

REPORT DOCUMENTATION PAGE			Form Approved OMB NO. 0704-0188		
<p>The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA, 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.</p>					
1. REPORT DATE (DD-MM-YYYY) 17-07-2023		2. REPORT TYPE Final Report		3. DATES COVERED (From - To) 1-Jul-2020 - 30-May-2022	
4. TITLE AND SUBTITLE Final Report: Role of astrocytes in Ca <sup>2+</sup> - dependent microglia modulation of synaptic activity			5a. CONTRACT NUMBER W911NF-20-1-0189		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER 611102		
6. AUTHORS			5d. PROJECT NUMBER		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAMES AND ADDRESSES Children's Research Institute 111 Michigan Avenue, NW  Washington, DC 20010 -2916			8. PERFORMING ORGANIZATION REPORT NUMBER		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS (ES) U.S. Army Research Office P.O. Box 12211 Research Triangle Park, NC 27709-2211			10. SPONSOR/MONITOR'S ACRONYM(S) ARO		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S) 75164-HC.2		
12. DISTRIBUTION AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.					
13. SUPPLEMENTARY NOTES The views, opinions and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other documentation.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	15. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON Nathan Smith
a. REPORT UU	b. ABSTRACT UU	c. THIS PAGE UU			19b. TELEPHONE NUMBER 585-224-6284

**RPPR Final Report**  
as of 18-Jul-2023

Agency Code: 21XD

Proposal Number: 75164HC

**Agreement Number: W911NF-20-1-0189**

**INVESTIGATOR(S):**

**Name:** Ph.D. Nathan A. Smith  
**Email:** nathan\_smith@urmc.rochester.edu  
**Phone Number:** 5852246284  
**Principal:** Y

Organization: **Children's Research Institute**

Address: 111 Michigan Avenue, NW, Washington, DC 200102916

Country: USA

DUNS Number: 143983562

EIN: 1521654453

**Report Date:** 30-Aug-2022

Date Received: 17-Jul-2023

**Final Report** for Period Beginning 01-Jul-2020 and Ending 30-May-2022

**Title:** Role of astrocytes in Ca<sup>2+</sup>- dependent microglia modulation of synaptic activity

**Begin Performance Period:** 01-Jul-2020

**End Performance Period:** 30-May-2022

**Report Term:** 0-Other

Submitted By: Ph.D. Nathan Smith

Email: nathan\_smith@urmc.rochester.edu

Phone: (585) 224-6284

**Distribution Statement:** 1-Approved for public release; distribution is unlimited.

**STEM Degrees:**

**STEM Participants:**

**Major Goals:** Please refer to uploaded document

**Accomplishments:** Please see uploaded document.

**Training Opportunities:** Nothing to Report

**Results Dissemination:** Nothing to Report

**Honors and Awards:** 2020: Inducted into Sigma XI Research Honor Society

2021: Named by Cell Press as one of 1000 most Inspiring Black Scientists in America

2022: Elected 2021 American Association for the Advancement of Science (AAAS) Fellow

2022: Vanderbilt Juneteenth Award

**Protocol Activity Status:**

**Technology Transfer:** Nothing to Report

**ARTICLES:**

# RPPR Final Report

## as of 18-Jul-2023

**Publication Type:** Journal Article      Peer Reviewed: Y      **Publication Status:** 1-Published

**Journal:** European Journal of Neuroscience

Publication Identifier Type: DOI

Publication Identifier: 10.1111/ejn.15045

Volume: 00

Issue:

First Page #:

Date Submitted: 8/31/21 12:00AM

Date Published: 11/1/20 2:00PM

Publication Location:

**Article Title:** Locus coeruleus in memory formation and Alzheimer's disease

**Authors:** Tony James, Bartosz Kula, Seowon Choi, Shahzad S. Khan, Lane K. Bekar, Nathan A. Smith

**Keywords:** Alzheimer's disease, dopamine, locus coeruleus, memory, norepinephrine

**Abstract:** Catecholamine neurons of the locus coeruleus (LC) in the dorsal pontine tegmentum innervate the entire neuroaxis, with signaling actions implicated in the regulation of attention, arousal, sleep-wake cycle, learning, memory, anxiety, pain, mood, and brain metabolism. The co-release of norepinephrine (NE) and dopamine (DA) from LC terminals in the hippocampus plays a role in all stages of hippocampal-memory processing. This catecholaminergic regulation modulates the encoding, consolidation, retrieval, and reversal of hippocampus-based memory. LC neurons in awake animals have two distinct firing modes: tonic firing (explorative) and phasic firing (exploitative). These two firing modes exert different modulatory effects on post-synaptic dendritic spines. In the hippocampus, the firing modes regulate long-term potentiation (LTP) and long-term depression, which differentially regulate the mRNA expression and transcription of plasticity-related proteins (PRPs).

**Distribution Statement:** 2-Distribution Limited to U.S. Government agencies only; report contains proprietary info  
Acknowledged Federal Support: Y

### Partners

I certify that the information in the report is complete and accurate:

Signature: Nathan Anthony Smith

Signature Date: 7/17/23 3:36PM

**REPORT DOCUMENTATION PAGE**

*Form Approved  
OMB No. 0704-0188*

The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

**PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.**

<b>1. REPORT DATE</b> ( <i>DD-MM-YYYY</i> )	<b>2. REPORT TYPE</b>	<b>3. DATES COVERED</b> ( <i>From - To</i> )
---	-----------------------	--

<b>4. TITLE AND SUBTITLE</b>	<b>5a. CONTRACT NUMBER</b>
	<b>5b. GRANT NUMBER</b>
	<b>5c. PROGRAM ELEMENT NUMBER</b>

<b>6. AUTHOR(S)</b>	<b>5d. PROJECT NUMBER</b>
	<b>5e. TASK NUMBER</b>
	<b>5f. WORK UNIT NUMBER</b>

<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b>	<b>8. PERFORMING ORGANIZATION REPORT NUMBER</b>
---	---

<b>9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b>	<b>10. SPONSOR/MONITOR'S ACRONYM(S)</b>
	<b>11. SPONSOR/MONITOR'S REPORT NUMBER(S)</b>

**12. DISTRIBUTION/AVAILABILITY STATEMENT**

**13. SUPPLEMENTARY NOTES**

**14. ABSTRACT**

**15. SUBJECT TERMS**

<b>16. SECURITY CLASSIFICATION OF:</b>			<b>17. LIMITATION OF ABSTRACT</b>	<b>18. NUMBER OF PAGES</b>	<b>19a. NAME OF RESPONSIBLE PERSON</b>
a. REPORT	b. ABSTRACT	c. THIS PAGE			<b>19b. TELEPHONE NUMBER</b> ( <i>Include area code</i> )

---

**REPORT DOCUMENTATION PAGE (SF298)**  
**(Continuation Sheet)**

---

## INSTRUCTIONS FOR COMPLETING SF 298

**1. REPORT DATE.** Full publication date, including day, month, if available. Must cite at least the year and be Year 2000 compliant, e.g. 30-06-1998; xx-06-1998; xx-xx-1998.

**2. REPORT TYPE.** State the type of report, such as final, technical, interim, memorandum, master's thesis, progress, quarterly, research, special, group study, etc.

**3. DATES COVERED.** Indicate the time during which the work was performed and the report was written, e.g., Jun 1997 - Jun 1998; 1-10 Jun 1996; May - Nov 1998; Nov 1998.

**4. TITLE.** Enter title and subtitle with volume number and part number, if applicable. On classified documents, enter the title classification in parentheses.

**5a. CONTRACT NUMBER.** Enter all contract numbers as they appear in the report, e.g. F33615-86-C-5169.

**5b. GRANT NUMBER.** Enter all grant numbers as they appear in the report, e.g. AFOSR-82-1234.

**5c. PROGRAM ELEMENT NUMBER.** Enter all program element numbers as they appear in the report, e.g. 61101A.

**5d. PROJECT NUMBER.** Enter all project numbers as they appear in the report, e.g. 1F665702D1257; ILIR.

**5e. TASK NUMBER.** Enter all task numbers as they appear in the report, e.g. 05; RF0330201; T4112.

**5f. WORK UNIT NUMBER.** Enter all work unit numbers as they appear in the report, e.g. 001; AFAPL30480105.

**6. AUTHOR(S).** Enter name(s) of person(s) responsible for writing the report, performing the research, or credited with the content of the report. The form of entry is the last name, first name, middle initial, and additional qualifiers separated by commas, e.g. Smith, Richard, J, Jr.

**7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES).** Self-explanatory.

**8. PERFORMING ORGANIZATION REPORT NUMBER.** Enter all unique alphanumeric report numbers assigned by the performing organization, e.g. BRL-1234; AFWL-TR-85-4017-Vol-21-PT-2.

**9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES).** Enter the name and address of the organization(s) financially responsible for and monitoring the work.

**10. SPONSOR/MONITOR'S ACRONYM(S).** Enter, if available, e.g. BRL, ARDEC, NADC.

**11. SPONSOR/MONITOR'S REPORT NUMBER(S).** Enter report number as assigned by the sponsoring/monitoring agency, if available, e.g. BRL-TR-829; -215.

**12. DISTRIBUTION/AVAILABILITY STATEMENT.** Use agency-mandated availability statements to indicate the public availability or distribution limitations of the report. If additional limitations/ restrictions or special markings are indicated, follow agency authorization procedures, e.g. RD/FRD, PROPIN, ITAR, etc. Include copyright information.

**13. SUPPLEMENTARY NOTES.** Enter information not included elsewhere such as: prepared in cooperation with; translation of; report supersedes; old edition number, etc.

**14. ABSTRACT.** A brief (approximately 200 words) factual summary of the most significant information.

**15. SUBJECT TERMS.** Key words or phrases identifying major concepts in the report.

**16. SECURITY CLASSIFICATION.** Enter security classification in accordance with security classification regulations, e.g. U, C, S, etc. If this form contains classified information, stamp classification level on the top and bottom of this page.

**17. LIMITATION OF ABSTRACT.** This block must be completed to assign a distribution limitation to the abstract. Enter UU (Unclassified Unlimited) or SAR (Same as Report). An entry in this block is necessary if the abstract is to be limited.