

CURRICULUM VITAE: LAURA SMALE

Contact information:

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Education:

Ph.D., University of California, Berkeley, Jan. 1987 Psychobiology
B.A., University of California, Berkeley, 1982 Psychobiology

Current position:

Professor, Department of Psychology, Michigan State University
Professor, Department of Zoology, Michigan State University

Other positions held:

1997-2002	Associate Professor, Psychology Department, Michigan State University
1992-1997	Assistant Professor, Psychology Department, Michigan State University
1989-1992	Research Associate, State University of New York, Stony Brook
1987-1988	Post-doctoral Fellow, State University of New York, Stony Brook
1982-1987	Graduate student Teaching Assistant, University of California, Berkeley
1982-1987	Graduate student Research Assistant, University of California, Berkeley

Honors/Fellowships/Service:

NIMH grant review panel for sleep/rhythms research, 2005-2008,
Gordon Conference invitee, 2005
NIMH *ad hoc* reviewer for sleep/rhythms panel, 2003, 2004
NIMH *ad hoc* reviewer for special program in Neuroscience Sleep and Circadian Biology, 2005
DataBlitz Program Committee, Society for Neuroscience, 2003
Advisory Board, Journal of Biological Rhythms, 2001-present
Editorial Board, Hormones and Behavior, 1999-present
NSF ad-hoc reviewer for panel on Neuroendocrine Systems, 1996-present
NSF ad-hoc reviewer for panel on Animal Behavior, 1995-present
IACUC member 1999-2006
Advisory Committee, MSU Program in Ecology, Evolutionary Biology and Behavior, 1998-present
Member of MSU Neuroscience Program
Member of MSU program in Ecology, Evolution and Behavioral Biology
Recipient of the Frank A. Beach award, 1994

Research Interests:

Neural substrates of circadian rhythms; mammalian reproduction and behavioral endocrinology; behavioral development; biology of social behavior.

Teaching Experience:

MSU Undergraduate classes: Psychobiology of the Lifespan; Brain and Behavior; Introductory Psychology; The Biology of Sleep and Rhythms

MSU Graduate student classes: Developmental Psychobiology; Neuroendocrine Aspects of Aggressive Behavior; Mating Systems and Social Behavior: Evolutionary and Neuroendocrine Perspectives, Evolution of a Social Brain.

UC Berkeley: Graduate student teaching assistant for undergraduate courses in: Hormones and Behavior; Advanced General Psychology; Introduction to Biopsychology; Applications of Biopsychology to Human Problems.

Current grant support:

National Institute of Mental Health, The psychobiology of rhythms in diurnal mammals, Principle investigator: Laura Smale, Co-investigators: Antonio A. Nunez, David Weaver, 2007-2010

United States-Israel Binational Science Foundation, The neural mechanisms of daily rhythms and their plasticity in *Acomys russatu*, Principle Investigator: Noga Kronfeld-Schor, Co-Principle Investigator: Laura Smale, 2006-2008

Past grant support:

National Institute of Mental Health, The psychobiology of rhythms in diurnal mammals, Principle investigator: Laura Smale, Co-investigators: Antonio A. Nunez, David Weaver, 2002-2007

National Science Foundation, Mammalian behavioral development under contrasting regimes of interspecific competition, Principle Investigator: Kay E. Holekamp, Co-Principle Investigator: Laura Smale, 2003-2008

National Science Foundation, Neuroendocrine determinants of mating in the day versus night, Principle Investigator: Laura Smale, Co-Principle Investigators: Cheryl Sisk, Kristine Krajnek, 2002-2006

United States-Israel Binational Science Foundation, The neural mechanisms of daily rhythms and their plasticity in *Acomys russatu*, Principle Investigator: Noga Kronfeld-Schor, Co-Principle Investigator: Laura Smale, 2003-2005

National Science Foundation, Mammalian Sibling Rivalry, Principle Investigator: Kay Holekamp, Co-Principle Investigator: Laura Smale, 2000-2006

National Institute of Mental Health, The psychobiology of rhythms in diurnal mammals, Principle Investigator: Laura Smale, Co-Investigator: Antonio A. Nunez, 1998-2002

National Science Foundation, The evolution of intelligence in response to social complexity, Principle Investigator: Kay Holekamp, Co-Principle Investigators: Laura Smale, 1997-2000

All University Research Investigators Grant, MSU, Intraspecific variation in patterns of circadian rhythmicity, Principle Investigator: Laura Smale, 1999

National Institute of Mental Health, The psychobiology of rhythms in diurnal mammals, Principle Investigator: Laura Smale, 1994-1997

National Science Foundation, Rank and reproduction in free-living spotted hyenas, Principle Investigator: Kay Holekamp, Co-Principle Investigator Laura Smale, 1994-1997

All University Research Investigators Grant, MSU, Hormonal modulation of circadian rhythmicity, 1993

National Science Foundation, Dispersal and mating in free-living spotted hyenas, 1991-1994, Principle Investigator: K. Holekamp; Co-Principle Investigators: L. Smale

American Association of University Women, Postdoctoral fellowship, 1989-1990

Ad hoc reviewer for:

Acta Theriological
Animal Behavior
Behavioral Ecology and Sociobiology
Behavioral Neuroscience
Brain Research
Chronobiology International
Developmental Brain Research
Developmental Psychobiology
European Journal of Neuroscience
Hormones and Behavior
Integrative and Comparative Biology
Journal of Biological Rhythms
Journal of Comparative Neurology
Journal of Mammalogy
Neuroendocrinology
Neuroscience
Neurotoxicology
Physiological and Biochemical Zoology
Physiology and Behavior
Proceedings of the National Academy of Sciences

Publications: Research Reports

Ramanathan, C, Nunez, AA and **Smale, L**, Daily rhythms in PER1 within and beyond the suprachiasmatic nucleus of female grass rats (*Arvicanthis niloticus*), *Neuroscience*, 2008, 156:48-56.

Ramanathan, C, **Smale, L** and Nunez AA, Rhythms in expression of PER1 protein in the amygdala and bed nucleus of the stria terminalis of the diurnal grass rat (*Arvicanthis niloticus*), *Neuroscience Letters*, 2008, 441:86-89.

Gaillard, F, Bonfield, S, Gilmour, GS, Kuny, S, Mema, SC, Martin, BT, **Smale, L**, Crowder N, Stell WK, Sauv  Y, Retinal anatomy and visual performance in a diurnal cone-rich laboratory rodent, the Nile grass rat (*Arvicanthis niloticus*), *The Journal of Comparative Neurology*, 2008, 403:190-208.

Tanner, J, Holekamp, KE and **Smale, L**. Ontogenetic variation in the play behavior of spotted hyenas (*Crocuta crocuta*), *Journal of Developmental Processes*, 2007, 22:5-30.

Nixon, JP and **Smale, L**, A comparative analysis of the distribution of orexins in the brains of nocturnal and diurnal rodents, *Behavioral and Brain Functions*, 2007. 3:28, doi.10.1186/1744-9081-3-28.

Manoney, MM, Ramanatham C and **Smale, L**, Tyrosine hydroxylase positive neurons and their contacts with vasoactive intestinal polypeptide-containing fibers in the hypothalamus of the diurnal murid rodent, *Arvicanthus niloticus*, *Brain Research*, 2007, 33:131-139.

Novak, C, Parfitt, D, Sisk, C and **Smale, L**, Associations between behavior, hormones and Fos responses to novelty differ in pre- and post-pubertal grass rats, *Physiology and Behavior*, 2006, 90: 125-132.

Ramanathan, C, Nunez, AA, Schwartz, MD, Martinez, G and **Smale, L**, Temporal and spatial distribution of immunoreactive PER1 and PER2 proteins in the suprachiasmatic nucleus and peri-suprachiasmatic region of the diurnal grass rat (*Arvicanthis niloticus*), *Brain Research.*, 2006, 1073: 348-358.

Schwartz, M and **Smale, L.**, Individual differences in rhythms of behavioral sleep and its neural substrates in Nile grass rats, *Journal of Biological Rhythms*, 2005, 20: 526-537.

Boydston, EE, Kapheim, KM, Van Horn, RC, **Smale, L** and Holekamp, KE, Sexually dimorphic patterns of space use throughout ontogeny in the spotted hyaena (*Crocuta crocuta*), *Journal of Zoology, London*, 2005, 267:271-281.

Nixon, J and **Smale, L**, Orexin fibers form appositions with Fos expressing neuropeptide-Y cells in the grass rat intergeniculate leaflet, *Brain Research*, 2005, 1053: 33-37.

Lambert, CM, Machida, KK, **Smale, L**, Nunez, AA and Weaver, DR, Analysis of the Prokineticin 2 system in a diurnal rodent, the unstriped Nile grass rat (*Arvicanthis niloticus*), *Journal of Biological Rhythms*, 2005, 20:206-218.

Mahoney, MM and **Smale, L**, Arginine vasopressin and vasoactive intestinal polypeptide fibers make appositions with gonadotropin-releasing hormone and estrogen receptor cells in the diurnal rodent *Arvicanthis niloticus*, *Brain Research*, 2005, 1049: 156-164.

Mahoney, MM and **Smale, L**, A daily rhythm in mating behavior in a diurnal murid rodent *Arvicanthis niloticus*, *Hormones and Behavior*, 2005, 47:8-13.

Nixon, J and **Smale, L**, Individual differences in wheel running rhythms are related to temporal and spatial patterns of activation of orexin A and B cells in a diurnal rodent (*Arvicanthis niloticus*), *Neuroscience*, 2004, 127:13-23.

Schwartz, M, Nunez, AA and **Smale, L**, Differences in the suprachiasmatic nucleus and lower subparaventricular zone of diurnal and nocturnal rodents, *Neuroscience*, 2004, 127:25-34.

Mahoney, MM, Sisk, C., Ross, H., and **Smale, L.**, Circadian regulation of gonadotropin-releasing hormone neurons and the preovulatory surge in luteinizing hormone in the diurnal rodent, *Arvicanthis niloticus*, and in a nocturnal rodent, *Rattus norvegicus*, *Biology of Reproduction*, 2004, 70:1049-1054.

Martinez, G.S., **Smale, L.** and Nunez, A.A., Diurnal and nocturnal rodents show different patterns of rhythmicity in orexigenic neurons, *Brain Research*, 2003, 9555:1-7.

Nunes, S., McElhinny, T.L., Mahoney, M.M. and **Smale, L.**, Effects of photoperiod on the reproductive condition of Nile grass rats from an equatorial population. *African Journal of Ecology*, 2002, 40:295-302.

Engh, A.L., Funk, S.M., Van Horn, R.C., Scribner, K.T., Bruford, M.W., Libants, S., Szykman, M., **Smale, L.** and Holekamp, K.E., Reproductive skew among males in a female dominated mammalian society, *Behavioral Ecology*, 2002, 13:193-200.

Smale, L., Castleberry, C. Nunez, AA, Fos rhythms in the hypothalamus of *Rattus* and *Arvicanthis* that exhibit nocturnal and diurnal patterns of rhythmicity, *Brain Research*, 2001, 800:101-105.

Smale, L., McElhinny, T, Nixon, J, Gubik, B, Rose, S, Patterns of wheel running are related to Fos expression in neuropeptide Y containing neurons in the intergeniculate leaflet of *Arvicanthis niloticus*, *Journal of Biological Rhythms*, 2001, 16:149-162.

Mahoney, M.M., Bult, A., **Smale, L.**, Phase response curve and light induced Fos expression in the suprachiasmatic nucleus and adjacent hypothalamus of *Arvicanthis niloticus*, *Journal of Biological Rhythms*, 2001, 16:163-172.

Engh, A.L., Esch, K., **Smale**, L. and Holekamp, K.E., Mechanisms of maternal rank “inheritance” in the spotted hyena, *Crocuta crocuta*, *Animal Behavior*, 2000, 60:323-332.

Novak, C.M., Harris, J., **Smale**, L., Nunez, A.A., Suprachiasmatic nucleus projections to the paraventricular thalamic nucleus in nocturnal rats (*Rattus norvegicus*) and diurnal Nile grass rats (*Arvicanthis niloticus*), *Brain Research*, 2000, 874:147-157.

Mahoney, M.M., Nunez, A.A. and **Smale**, L., Calbindin and Fos within the suprachiasmatic nucleus and adjacent hypothalamus of *Arvicanthis niloticus* and *Rattus norvegicus*, *Neuroscience*, 2000, 99:565-575.

Novak, C.M., **Smale**, L., and Nunez, A.A., Rhythms in Fos expression in brain areas related to the sleep-wake cycle in the diurnal *Arvicanthis niloticus*, *American Journal of Physiology*, 2000, 278:R1267-R1274.

Blanchong, J.B. and **Smale**, L., Temporal patterns of activity in the unstriped Nile rat, *Arvicanthis niloticus* in its natural habitat, *Journal of Mammalogy*, 2000, 81:595-599.

Blanchong, J.B., McElhinny, T.L., Mahoney, M.M, and **Smale**, L., Nocturnal and diurnal rhythms in the unstriped Nile rat, *Arvicanthis niloticus*, *Journal of Biological Rhythms*, 1999, 14:364-377.

Smale, L., Holekamp, K.E. and White, P.A., Siblicide revisited in the spotted hyaena: does it conform to obligate or facultative models?, *Animal Behavior*, 1999, 58:545-551.

McElhinny, T.L., Sisk, C.L., Holekamp, K.E. and **Smale**, L., A morning surge in plasma LH coincides with elevated Fos expression in GnRH-IR neurons in the diurnal rodent *Arvicanthis niloticus*, *Biology of Reproduction*, 1999, 61:1115-1122.

Nunez, A.A., Bult, A. McElhinny, T.M. and **Smale**, L., Daily rhythms of Fos expression in hypothalamic targets of the suprachiasmatic nucleus in diurnal and nocturnal rodents, *Journal of Biological Rhythms*, 1999; 14:300-306.

Goel, N., Lee, T. M. and **Smale** L., Suprachiasmatic nucleus and intergeniculate leaflet in the diurnal rodent, *Octodon degus*: retinal projections and immunocytochemical characterization, *Neuroscience*, 1999, 92:1491-1506.

Novak, C.M., **Smale**, L. and Nunez, A.A. Fos expression in the sleep-active cell group of the ventrolateral preoptic area in the diurnal murid rodent, *Arvicanthis niloticus*, *Brain Research*, 1999, 818:375-382.

Rose, S. Novak, C., Mahoney, M.M., Nunez, A. and **Smale**, L., Fos expression within vasopressin-containing neurons in the suprachiasmatic nucleus of diurnal compared to nocturnal rodents, *Journal of Biological Rhythms*, 1999, 14:37-46.

- Smale**, L. and Boverhof, J., The suprachiasmatic nucleus and intergeniculate leaflet of *Arvicanthis niloticus*, a diurnal rodent from East Africa, *Journal of Comparative Neurology*, 1999, 403:190-208.
- Holekamp, K.E., Szykman, Boydston, E.E. and **Smale**, L. Association of seasonal reproductive patterns with changing food availability in an equatorial carnivore, the spotted hyena (*Crocuta crocuta*) *Journal of Reproduction and Fertility*, 1999, 116:87-93.
- Cooper, S.M., Holekamp, K.E. and **Smale**, L., A seasonal feast: long term analysis of feeding behavior in the spotted hyena, *Crocuta crocuta*, *African Journal of Ecology*, 1999, 37:149-160.
- Bult, A. and **Smale**, L., Distribution of Ca²⁺-dependent protein kinase C isoforms in the suprachiasmatic nucleus of the diurnal murid rodent, *Arvicanthis niloticus*, *Brain Research*, 1998, 816:190-199.
- Holekamp, K.E. and **Smale**, L., Dispersal status influences hormones and behavior in the male spotted hyena, *Hormones and Behaviour*, 1998, 33:205-216.
- Nunes, S., Ha, C.T., Garrett, P.J., Mueke, E., **Smale**, L. and Holekamp, K.E., Body fat and time of year interact to mediate dispersal behaviour in ground squirrels, *Animal Behavior*, 1998, 55:605-614.
- Katona, C., Rose, S. and **Smale**, L., The expression of Fos within the suprachiasmatic nucleus of the diurnal rodent *Arvicanthis niloticus*, *Brain Research*, 1998, 791:27-34.
- McElhinny, T.M., **Smale**, L. and Holekamp, K.E., Patterns in body temperature, activity and reproductive behavior in a tropical murid rodent, *Arvicanthis Niloticus*, *Physiology and Behavior*, 1997, 62:91-96.
- Holekamp, K.E., **Smale**, L., Berg, R. and Cooper, S.M., Hunting rates and hunting success in the spotted hyenas, *Journal of Zoology, London*, 1997, 242:1-15.
- Holekamp, K.E., Cooper, S.M., Katona, C.K., Berry, A., Frank, L.G., and **Smale**, L., Patterns of association among female spotted hyenas (*Crocuta crocuta*), *Journal of Mammalogy*, 1997, 78:55-74.
- Katona, C.I. and **Smale**, L., Wheel-running rhythms in *Arvicanthis niloticus*, *Physiology and Behavior*, 1996, 61:365-372.
- Holekamp, K.E., **Smale**, L. and Szykman, M., Rank and reproduction in female spotted hyenas, *Journal of Reproduction and Fertility*, 1996, 108:229-237.
- Alexander, K.A., Kat, P.W., Frank, L.G., Holekamp, K.E., **Smale**, L., Muller, W.W. and G. von Hegel., Evidence of canine distemper virus infection among free-ranging spotted hyenas (*Crocuta crocuta*) in the Masai Mara, Kenya, *Journal of Zoo and Wildlife Medicine*, 1995, 26:201-206.

Smale, L., Holekamp, K.E., Weldele, M., Frank, L.G., Glickman, S.E., Competition and cooperation between littermates in the spotted hyaena, *Crocuta crocuta*, *Animal Behavior*, 1995, 50:671-682.

Holekamp, K.E. and **Smale, L.**, Rapid changes in offspring sex ratios after clan fission in the spotted hyena, *American Naturalist*, 1995, 145:261-278.

Morin, L.P., Goodless-Sanchez, N., **Smale, L.** and R.Y. Moore, Projections of the suprachiasmatic nuclei and retrochiasmatic area in the golden hamster, *Neuroscience*, 1994, 61:391-410.

Alexander, K.A., Maclaughlin, N.J., Kat, P.W., House, C., O'Brien, S.J., Frank, L.G., Holekamp, K., **Smale, L.**, McNutt, J.W., Laurenson, M.K., Mills, M.G.L. and Osburn, B.I., Evidence of natural bluetongue virus infection among African and Indian carnivores, *American Journal of Tropical Medicine and Hygiene*, 1994, 51:568-576.

Holekamp, K. E., **Smale, L.**, Ogutu, J., Frank, L.G. and Dublin, H.T., Fission of a spotted hyena clan: Consequences of female absenteeism and causes of female emigration, *Ethology*, 1993, 93:285-299.

Smale, L., L. G. Frank, and K. E. Holekamp, Ontogeny of dominance in free-living spotted hyaenas: Juvenile rank relations with adults, *Animal Behavior*, 1993, 46:467-477.

Holekamp, K. E. and L. **Smale**, Ontogeny of dominance in free-living spotted hyaenas: Juvenile rank relations with other immature individuals, *Animal Behavior*, 1993. 46:451-466.

Smale, L., Blanchard, J., Moore, R.Y. and Morin, L.P., Immunocytochemical characterization of the suprachiasmatic nucleus and the intergeniculate leaflet in the diurnal ground squirrel, *Spermophilus lateralis*, *Brain Research*, 1991. 563:77-86.

Holekamp, K. E. and L. **Smale**, Provisioning and food-sharing by lactating spotted hyenas (*Crocuta*), *Ethology*, 1990, 86: 191-202.

Smale, L. and Morin, L.P., Photoperiodic responsiveness of hamsters with lesions of the lateral geniculate nucleus is related to hippocampal damage, *Brain Research Bulletin*, 1990, 24:185-190.

Smale, L., Pederson, J., Block, M. and Zucker, I., Investigation of conspecific male odours by female prairie voles, *Animal Behavior*, 1990, 39:768-774.

Smale, L., Lee, T., Nelson, R.J. and Zucker, I., Prolactin counteracts effects of short day lengths on pelage growth in the meadow vole (*Microtus pennsylvanicus*), *Journal of Experimental Zoology*, 1990, 253:186-188.

Smale, L., Michels, K.M., Moore, R.Y. and Morin, L.P., Destruction of the hamster serotonergic system by 5,7-DHT: effects on circadian rhythm phase, entrainment and response to triazolam, *Brain Research*, 1990, 515:9-19.

Smale, L., Cassone, V.M., Moore, R.Y., Morin, L.P., Paraventricular nucleus projections mediating pineal melatonin and gonadal responses to photoperiod in the hamster, *Brain Research Bulletin*, 1989, 22:263-269.

Johnson, R., **Smale, L.P., Moore, R.Y. and Morin, L.P.,** Paraventricular nucleus efferents mediating photoperiodism in male golden hamsters, *Neuroscience Letters*, 1989, 98:85-90.

Nelson, R.J., Frank, D., **Smale, L., and Willoughby, S.B.,** Photoperiod and temperature affect reproductive and nonreproductive functions in the male prairie vole, (*Microtus ochrogaster*), *Biology of Reproduction*, 1989. 40:481-487.

Smale, L., Dark, J. and Zucker, I., Pineal and photoperiodic influences on fat deposition, pelage and testicular activity in meadow voles, *Journal of Biological Rhythms*, 1988, 3:349-355.

Johnson, R.F., **Smale, L., Moore, R.Y. and Morin, L.P.,** Lateral geniculate lesions block circadian phase responses to a benzodiazepine, *Proceedings of the National Academy of Sciences*, 1988, 85:5301-5304.

Smale, L., Influence of male gonadal hormones and familiarity on pregnancy interruption in prairie voles, *Biology of Reproduction*, 1988, 39:28-31.

Smale, L., Nelson, R.J. and Zucker I., Day length influences pelage characteristics and prolactin but not reproduction in the prairie vole (*Microtus ochrogaster*), *Journal of Reproduction and Fertility*, 1988. 83:99-106.

Lee, T., **Smale, L., Dark, J. and Zucker, I.,** Influence of daylength experienced by dams on post-natal development of young meadow voles (*Microtus pennsylvanicus*), *Journal of Reproduction and Fertility*, 1987, 81:337-342.

Lee, T., **Smale, L., Dark, J. and Zucker, I.,** Interaction of daylength and lactation in the control of pelage and nest-building in female meadow voles, (*Microtus Pennsylvanicus*), *Journal of Reproduction and Fertility*, 1987, 81:351-356.

Lee, T., **Smale, L., Dark, J. and Zucker, I.,** Role of photoperiod during pregnancy and lactation in the meadow vole, *Microtus pennsylvanicus*, *Journal of Reproduction and Fertility*, 1987, 81:343-350.

Smale, L., Pelz, K., Zucker, I. and Licht, P., Neonatal androgenization in ground squirrels: Influence on sex differences in body mass and luteinizing hormone levels, *Biology of Reproduction*, 1986, 34:507-513.

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Beasely, L.J., **Smale**, L. and Smith, E.R., Melatonin influences the reproductive physiology of male pallid bats, *Biology of Reproduction*, 1984, 30:300-305.

Holekamp, K.E., **Smale**, L., Simpson, B.H. and Holekamp, N.A., Hormonal influences on natal dispersal in free living Belding's ground squirrels, (*Spermophilus beldingi*), *Hormones and Behavior*, 1984. 18:465-483.

Publications: Book Chapters and Review Articles

Smale, L, Nunez, AA, and Schwartz, MD, Rhythms in a diurnal brain, *Biological Rhythms Research*, 2008, 39:305-318

Lee, TM and **Smale L**, The neuroendocrinology of behavioral rhythms. In: Handbook of Neurochemistry and Molecular Neurobiology, 3rd edition, vol. 21, Behavioral Neurochemistry, Neuroendocrinology and Molecular Neurobiology, Ed. A. Lajtha, (Editor-in-chief) and J. Blaustein (volume editor), Handbook of Neurochemistry. 2007, 21: 835-868.

Smale, L, Heideman, PD, French, JA, Behavioral Neuroendocrinology in Nontraditional Species of Mammals: Things the 'Knockout' Mouse CAN'T Tell Us, *Hormones and Behavior*, 2005, 48 (4): 474-483.

Smale, L., Lee, T. and Nunez, A.A., Diurnality: Some facts and gaps, *Journal of Biological Rhythms*, 2003, 18:356-366.

Holekamp, K.E., Boyston, E.E. and **Smale**, L., Group movements in social carnivores, In: *Group Movements*, Ed. By Boinski, S. and Garber, P., 2000, pp.587-627.

Holekamp, K.E. and **Smale**, L., Feisty females and meek males: reproductive strategies in the spotted hyena. In: *Reproduction in Context*, Eds: Schneider, J. and Wallen, K., The MIT Press, 2000, pp.257-286

Smale, L., Nunes, S., and Holekamp, K.E., Sexually dimorphic dispersal in mammals: patterns, causes and consequences. *Advances in the Study of Behavior*, 1997, 26:181-250.

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Glickman, S.E., L.G. Frank, K.E. Holekamp, L. **Smale**, and P. Licht. Costs and benefits of "androgenization" in the female spotted hyena: The natural selection of physiological mechanisms. In *Perspectives in Ethology*, Vol. 10, Behavior and Evolution. pp. 87-117. Ed. by P.P.G. Bateson, P.H. Klopfer and N.S. Thompson. New York: Plenum Press, 1993.

Holekamp, K. E. and **Smale**, L, Dominance acquisition during mammalian social development: the "inheritance" of maternal rank, *American Zoologist*, 1991, 31: 306-317.

Morin, L.P., Michels, K.M., **Smale**, L. and Moore, R.Y., Serotonin regulation of circadian rhythmicity. In: *The Neuropharmacology of Serotonin*, Ed. by Whitaker-Azmitia, P.M. and Peroutka, S.J., Annals of the New York Academy of Sciences, 1990, 600:418-426.

Holekamp, K.E., Simpson, B.H. and **Smale**, L., Endocrine influences on natal dispersal in beltdings ground squirrels (*Spermophilus beldingi*). In: *Migration: Mechanisms and Adaptive Significance*, University of Texas press, Ed. Rankin, M.A., 1985.

Publications: Other

Smale, L and Nunez AA, Nocturnal/diurnal, Encyclopedia of Neuroscience, Springer, *in press*.

Nunez AA and **Smale**, Seasonality, Encyclopedia of Neuroscience, Springer, *in press*.

Smale, L, Book Review of: Life History and Social Strategies: from Development to Evolution, *Bioscience*, 2004, 54:462-463.

Holekamp, K.E. and **Smale**, L., A hostile homecoming, In: *The Smile of a Dolphin: Remarkable Accounts of Animal Emotions*, Ed: Bekoff, M, Discovery Books, NY., 2000 pp.119-121.

Smale, L., Book Review of: The Evolution of Sibling Rivalry, by D.M. Mock and G.A. Parker, *American Zoologist*, 1999, Volume 38, #6.

Smale, L, *Arvicanthis niloticus*: a diurnal "lab rat"?, *Biological Rhythms Bulletin*, Summer 1999, 1:9-11.

Holekamp, K.E. and **Smale**, L., Behavioral development in the spotted hyena, *Bioscience*, 1998, 48:997-1006.

Smale, L., Book Review of: Cheetahs of the Serengeti Plains: Group living in an asocial species, by T.M. Caro, *Animal Behavior*, 1996, 51:499-490.

Smale, L. and K.E. Holekamp, Growing up in the clan, *Natural History*, January 1993, p.42-53.

Smale, L. and Holekamp, K. E., The misunderstood spotted hyena, *Swara*, 1991 14: 10-13.

Invited Talks:

October 2006, "The diurnal brain," University of San Fransisco

January, 2006, "The neural substrates of diurnality," Winter Brain Conference

June, 2003, "Circadian organization of nocturnal vs. diurnal mammals," NIMH Workshop on: "Making sense of SCN heterogeneity: The tissue is the issue," Washington DC.

May, 2002, "The development of differences and similarities between the sexes in spotted hyenas (*Crocuta crocuta*)," Instituto de Ecologia, UNAM (Mexico City).

March, 2002, "Diurnal and nocturnal adaptations to the day-night cycle: how do the underlying neural mechanisms differ?" University of Alaska, Fairbanks.

March, 2000, "Circadian rhythms in diurnal rodents," The Florida State University Rushton Symposium on Biological Clocks.

August, 1999, "Neural correlates of a diurnal pattern of entrainment," International Congress of Chronobiology, Washington D.C.

March, 1997, NSF/CNRS sponsored conference, Lyons, France, Biological Rhythms: Physiological and molecular mechanisms.

January 1997, "Within and between species variation in patterns of circadian rhythmicity," Winter Animal Behavior Conference.

May 1995, "Circadian rhythms in diurnal mammals," Midwest Psychology Association, Chicago.

January 1995, "Sibling rivalry in spotted hyenas," Winter Animal Behavior Conference.

November 1994, "The development of sex differences in spotted hyenas," Society for Neuroscience conference.

April 1994, "Aggressive behavior in female spotted hyenas: a multilevel perspective," Midwest Animal Behavior Society.

March 1994, "The development of sex differences in spotted hyenas," University of Michigan, Biospsychology colloquium.

March 1992, "Neural substrates of circadian rhythms of physiology and behavior," University of Wisconsin, Madison.

February 1991, "Seasonal rhythms in prairie voles," Columbia University,

February 1991, "Behavioral development in free-living spotted hyenas," University of Cincinnati.

February 1991, "Circadian rhythms and their neural substrates," Princeton University.

February 1991, "Behavioral development in free-living spotted hyenas," University of California, Santa Barbara.

March 1991, "Association patterns and dominance in free-living spotted hyenas," University of California Berkeley.

November 1990, and November 1991, "Behavioral development in free-living spotted hyenas," National Museums of Kenya.

Spring 1990, "Rank acquisition in free-living spotted hyenas," and "Reproduction in free-living spotted hyenas," University of Michigan, Ann Arbor.

Spring 1990, "Rank acquisition in free-living spotted hyenas," State University of New York, Stony Brook.

Spring 1989, "Behavioral development in free-living spotted hyenas," University of Nairobi.

Spring 1989, "Behavioral development in free-living spotted hyenas," University of California, Berkeley.

Research Experience:

Faculty research: August 1992-present. Circadian rhythms and biology of social behavior.

Research Associate: September 1988-August 1992. NSF-funded study of behavioral development in free-living spotted hyenas, conducted in Masai Mara National Reserve, Kenya, with Dr. K.E. Holekamp.

Postdoctoral research: January 1987-September 1988. State University of New York, Stony Brook, Neural substrates of circadian and seasonal rhythms, conducted in the labs of Dr. L.P. Morin and Dr. R.Y. Moore.

Graduate student research: June 1982-Jan. 1987. University of California, Berkeley, Hormonal influences on behavior, and environmental influences on hormones, conducted in the lab of Dr. I. Zucker.

Undergraduate field research: Summers of 1979 and 1981. Study of hormones, development and natal dispersal of Belding's ground squirrels.

Membership in Professional Societies:

Society for Research on Biological Rhythms

Society for Neuroscience

Animal Behavior Society

Society for Behavioral Neuroendocrinology

American Society of Mammalogists

American Association of University Women

