range: 0-100). Apathy was present in over half of the participants (53.0%, n=35) as measured by the NPI-Apathy. A DNA variant within OXTR (rs53576) significantly predicted 19.4% of the variance in apathy severity as measured by the NPI-Apathy (F=3.379, p=.027), while controlling for cognitive status and number of APOE4 alleles (Goris, 2013). The AA genotype was associated with more severe apathy. While this dissertation work was an important step in explicating the relationship between individual characteristics, such as genetics, apathy, and functional status in persons with AD, the relationship between apathy and OXTR genotype status must be further explored.

1.2 Objectives
1. Establish a novel collaboration between the Nursing and Biology Departments at Hope College, while cross-training 2-3 nursing and/or biology students in nursing research and molecular genetic techniques as part of the proposed project.
2. Establish an infrastructure for ongoing work in the Goris wet lab by establishing protocols and laboratory manuals that will be utilized as part of a larger future project.
3. Further examine the extent to which variations within the Oxytocin Receptor Gene (OXTR) are associated with apathy in persons with Alzheimer Disease (AD) by identifying additional tagging single nucleotide polymorphisms (SNPs) in and around OXTR with subsequent genotyping.
1.3 Methods

Undergraduate students in nursing and/or biology will be trained in nursing research and basic molecular genetic techniques for future work in the STEM fields. Techniques to be learned by students as part of this research project include the skills of DNA collection via saliva sampling and DNA extraction from saliva samples, as well as use of laboratory equipment. Course materials from GEMS 161 “Biotechnology and You Laboratory,” developed by Burnatowska-Hledin, will be utilized in the training effort. Examples include laboratory activities for “Micropipette Technique and Dilutions” and “Gel Electrophoresis of DNA.”

Students will work with the PI and consultants to identify additional tagging SNPs in and around OXTR in order to investigate whether there is a stronger association between apathy and any other single SNP or combination of SNPs. Criteria for selecting SNPs within OXTR as part of the PI’s dissertation work included: 1) SNPs with empiric evidence for an association with apathy or related phenotypes (Lerer et al., 2008; Park et al., 2010), 2) SNPs known to alter gene function (Park et al., 2010), and 3) SNPs with a minor allele frequency >0.2 (Kent et al., 2002).

The PI also has access to the Ion Torrent Personal Genome Machine on campus and has been in consultation with colleagues, including Dr. Aaron Best, regarding the feasibility of sequencing the entire OXTR gene, a relatively small 19,000 Kilo-base pair region on chromosome 3p25, or the 4 exons within the OXTR gene. Techniques for primer design, as needed for exon sequencing, have been previously established and successfully implemented in the Burnatowska-Hledin lab (Lewis, Willis, Johnson, Resau, & Burnatowska-Hledin, 2011). To that end, students have been successfully trained in these molecular techniques as part of a past faculty/student collaborative research project with published results (Lewis et al., 2011), that was both funded by HHMI and conducted at Hope College. Genotyping will be completed on existing samples. In tandem with these specific efforts, faculty and student investigators will work to establish an infrastructure for ongoing work in the Goris wet lab by establishing protocols and laboratory manuals that will be utilized as part of a larger future project.

1.4 Expected Outcomes

The PI has had solid training as part of her recently completed doctoral program at Michigan State University. With strong mentorship provided internally by Dr. Maria Burnatowska-Hledin, it is expected that the PI will successfully establish a functioning wet lab via collaboration between the nursing and biology departments. The expertise of Dr. Debra Schutte will also aid in the success of this project by offering an outside perspective and continued networking opportunities with leaders in the field of nursing genetics. It is expected that 1-2 students will greatly benefit from cross-training in nursing research and molecular genetic techniques as part of the proposed project, with opportunities to develop their skills as STEM researchers. The results will be presented in local, national, and international conferences and submitted for publication in peer-reviewed journals. Likely conferences for dissemination include annual meetings of the Midwest Nursing Research Society (MNRS), the Gerontological Society of America (GSA), and/or the International Society of Nurses in Genetics (iSONG), professional organizations of which the PI is a member. Possible target journals span the disciplines of nursing, biology, neurology, and molecular genetics. Efforts undertaken as part of this project will also aid in the establishment of an infrastructure for ongoing collaborative student/faculty research projects in the Goris wet lab.

1.5 Potential Difficulties

While the PI has established research space at Hope College in the form of a wet lab, all materials for independently conducting additional genotyping for existing samples are not yet
available. The PI is working to secure additional funds to purchase a thermocycler for polymerase chain reaction (PCR) and the necessary reagents and software for genotyping and allelic discrimination, possibly using Taqman® PCR (Applied Biosystems).

Because this project is set to begin August 15, 2014, the PI has some time to secure used equipment. If all necessary equipment cannot be secured, the PI will work with consultant Dr. Debra Schutte to borrow equipment or to secure a site for remote sample processing at the Michigan State University Department of Microbiology and Molecular Genetics or within Wayne State University. The PI has also been in consultation with Dr. Aaron Best regarding the feasibility of sequencing the entire OXTR gene, a relatively small 19,000 Kilo-base pair region on chromosome 3p25, or the 4 exons within the OXTR gene, using the Ion Torrent Personal Genome Machine on campus.

1.6 Connection to other HHMI Programs

The proposed project further strengthens current HHMI programs at Hope College and aligns with program goals of the institute at large. First, the project uniquely contributes to the HHMI program at Hope College by introducing a novel collaboration between the Nursing and Biology Departments, where students will be cross-trained in nursing research and molecular genetic techniques. Students involved in the project will engage in STEM research training throughout their college career – using faculty start-up funds for summer experiences, and with HHMI funds supporting experiences throughout the academic year – as specified in HHMI Program Goals. In addition, the project will allow Goris to work on cutting edge STEM research initiatives related to examining candidate genes for apathy among persons with AD, providing opportunities for students to develop their skills as STEM researchers.

1.7 Plans for External Funding To Continue Work

The funds requested from the HHMI program will be used to complement the PI’s current funding and support, as well as to provide a platform for future grant applications. As a new faculty member, the PI has already secured new-faculty start-up funds to support herself and a research student throughout summer 2014. The proposed project will be conducted during the 2014-2015 academic years, providing an uninterrupted funding stream. In fall 2014, the PI will submit an application for external funding to the Kenneth H. Campbell Foundation for Neurological Research (Grand Rapids, MI) in order to support a larger future study of apathy, genetics, and functional status among persons with AD in West Michigan. Goris also plans to seek external funding from the National Institutes of Health via the Exploratory/Developmental Research Grant Award (R21) mechanism in collaboration with Dr. Debra Schutte, of the Wayne State University College of Nursing, in the future.

1.8 Timeline

The proposed project will be conducted from August 15, 2014 – May 15, 2015. During summer 2014, the PI will work with students to begin adaptation of existing protocols for use at Hope College and will secure Institutional Review Board (IRB) approval for the proposed work. Initial efforts during the award period will focus on familiarizing student investigators with basic molecular genetic techniques in addition to the writing and submission of a larger grant proposal. The PI and consultants will then work with students to identify the most appropriate methods for subsequent genotyping of the existing samples. Throughout the award period, students and faculty will work to establish an infrastructure for ongoing work in the Goris wet lab by establishing protocols and laboratory manuals that will be utilized as part of a larger future project. Data analysis and dissemination will begin early in 2015.
2. Bibliography/References


4. Biographical Sketches

4.1 Emilie J. Dykstra Goris

A. Professional Preparation

<table>
<thead>
<tr>
<th>Institution</th>
<th>Major</th>
<th>Degree and Year</th>
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<tr>
<td>Michigan State University</td>
<td>Nursing</td>
<td>Ph.D. 2013</td>
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<tr>
<td>Hope College</td>
<td>Nursing</td>
<td>B.S.N. 2008</td>
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</table>

B. Appointments

- Assistant Professor, Department of Nursing
  Hope College  2012-present
- John A. Hartford Foundation Building Academic
  2011-2013
- Geriatric Nursing Capacity Scholar
- Research Assistant, College of Nursing
  Michigan State University  2010-2013
- Staff Nurse, Surgical Intensive Care Unit
  Spectrum Health  2008-2012
- Research Assistant, Department of Nursing
  Hope College  2007-2008

C. Selected Honors

- Dissertation Completion Fellowship
  Michigan State University  2013
- Graduate Office Fellowship
  Michigan State University  2013
- John F. Dunkel Memorial Endowed Scholarship
  Michigan State University  2012
- George and Margaret Lorimer Parsons Nursing Endowed Scholarship
- Graduate Office Fellowship
  Michigan State University  2009-2010
- Senior Nursing Award
  Hope College  2008
- Sigma Theta Tau Award
  Hope College  2008
- The Southland Medal
  Hope College  2008

D. Professional Membership

- International Society of Nurses in Genetics  2012-present
- American Nurses Association  2011-present
- Gerontological Society of America  2010-present
- American Association of Critical Care Nurses  2009-2012
- Midwest Nursing Research Society  2008-present
- Phi Beta Kappa Society, Zeta of Michigan  2008-present
- Sigma Theta Tau International, Kappa Epsilon at-Large Chapter  2007-present

E. Selected Products

E.1 Research Papers


E.2 Manuscripts in preparation (underline indicates undergraduate author)

E.3 Selected Abstracts


3. 2010, April. Dunn, S., Tintle, N., Dykstra, E., & Leger, N. Increased Hopelessness Levels in Patients with Coronary Heart Disease 6 Months After Hospitalization and After Attending a Phase Two Cardiac Rehabilitation Program. Paper presentation. Midwest Nursing Research Society Annual Nursing Conference, Kansas City, MO.


4.2 Maria A. Burnatowka-Hledin

A. Professional Preparation

<table>
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<tr>
<th>Institution</th>
<th>Major</th>
<th>Degree and Year</th>
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<tr>
<td>McGill University</td>
<td>Physiology</td>
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<td>McGill University</td>
<td>Physiology</td>
<td>M.S., 1977</td>
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<tr>
<td>McGill University</td>
<td>Biochemistry</td>
<td>BSc., 1975</td>
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B. Appointments

Paul. A. Schaap Chemistry Research Fellow
Director, Biochemistry and Molecular Biology Program
Frederich Garrett and Helen Floor Dekker
Professor of Biomedicine and Chemistry
Associate Professor, Departments of Biology & Chemistry
Assistant Professor, Department of Physiology
Instructor, Departments of Medicine & Physiology

C. Selected Products

C.1 Recent Significant Publications (underline indicates undergraduate authors)


8. Johnson, Alyssa; Le, Isabelle; Andresen, Bradley; Stodola, Joseph; Dewey, Gary; Bradley, Shirley; Resau, James; Haak, Pete; Rouch, Travis; Sartor, Ashleigh; Barney, Christopher; Burnatowska-Hledin, Maria: VACM-1/cul5 Expression in Vascular Tissue In Vivo is Induced by Water Deprivation and its Expression in Vitro Regulates Aquaporin-1 Concentrations. Cell Tissue Res. 349: 527-539: 2012

C.2 Other Significant Products

D. Synergistic Activities
- The Arnold and Mabel Beckman Foundation Award for 2012-2015: Scholars program Award Director (3 yrs)
- Director for the Biochemistry Molecular Biology Program at Hope College
- Supervisor/Mentor for the BMB student club
- Thesis (MSc) reviewer for a student at Midwestern University in Chicago
- Invited speaker at a Bioinformatics Workshop at Bates College (June 2006)
- Developed and taught a science course with labs for not majors (Biotechnology and You)
- Wrote research proposals that have been funded
- Organized and chaired a meeting on Bioinformatics for GLCA/AMC colleges in May 2004
- Sigma Xi Award for Scientific Outreach, Hope College, 2001
- Chair and Presenter, ACS-Midwest Meeting on Teaching Biochemistry through Research, 2001
- Dreyfus Teacher/Scholar Award, 2000

E. Collaborators and Other Affiliations (excluding advisees)
Collaborators: Jim Resau and Pete Haak at Van Andel Research Institute. Michael Fay at Midwestern University; Contributed towards the MRI proposal (written by Dr. A. Putzke) for the confocal microscope (funded).
Undergraduate Students: Approximately 64 undergraduate students participating in research activities mentored since 2006. Students in 2013-2014 include: Zach Debruine, Sarah Wieskamp, Maria Kief, Abby Schnell, Collin Breit. Each year students present their work at the regional and national ASBMB meeting. Additionally, three high school students have been mentored over the last four years.
4.3 Debra L. Schutte

A. Professional Preparation

<table>
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<tr>
<th>Institution</th>
<th>Major</th>
<th>Degree and Year</th>
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<tr>
<td>University of Iowa</td>
<td>Gerontological Nursing</td>
<td>Ph.D., 2001</td>
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<td>University of Iowa</td>
<td>Community Health Nursing</td>
<td>M.S.N., 1996</td>
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<tr>
<td>University of Iowa</td>
<td>Nursing</td>
<td>B.S.N., 1994</td>
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<tr>
<td>Methodist School of Nursing</td>
<td>Nursing</td>
<td>Diploma, 1982</td>
</tr>
</tbody>
</table>

B. Personal Statement

My role on this proposal is Consultant. I have been actively conducting research to explicate phenotypic variability in persons with Alzheimer disease (See Pub 3, 14) and pain (6, 10). And recently received internal funding to integrate peripheral and central auditory processing into my research aimed at understanding cognitive and behavioral symptoms in persons with dementia. I have research experience using both qualitative methods (See Pub 8 and 10) as well as quantitative methods (See Pub 8 and 10), in both institutional and community settings. I also have experience with intervention research (See Pub 2,3,5, 12 and 14). I am actively engaged in the nursing genetics and gerontology communities being a past president of the International Society of Nurses in Genetics (2001), a past John A. Hartford Foundation Building Academic Geriatric Nursing Capacity Post-Doctoral Fellow (2002-2004) and a recent primary mentor for a John. A Hartford Foundation Building Academic Geriatric Nursing Capacity Pre-Doctoral Scholar (Goris; 2011-2013). In this proposal, my specific functions will be to provide consultation related to the genetics methods.

C. Appointments

<table>
<thead>
<tr>
<th>Position</th>
<th>Institution</th>
<th>Year(s)</th>
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<tbody>
<tr>
<td>Associate Professor, College of Nursing</td>
<td>Wayne State University</td>
<td>2013-</td>
</tr>
<tr>
<td>Adjunct Faculty, Institute of Gerontology</td>
<td>Wayne State University</td>
<td>2013-</td>
</tr>
<tr>
<td>Senior Investigator Award, Genetics Research Section, Midwest Nursing Research Society</td>
<td>MNRS</td>
<td>2012</td>
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<tr>
<td>Marjorie A. Holmes College of Nursing Endowed Faculty Enrichment Award</td>
<td>Michigan State University</td>
<td>2010</td>
</tr>
<tr>
<td>Editorial Board, Outstanding article in Practice</td>
<td>Nursing Outlook</td>
<td>2010</td>
</tr>
<tr>
<td>Faculty, Genetics PhD Program</td>
<td>Michigan State University</td>
<td>2008-</td>
</tr>
<tr>
<td>Associate Professor, College of Nursing</td>
<td>Michigan State University</td>
<td>2008-2013</td>
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<tr>
<td>Junior Investigator Award, Genetics Research Section, Midwest Nursing Research Society</td>
<td>MNRS</td>
<td>2004</td>
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<tr>
<td>Associate Professor, College of Nursing</td>
<td>University of Iowa</td>
<td>2007-2008</td>
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<tr>
<td>Assistant Professor, College of Nursing</td>
<td>University of Iowa</td>
<td>2001-2007</td>
</tr>
<tr>
<td>John A. Hartford Foundation Building Academic Geriatric Nursing Capacity Scholar, Post-Doctoral Fellowship</td>
<td>Michigan State University</td>
<td>2002</td>
</tr>
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</table>

D. Selected peer-reviewed publications: (15 from 32)


**E. Completed Research Support**

Completed Research Support includes substantial grants from sources such as the National Institutes of Health/National Cancer Institute, National Institutes of Health/National Institute of Nursing Research, the Gerontological Nursing Interventions Research Center at the University of Iowa, The University of Iowa Biological Sciences Funding Program, and the John A. Hartford Foundation.
5. Current and Pending Support
5.1 Emilie J. Dykstra Goris
   New Faculty Start-Up Funds, Dean of Natural and Applied Sciences, Hope College.
   Status: Current
   *See 1.7 Plans for External Funding To Continue Work
5.2 Maria A. Burnatowka-Hledin
   The Arnold and Mabel Beckman Foundation Award for 2012-2015: Scholars program
   Award Director (3 yrs)
   Status: Current
5.3 Debra L. Schutte
   Dr. Schutte recently received internal funding from Wayne State University to integrate
   peripheral and central auditory processing into her research aimed at understanding
   cognitive and behavioral symptoms in persons with dementia.
   Status: Current