BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Karen J. Parker

eRA COMMONS USER NAME (credential, e.g., agency login): PARKER.KAREN

POSITION TITLE: Truong-Tan Broadcom Endowed Professor, Department of Psychiatry & Behavioral Sciences, and by courtesy, Department of Comparative Medicine, School of Medicine, Stanford University

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
University of Michigan	AB	04/1994	Psychology
University of Michigan	PhD	12/2000	Biological Psychology
Stanford University	Postdoctoral fellow	03/2006	Psychiatry Neuroscience

A. Personal Statement

The principal goal of my research program is to better understand the neurobiological underpinnings of social functioning across a range of species and to translate these fundamental insights to drive development of novel diagnostic and treatment solutions for patients with neurodevelopmental and neuropsychiatric disorders. I have served as the PI on numerous federal (NIMH, NICHD, DoD) and private foundation (Simons Foundation; NARSAD; BRAIN Foundation; Weston Havens Foundation; Oxnard Foundation) grants focused on behavioral phenotyping, biomarker discovery (in blood, CSF, and brain), and pharmacological testing in both animals and human patients, using identical measures and shared endpoints. I have a long-standing interest and expertise in the regulatory roles of oxytocin (#1) and vasopressin (#2), and over the past 15+ years, I have increasingly applied this knowledge to better understand the pathophysiology of autism spectrum disorder (e.g., in the context of animal model development, biomarker discovery, and medication trials; #3). A second long-standing line of work in my lab has investigated neuroendocrine and social contributions to the pathogenesis of stress-related mood and anxiety disorders, as well as resilience to developing them (see below). I have disseminated findings from this body of research in journals such as *Science Translational Medicine*, *PNAS, JAMA Psychiatry, and Molecular Psychiatry.* These translational research endeavors necessitated that I master a team-based approach to science early in my career; I have a long and successful track-record of building and leading multidisciplinary research teams to achieve ambitious goals on accelerated timelines. My research accomplishments have been recognized by invitations to serve on key opinion leader planning committees for non-human primate and autism research roadmaps (e.g., for the US National Academies; NIH Brain Initiative 2.0; Simons Foundation, Autism Research Institute) as well as on international research advisory committees (e.g., for the American College of Neuropsychopharmacology; Society for Neuroscience) and scientific advisory boards (e.g., for the Wisconsin National Primate Research Center; Simian Collective). I also have a successful track-record of mentoring junior faculty and trainees, and I also participate in collaborative science advocacy and awareness efforts (#4).

Review and patent citations:

1. Itskovich E, Bowling DL, Garner JP & **Parker KJ** (2022). Oxytocin and the social facilitation of placebo effects. *Molecular Psychiatry*, 27(6): 2640-2649. PMID: 35338314.
2. **Parker KJ**, Carson DS, Hardan AY (2024). Intranasal vasopressin treatment for social deficits in children with autism. US Patent 11,951,149. Stanford University.
3. **Parker KJ** (2022). Leveraging a translational research approach to drive diagnostic and treatment advances for autism. *Molecular Psychiatry*, 27(6): 2650-2658. PMCID: PMC9167797.

4. Miller C, Basso M, Batista A, Gothard K, **Parker KJ**, Tsao D, Williams Z & Platt M (2025). Science must break its silence to rebuild public trust. *Nature Neuroscience*, 28(11):2169-2170. PMID: 41087752.

B. Positions, Scientific Appointments, and Honors

Positions and Scientific Appointments

02/25-	Corresponding member, UCSD/Salk CARTA Center (by invitation)
01/25-	Scientific advisory board member, biomarkers core, Emory National Primate Research Center
01/24-	Member, Constitution, Rules, and Ethics Committee, American College of Neuropsychopharmacology
10/23-	Inaugural Truong-Tan Broadcom Endowed Professor, Stanford University School of Medicine
09/23-	Scientific advisory board member, Wisconsin National Primate Research Center
08/23-	Professor, Depts. of Psychiatry and Comparative Medicine (courtesy), Stanford University
01/23-	Fellow, American College of Neuropsychopharmacology (by election)
05/22-	Executive committee member, Simian Collective
11/19-	Associate Chair, Research Strategy & Oversight, Department of Psychiatry, Stanford University
11/19-	Chair, Major Laboratories Division, Department of Psychiatry, Stanford University
02/14-	Faculty affiliate and advisor, Undergraduate Program in Human Biology, Stanford University
10/13-	Editorial board member, *Psychoneuroendocrinology*
08/12-	Affiliate scientist, California National Primate Research Center
05/07-	Stanford faculty research affiliations: Wu Tsai Neurosciences Institute, Stanford Autism Center at Packard Children's Hospital, Bio-X, Stanford Maternal and Child Health Research Institute

Honors

2023	Stanford Department of Psychiatry Chairman's Award for Advancing Science
2016	Kavli Fellow, US National Academy of Sciences (recognition of early scientific achievement)
2015	George A. Miller Award (most outstanding article), American Psychological Association
2012-2013	Stanford University School of Medicine Advanced Leadership Development Program
2012	McCormick Faculty Award (for advancing women in medicine and medical research)
2007	NARSAD Young Investigator Award
2000	University of Michigan Distinguished Dissertation Award (best dissertation)
2000	Department of Psychology Marquis Award (best dissertation)
1993-1994	Psi Chi National Honor Society and Chapter President, University of Michigan

C. Contributions to Science

1. Developing and validating a novel primate model of autism. Progress in detecting and treating autism has been impeded by difficulty in obtaining brain-relevant tissues from patients to study disease biology directly, and the absence of tractable animal models with direct relevance to core autism symptoms. These limitations underscored the tremendous value in developing a refined animal model of complex social deficits with more reliable behavioral and biological homology to the human condition. Because quantitative autistic traits are common, highly heritable, and continuously distributed across the general human population (with autism representing the social extreme in people), my team pioneered the study of naturally occurring low sociality in rhesus monkeys to model human social deficits, taking advantage of a large outdoor-housed monkey colony (N=4,000) for behavioral screening and phenotype validation. We have found that adult low-social monkeys exhibit deficiencies in social information processing abilities (e.g., face recognition; gaze aversion), initiate fewer prosocial interactions, suggesting a social motivational deficit, display more inappropriate social behaviors, and exhibit an increased burden of autistic-like traits using a clinical autism screening instrument we reverse-translated and validated for use in macaques (1a, 1b). Like autism, we found that primate social impairments are highly heritable (1c) and stable across time. We have also identified subtle behavioral markers in infancy that predict, with 100% accuracy, whether a monkey will exhibit social impairments later in life (1a), paving the way for intervention studies (1d) to alter developmental outcomes in "at risk" monkey infants.

a. Sclafani V, Del Rosso LA, Seil SK, Calonder LA, Madrid JE, Bone KJ, Sherr EH, Garner JP, Capitanio JP & **Parker KJ** (2016). Early predictors of impaired social functioning in male rhesus macaques (*Macaca mulatta*). *PLOS ONE*, 11(10): e0165401. PMCID: PMC5082922.

b. Talbot CF, Garner JP, Maness AC, McCowan B, Capitanio JP & **Parker KJ** (2020). A psychometrically robust screening tool to rapidly identify socially impaired monkeys in the general population. *Autism Research*, *13*(9), 1465–1475. PMCID: PMC7932024.
c. Garner JP, Talbot CF, Del Rosso LA, McCowan B, Kanthaswamy S, Haig D, Capitanio JP & **Parker KJ** (2023). Rhesus macaque social functioning is paternally, but not maternally, inherited by sons: Potential implications for autism. *Molecular Autism*, 14(1): 25. PMCID: PMC10360241.
d. Talbot CF, Oztan O, Simmons SM, Trainor C, Ceniceros LC, Nguyen D, Del Rosso LA, Garner JP, Capitanio JP & **Parker KJ** (2024). Nebulized vasopressin penetrates CSF and improves social cognition without inducing aggression in a rhesus monkey model of autism. *Proceedings of the National Academy of Sciences*, 121(49):e2418635121. PMID: 39585977.

2. Autism biomarker discovery and clinical trials. To test the translational utility of our primate model described above, we next performed CSF biomarker discovery in low-social rhesus monkeys. Prior to our efforts, autism biomarker research had been largely restricted to blood, which requires less invasive collection procedures, but is less representative of brain biochemistry than CSF. Further, I was inspired by the progress that had been made in CSF biomarker discovery in neurodegenerative disease, and thought a similar approach might be suitable for autism. Using an innovative biomarker winnowing strategy, we discovered that low CSF vasopressin concentration is a key driver of group differences in macaque sociality and autistic-like trait burden (e.g., 2a). My team next extended our biomarker discovery approach to three pediatric patient cohorts. We found that CSF vasopressin concentration identified children with autism with high accuracy, and that autistic patients with the lowest CSF vasopressin concentrations had the greatest symptom severity (2a; 2b). Using a large archive of banked CSF samples, we also found that 0-3 month-old newborns, who were subsequently diagnosed years later with autism, have significantly lower CSF vasopressin concentrations compared to those who did not later receive an autism diagnosis (2c). These findings suggested that the vasopressin signaling pathway may be a promising target by which to improve social cognition in autism patients. To this end, my group conducted a first-in-class pilot phase 2a trial to test the safety and efficacy of vasopressin to improve social abilities in children with autism (2d). We found that vasopressin was well tolerated and significantly improved social abilities in children with autism, thereby enabling us to secure an NIH R01 grant to replicate and extend these findings in the largest single site medication trial for autism to date (>100 child participants). This trial is now complete, and we anticipate having top-line data soon.

a. **Parker KJ**, Garner JP, Oztan O, Tarara ER, Li J, Sclafani V, Del Rosso LA, Chun K, Berquist SW, Chez MG, Partap S, Hardan AY, Sherr EH & Capitanio JP (2018). Arginine vasopressin in cerebrospinal fluid is a marker of sociality in nonhuman primates. *Science Translational Medicine*, 10: eaam9100. PMCID: PMC6714978.
b. Oztan O, Garner JP, Partap S, Sherr EH, Hardan AY, Farmer C, Thurm A, Swedo SE & **Parker KJ** (2018). Cerebrospinal fluid vasopressin and symptom severity in children with autism. *Annals of Neurology*, 84(4): 611-615. PMCID: PMC6719782.
c. Oztan O, Garner JP, Constantino JN & **Parker KJ** (2020). Neonatal CSF vasopressin concentration predicts later medical record diagnoses of autism spectrum disorder. *Proceedings of the National Academy of Sciences*, 117(19): 10609-10613. PMCID: PMC7229671.
d. **Parker KJ**, Oztan O, Libove RA, Mohsin N, Karhson DS, Sumiyoshi RD, Summers JE, Hinman KE, Motonaga KS, Phillips JM, Carson DS, Fung LK, Garner JP & Hardan AY (2019). A randomized placebo-controlled pilot trial shows that intranasal vasopressin improves social deficits in children with autism. *Science Translational Medicine*, 11: eaau7356. PMCID: PMC7932024.

3. The neuroendocrinology of anxiety and social buffering in human and non-human primates. I have a long-standing interest in the role of social relationships, and the neuropeptides which regulate them, as buffers against anxiety and HPA axis stress responsivity. I was one of the first researchers to deliver oxytocin intranasally to squirrel monkeys and demonstrate its anxiolytic and anti-stress properties (3a). I subsequently translated this work collaboratively to Fragile-X patients (who exhibit social deficits, high anxiety, and enhanced neuroendocrine stress responsivity) (3b). Fragile-X was of interest to me because I knew that Fmr1 gene knockout mice had diminished hypothalamic oxytocin production. Our team used this information to show in a small pilot trial that intranasal oxytocin administration enhances eye contact and diminishes circulating cortisol levels in this population. In line with this work, my group was the first to show that low CSF oxytocin concentration is a robust marker of social anxiety in humans (3c). Finally, my team also published an oxytocin treatment trial in children

with idiopathic autism (3d), who as a population also exhibit comorbid anxiety symptoms. These findings demonstrated that our Fragile-X findings generalized to a non-syndromic form of autism, and that those with the lowest blood oxytocin levels benefited the most from oxytocin treatment.

a. **Parker KJ**, Buckmaster CL, Schatzberg AF & Lyons DM (2005). Intranasal oxytocin administration attenuates the ACTH stress response in monkeys. *Psychoneuroendocrinology*, 30: 924-929. PMID: 15946803.
b. Hall SS, Lightbody AA, McCarthy BE, **Parker KJ** & Reiss AL (2012). Effects of intranasal oxytocin administration on social anxiety in males with Fragile X syndrome. *Psychoneuroendocrinology,* 37(4): 509-518. PMCID: PMC3353652.
c. Carson DS, Berquist SB, Trujillo T, Garner JP, Hannah S, Hyde SA, Sumiyoshi R, Jackson L, Moss JK, Strehlow MC, Cheshier SH, Partap S, Hardan AY & **Parker KJ** (2015). Cerebrospinal fluid and plasma oxytocin concentrations are positively correlated and negatively predict anxiety in children. *Molecular Psychiatry*, 20(9): 1085-1090. PMID: 25349162.
d. **Parker KJ**, Oztan O, Libove RA, Sumiyoshi RD, Jackson LP, Karhson DS, Summers JE, Hinman KE, Motonaga KS, Phillips JM, Carson DS, Garner JP & Hardan AY (2017). Intranasal oxytocin treatment for social deficits and biomarkers of response in children with autism. *Proceedings of the National Academy of Sciences*, 114 (30): 8119-8124. PMCID: PMC5544319.

4. The neurobiology of stress vulnerability in monkey models and patients with stress-related psychiatric disorders. Repeated activation of stress response systems during prolonged stress exposure produces cumulative damage to the body and brain called "allostatic load." Allostatic load manifests as well characterized cognitive, neuroendocrine, and neuroanatomical impairments in monkey models and in human stress-related disorders. I have been involved in collaborative studies that successfully modeled risk factors for, and evidence of, these stress-induced impairments in monkeys (e.g., 4a), and have written extensively on the deleterious effects of early adverse experiences and chronic stress exposure in adulthood (4b-4d).

a. Lyons DM, **Parker KJ**, Zeitzer JM, Buckmaster CL & Schatzberg AF (2007). Preliminary evidence that hippocampal volumes in monkeys predict stress levels of adrenocorticotropic hormone. *Biological Psychiatry*, 62 (10): 1171-1174. PMCID: PMC2129091.
b. **Parker KJ**, Schatzberg AF & Lyons DM (2003). Neuroendocrine aspects of hypercortisolism in major depression. *Hormones and Behavior*, 43(1): 60-66. PMID: 12614635.
c. Miller GE, Chen E & **Parker KJ** (2011). Psychological stress in childhood and susceptibility to the chronic diseases of aging: Moving toward a model of behavioral and biological mechanisms. *Psychological Bulletin*, 137(6): 959-997. PMCID: PMC3202072.
d. **Parker KJ** & Maestripieri D (2011). Identifying key features of early stressful experiences that produce stress vulnerability and resilience in primates. *Neuroscience and Biobehavioral Reviews*, 35(7): 1466-1483. PMCID: PMC3023826.

5. Developing a novel primate model of stress resilience and translation of findings to humans. When I initiated this line of research, the prevailing view in psychiatry neuroscience was that early life stress exposure was invariantly pathogenic. As a postdoctoral fellow, I challenged this view by creating a novel primate model to test the paradigm-shifting hypothesis that mild early stress exposure can "inoculate" a developing organism, thereby producing stress resilient outcomes. Thus, exposure to mild early life stress produces diminished anxiety and attenuated neuroendocrine responses to later life stressors, while also increasing prefrontal-dependent cognitive control of behavior (5a, 5b). I also showed that stress resilience is induced by early life stress exposure, rather than mothering, as in rats (5c). These provocative findings served to reject a popular decades-old theory that posited all forms of early inducible stress resilience were maternally mediated. I then collaboratively translated these monkey stress inoculation findings to a human population (5d). This latter study was one of the first to document the stress resilience phenomenon in humans.

a. **Parker KJ**, Buckmaster CL, Schatzberg AF & Lyons DM (2004). Prospective investigation of stress inoculation in young monkeys. *Archives of General Psychiatry (now JAMA Psychiatry)*, 61(9): 933-941. PMID: 15351772.

b. **Parker KJ**, Buckmaster CL, Justus KR, Schatzberg AF & Lyons DM. (2005). Mild early life stress enhances prefrontal-dependent response inhibition in monkeys. *Biological Psychiatry*, 57(8): 848-855. PMID: 15820705.
c. **Parker KJ**, Buckmaster CL, Sundlass K, Schatzberg AF & Lyons DM. (2006). Maternal mediation, stress inoculation, and the development of neuroendocrine stress resistance in primates. *Proceedings of the National Academy of Sciences*, 103(8): 3000-3005. PMCID: PMC1413772.
d. Edge MD, Ramel W, Drabant EM, Kuo JR, **Parker KJ** & Gross JJ (2009). For better or worse? Stress inoculation effects for implicit but not explicit anxiety. *Depression and Anxiety,* 26(9): 831-837. PMCID: PMC3364103.

Complete List of Published Work in MyBibliography:

https://www.ncbi.nlm.nih.gov/myncbi/karen.parker.2/bibliography/public/