

Stanford



Luis de Lecea

Professor of Psychiatry and Behavioral Sciences (Major Laboratories and Clinical and Translational Neurosciences Incubator)

CONTACT INFORMATION

- **Alternate Contact**

Ayesha Abid

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Bio

ACADEMIC APPOINTMENTS

- Professor, Psychiatry and Behavioral Sciences
- Member, Bio-X
- Member, Wu Tsai Human Performance Alliance
- Member, Maternal & Child Health Research Institute (MCHRI)

HONORS AND AWARDS

- Senior Fulbright Fellow, Fulbright Commission (2015)
- Outstanding Scientific Achievement Award, Sleep Research Society (2016)
- Member, Board of Scientific Counselors, NIDA (2006-)
- Integrative Behavioral Neuroscience Prize, ACNP (2010)
- Distinguished Investigator Award, NARSAD (2013)

PROFESSIONAL EDUCATION

- Postdoc, The Scripps Research Institute , Molecular Neurobiology (1996)
- Ph.D., University of Barcelona , Molecular Biology (1991)
- B.Sc., University of Barcelona , Biology (1987)

LINKS

- Lab website: <http://delecea.stanford.edu>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

My lab uses molecular, optogenetic, anatomical and behavioral methods to identify and manipulate the neuronal circuits underlying brain arousal, with particular attention to sleep and wakefulness transitions. We are also interested in the changes that occur in neuronal circuits in conditions of hyperarousal such as stress and drug addiction.

Teaching

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Vasily Kruzhilin, Itamar Terem

Postdoctoral Faculty Sponsor

Kanako Asano, Oscar Gonzalez, Charlotte Luff, Yanan Zhao

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Molecular and Genetic Medicine (Fellowship Program)
- Neurosciences (Phd Program)
- Psychiatry and Behavioral Science (Fellowship Program)

Publications

PUBLICATIONS

- **Sleep and vigilance states: Embracing spatiotemporal dynamics.** *Neuron*
Nir, Y., de Lecea, L.
2023
- **A tool for monitoring cell type-specific focused ultrasound neuromodulation and control of chronic epilepsy.** *Proceedings of the National Academy of Sciences of the United States of America*
Murphy, K. R., Farrell, J. S., Gomez, J. L., Stedman, Q. G., Li, N., Leung, S. A., Good, C. H., Qiu, Z., Firouzi, K., Butts Pauly, K., Khuri-Yakub, B. P., Michaelides, M., Soltesz, et al
2022; 119 (46): e2206828119
- **Adolescent sleep shapes social novelty preference in mice.** *Nature neuroscience*
Bian, W. J., Brewer, C. L., Kauer, J. A., de Lecea, L.
2022
- **Hyperexcitable arousal circuits drive sleep instability during aging.** *Science (New York, N.Y.)*
Li, S. B., Damonte, V. M., Chen, C., Wang, G. X., Kebschull, J. M., Yamaguchi, H., Bian, W. J., Purmann, C., Pattni, R., Urban, A. E., Mourrain, P., Kauer, J. A., Scherrer, et al
2022; 375 (6583): eabh3021
- **Parallel circuits from the bed nuclei of stria terminalis to the lateral hypothalamus drive opposing emotional states** *NATURE NEUROSCIENCE*
Giardino, W. J., Eban-Rothschild, A., Christoffel, D. J., Li, S., Malenka, R. C., de Lecea, L.
2018; 21 (8): 1084+
- **VTA dopaminergic neurons regulate ethologically relevant sleep-wake behaviors.** *Nature neuroscience*
Eban-Rothschild, A., Rothschild, G., Giardino, W. J., Jones, J. R., de Lecea, L.
2016; 19 (10): 1356-1366
- **Tuning arousal with optogenetic modulation of locus coeruleus neurons** *NATURE NEUROSCIENCE*
Carter, M. E., Yizhar, O., Chikahisa, S., Nguyen, H., Adamantidis, A., Nishino, S., Deisseroth, K., de Lecea, L.
2010; 13 (12): 1526-U117
- **Phasic Firing in Dopaminergic Neurons Is Sufficient for Behavioral Conditioning** *SCIENCE*
Tsai, H., Zhang, F., Adamantidis, A., Stuber, G. D., Bonci, A., de Lecea, L., Deisseroth, K.
2009; 324 (5930): 1080-1084
- **Neural substrates of awakening probed with optogenetic control of hypocretin neurons** *NATURE*
Adamantidis, A. R., Zhang, F., Aravanis, A. M., Deisseroth, K., de Lecea, L.
2007; 450 (7168): 420-U9

- **The murine meninges acquire lymphoid tissue properties and harbour autoreactive B cells during chronic *Trypanosoma brucei* infection.** *PLoS biology*
Quintana, J. F., Sinton, M. C., Chandrasegaran, P., Kumar Dubey, L., Ogunsola, J., Al Samman, M., Haley, M., McConnell, G., Kuispond Swar, N. R., Ngoyi, D. M., Bending, D., de Lecea, L., MacLeod, et al
2023; 21 (11): e3002389
- **Dorsomedial and preoptic hypothalamic circuits control torpor.** *Current biology : CB*
Yamaguchi, H., Murphy, K. R., Fukatsu, N., Sato, K., Yamanaka, A., de Lecea, L.
2023
- **Sleep and the hypothalamus.** *Science (New York, N.Y.)*
Adamantidis, A. R., de Lecea, L.
2023; 382 (6669): 405-412
- **Cell type specific focused ultrasound neuromodulation in preclinical models of sleep and psychiatric disorders.** *Neuropsychopharmacology : official publication of the American College of Neuropsychopharmacology*
Murphy, K. R., de Lecea, L.
2023
- **The Effect of Food Motivational Status and Hypocretin (Orexin) 1 Receptor Antagonism on Decision Processes in the Murine Go/No-Go Behavioural Task**
Jacobson, L., Ji, M., Metha, J., Murawski, C., Nicholson, J., De Lecea, L., Hoyer, D.
WILEY.2023: 1025-1026
- **Adolescent sleep defects and dopaminergic hyperactivity in mice with a schizophrenia-linked Shank3 mutation.** *Sleep*
Bian, W. J., González, O. C., de Lecea, L.
2023
- **Myeloid deficiency of the intrinsic clock protein BMAL1 accelerates cognitive aging by disrupting microglial synaptic pruning.** *Journal of neuroinflammation*
Iweka, C. A., Seigneur, E., Hernandez, A. L., Paredes, S. H., Cabrera, M., Blacher, E., Pasternak, C. T., Longo, F. M., de Lecea, L., Andreasson, K. I.
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- **Automated Sleep Deprivation Setup Using a Shaking Platform in Mice.** *Bio-protocol*
Bian, W., De Lecea, L.
2023; 13 (4): e4620
- **Optogenetic and pharmacological interventions link hypocretin neurons to impulsivity in mice.** *Communications biology*
Tyree, S. M., Jennings, K. J., Gonzalez, O. C., Li, S., Nicholson, J. R., von Heimendahl, M., de Lecea, L.
2023; 6 (1): 74
- **Single cell and spatial transcriptomic analyses reveal microglia-plasma cell crosstalk in the brain during *Trypanosoma brucei* infection.** *Nature communications*
Quintana, J. F., Chandrasegaran, P., Sinton, M. C., Briggs, E. M., Otto, T. D., Heslop, R., Bentley-Abbot, C., Loney, C., de Lecea, L., Mabbott, N. A., MacLeod, A.
2022; 13 (1): 5752
- **The brake matters: Hyperexcitable arousal circuits in sleep fragmentation with age.** *Clinical and translational medicine*
Li, S., de Lecea, L.
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- **Lateral hypothalamic galanin neurons are activated by stress and blunt anxiety-like behavior in mice.** *Behavioural brain research*
Owens-French, J., Li, S., Francois, M., Leigh Townsend, R., Daniel, M., Soulier, H., Turner, A., de Lecea, L., Munzberg, H., Morrison, C., Qualls-Creekmore, E.
1800: 113773
- **Hypocretins (orexins): The ultimate translational neuropeptides.** *Journal of internal medicine*
Jacobson, L. H., Hoyer, D., de Lecea, L.
1800
- **Peripheral Lipopolysaccharide Rapidly Silences REM-Active LHGABA Neurons.** *Frontiers in behavioral neuroscience*
Borniger, J. C., de Lecea, L.
2021; 15: 649428

- **Twenty-Three Years of Hypocretins: The "Rosetta Stone" of Sleep/Arousal Circuits.** *Frontiers of neurology and neuroscience*
de Lecea, L.
2021; 45: 1-10
- **Heterogeneity of Hypocretin/Orexin Neurons.** *Frontiers of neurology and neuroscience*
Sagi, D., de Lecea, L., Appelbaum, L.
2021; 45: 61-74
- **Hypocretin/Orexins and Hyperarousal**
de Lecea, L.
SPRINGERNATURE.2020: 31
- **Neural and Hormonal Control of Sexual Behavior.** *Endocrinology*
Jennings, K. J., de Lecea, L.
2020
- **Impaired hypocretin/orexin system alters responses to salient stimuli in obese male mice.** *The Journal of clinical investigation*
Tan, Y., Hang, F., Liu, Z., Stoiljkovic, M., Wu, M., Tu, Y., Han, W., Lee, A. M., Kelley, C., Hajos, M., Lu, L., de Lecea, L., de Araujo, et al
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- **Multisensory modulation of body ownership in mice.** *Neuroscience of consciousness*
Buckmaster, C. L., Rathmann-Bloch, J. E., de Lecea, L. n., Schatzberg, A. F., Lyons, D. M.
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- **The hypocretin (orexin) system: from a neural circuitry perspective.** *Neuropharmacology*
Li, S. B., de Lecea, L. n.
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- **Neurobiological and Hormonal Mechanisms Regulating Women's Sleep.** *Frontiers in neuroscience*
Dorsey, A., de Lecea, L., Jennings, K. J.
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- **Hypothalamic circuitry underlying stress-induced insomnia and peripheral immunosuppression** *Science Advances*
Li, S. B., Borniger, J. C., Yamaguchi, H., Hédou, J., Gaudilliere, B., de Lecea, L.
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- **Sleep and neuropsychiatric illness** *NEUROPSYCHOPHARMACOLOGY*
Winkelman, J. W., de Lecea, L.
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- **Brain Circuit of Claustrophobia-like Behavior in Mice Identified by Upstream Tracing of Sighing.** *Cell reports*
Li, P. n., Li, S. B., Wang, X. n., Phillips, C. D., Schwarz, L. A., Luo, L. n., de Lecea, L. n., Krasnow, M. A.
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- **Arousal-state dependent alterations in VTA-GABAergic neuronal activity.** *eNeuro*
Eban-Rothschild, A. n., Borniger, J. C., Rothschild, G. n., Giardino, W. J., Morrow, J. G., de Lecea, L. n.
2020
- **Editorial: Hypocretins/Orexins.** *Frontiers in endocrinology*
Lopez, M., de Lecea, L., Dieguez, C.
2020; 11: 357
- **CRISPR/Cas9 Editing of Neuropeptide Receptor Signaling Reveals an Extended Amygdala Circuit Mechanism Modulating Alcohol Drinking, Anxiety, and Avoidance**
Giardino, W., Yamaguchi, H., de Lecea, L.
NATURE PUBLISHING GROUP.2019: 505
- **Construction of Viral Vectors for Cell Type-specific CRISPR Gene Editing in the Adult Mouse Brain.** *Bio-protocol*
Yamaguchi, H., de Lecea, L.
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- **Construction of Viral Vectors for Cell Type-specific CRISPR Gene Editing in the Adult Mouse Brain** *BIO-PROTOCOL*
Yamaguchi, H., de Lecea, L.
2019; 9 (16)
- **In vivo cell type-specific CRISPR gene editing for sleep research** *JOURNAL OF NEUROSCIENCE METHODS*
Yamaguchi, H., de Lecea, L.
2019; 316: 99–102
- **Hypocretin and the Regulation of Sleep-Wake Transitions** *HANDBOOK OF SLEEP RESEARCH, VOL 30*
Nevarez, N., de Lecea, L., Dringenberg, H. C.
2019; 30: 89–99
- **In vivo cell type-specific CRISPR knockdown of dopamine beta hydroxylase reduces locus coeruleus evoked wakefulness.** *Nature communications*
Yamaguchi, H., Hopf, F. W., Li, S. B., de Lecea, L.
2018; 9 (1): 5211
- **Parallel Circuits From the Bed Nuclei of Stria Terminalis to the Lateral Hypothalamus Drive Opposing Emotional States**
Giardino, W., Eban-Rothschild, A., Christoffel, D., Li, S., Malenka, R., de Lecea, L.
NATURE PUBLISHING GROUP.2018: S234
- **In vivo cell type-specific CRISPR gene editing for sleep research.** *Journal of neuroscience methods*
Yamaguchi, H., de Lecea, L.
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- **Parallel circuits from the bed nuclei of stria terminalis to the lateral hypothalamus drive opposing emotional states.** *Nature neuroscience*
Giardino, W. J., Eban-Rothschild, A., Christoffel, D. J., Li, S., Malenka, R. C., de Lecea, L.
2018
- **Hypocretin as a Hub for Arousal and Motivation** *FRONTIERS IN NEUROLOGY*
Tyree, S. M., Bomiger, J. C., de Lecea, L.
2018; 9: 413
- **Hypocretin/orexin deficiency decreases cocaine abuse liability** *NEUROPHARMACOLOGY*
Steiner, N., Rossetti, C., Sakurai, T., Yanagisawa, M., de Lecea, L., Magistretti, P. J., Halfon, O., Boutrel, B.
2018; 133: 395–403
- **Neuronal Mechanisms for Sleep/Wake Regulation and Modulatory Drive** *NEUROPSYCHOPHARMACOLOGY*
Eban-Rothschild, A., Appelbaum, L., de Lecea, L.
2018; 43 (5): 937–52
- **Optical Probing of Orexin/Hypocretin Receptor Antagonists.** *Sleep*
Li, S. B., Nevárez, N. n., Giardino, W. J., de Lecea, L. n.
2018
- **Optical Probing of Orexin/Hypocretin Receptor Antagonists** *Sleep*
Li, S., Nevárez, N., Giardino, W. J., de Lecea, L.
2018
- **In vivo cell type-specific CRISPR knockdown of dopamine beta hydroxylase reduces locus coeruleus evoked wakefulness** *Nature Communications*
Yamaguchi, H., Hopf, F., Li, S., de Lecea, L.
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Nevarez, N., de Lecea, L.
2018; 7
- **Hypothalamic Tubermammillary Nucleus Neurons: Electrophysiological Diversity and Essential Role in Arousal Stability** *JOURNAL OF NEUROSCIENCE*
Fujita, A., Bonnavion, P., Wilson, M. H., Mickelsen, L. E., Bloit, J., de Lecea, L., Jackson, A. C.
2017; 37 (39): 9574–92

- **To sleep or not to sleep: neuronal and ecological insights.** *Current opinion in neurobiology*
Eban-Rothschild, A., Giardino, W. J., de Lecea, L.
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- **Neuronal substrates for initiation, maintenance, and structural organization of sleep/wake states.** *F1000Research*
Eban-Rothschild, A., de Lecea, L.
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- **Stress Coping and Resilience Modeled in Mice** *ANIMAL MODELS FOR THE STUDY OF HUMAN DISEASE, 2ND EDITION*
Lyons, D. M., de Lecea, L., Schatzberg, A. F., Conn, P. M.
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- **Behavioral Neuroscience of Orexin/Hypocretin Preface** *BEHAVIORAL NEUROSCIENCE OF OREXIN/HYPOCRETIN*
Lawrence, A. J., de Lecea, L., Lawrence, A. J., DeLecea, L.
2017; 33: V-VI
- **Lateral Hypothalamic Control of the Ventral Tegmental Area: Reward Evaluation and the Driving of Motivated Behavior.** *Frontiers in systems neuroscience*
Tyree, S. M., de Lecea, L. n.
2017; 11: 50
- **Rat intersubjective decisions are encoded by frequency-specific oscillatory contexts.** *Brain and behavior*
Schaich Borg, J. n., Srivastava, S. n., Lin, L. n., Heffner, J. n., Dunson, D. n., Dzirasa, K. n., de Lecea, L. n.
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- **Optogenetic Investigation of Arousal Circuits.** *International journal of molecular sciences*
Tyree, S. M., de Lecea, L. n.
2017; 18 (8)
- **Hypocretins and Arousal.** *Current topics in behavioral neurosciences*
Li, S., Giardino, W. J., de Lecea, L.
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- **VTA Dopaminergic Neurons Regulate Ethologically Relevant Sleep-Wake Behaviors**
Eban-Rothschild, A., Rothschild, G., Giardino, W. J., Jones, J. R., de Lecea, L.
NATURE PUBLISHING GROUP.2016: S259
- **Obesity- and gender-dependent role of endogenous somatostatin and cortistatin in the regulation of endocrine and metabolic homeostasis in mice** *SCIENTIFIC REPORTS*
Luque, R. M., Cordoba-Chacon, J., Pozo-Salas, A. I., Porteiro, B., de Lecea, L., Nogueiras, R., Gahete, M. D., Castano, J. P.
2016; 6
- **Hubs and spokes of the lateral hypothalamus: cell types, circuits and behaviour** *JOURNAL OF PHYSIOLOGY-LONDON*
Bonnavion, P., Mickelsen, L. E., Fujita, A., de Lecea, L., Jackson, A. C.
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- **Fasting modulates GH/IGF-I axis and its regulatory systems in the mammary gland of female mice: Influence of endogenous cortistatin.** *Molecular and cellular endocrinology*
Villa-Osaba, A., Gahete, M. D., Cordoba-Chacon, J., de Lecea, L., Castaño, J. P., Luque, R. M.
2016; 434: 14-24
- **In vivo assessment of behavioral recovery and circulatory exchange in the peritoneal parabiosis model** *SCIENTIFIC REPORTS*
Castellano, J. M., Palner, M., Li, S., Freeman, G. M., Andy Nguyen, A., Shen, B., Stan, T., Mosher, K. I., Chin, F. T., de Lecea, L., Luo, J., Wyss-Coray, T.
2016; 6
- **Cortistatin Is a Key Factor Regulating the Sex-Dependent Response of the GH and Stress Axes to Fasting in Mice** *ENDOCRINOLOGY*
Cordoba-Chacon, J., Gahete, M. D., Pozo-Salas, A. I., de Lecea, L., Castano, J. P., Luque, R. M.
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- **Hypocretin (Orexin) System and its Functions in Arousal/sleep**

- de Lecea, L.
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- **Superficial Layer-Specific Histaminergic Modulation of Medial Entorhinal Cortex Required for Spatial Learning** *CEREBRAL CORTEX*
He, C., Luo, F., Chen, X., Chen, F., Li, C., Ren, S., Qiao, Q., Zhang, J., de Lecea, L., Gao, D., Hu, Z.
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 - **Resting easy with a sleep regulator** *ELIFE*
Giardino, W. J., de Lecea, L.
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 - **Sleep disruption impairs haematopoietic stem cell transplantation in mice** *NATURE COMMUNICATIONS*
Rolls, A., Pang, W. W., Ibarra, I., Colas, D., Bonnavion, P., Korin, B., Heller, H. C., Weissman, I. L., de Lecea, L.
2015; 6
 - **Not So Giants: Mice Lacking Both Somatostatin and Cortistatin Have High GH Levels but Show No Changes in Growth Rate or IGF-1 Levels** *ENDOCRINOLOGY*
Pedraza-Arevalo, S., Cordoba-Chacon, J., Pozo-Salas, A. I., Lopez, F. L., De Lecea, L., Gahete, M. D., Castano, J. P., Luque, R. M.
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 - **Obesity Alters Gene Expression for GH/IGF-I Axis in Mouse Mammary Fat Pads: Differential Role of Cortistatin and Somatostatin** *PLOS ONE*
Villa-Osaba, A., Gahete, M. D., Cordoba-Chacon, J., de Lecea, L., Pozo-Salas, A. I., Javier Delgado-Lista, F., Alvarez-Benito, M., Lopez-Miranda, J., Luque, R. M., Castano, J. P.
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 - **Antagonistic interplay between hypocretin and leptin in the lateral hypothalamus regulates stress responses** *NATURE COMMUNICATIONS*
Bonnaivon, P., Jackson, A. C., Carter, M. E., de Lecea, L.
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Chen, Q., de Lecea, L., Hu, Z., Gao, D.
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 - **Optogenetic Dissection of Neural Circuit Function in Behaving Animals** *NEURAL TRACING METHODS: TRACING NEURONS AND THEIR CONNECTIONS*
Herrera, C., Adamantidis, A., Zhang, F., Deisseroth, K., de Lecea, L., Arenkiel, B. R.
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 - **Optogenetic control of hypocretin (orexin) neurons and arousal circuits.** *Current topics in behavioral neurosciences*
de Lecea, L. n.
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 - **Optogenetics in Freely Moving Mammals: Dopamine and Reward.** *Cold Spring Harbor protocols*
Zhang, F., Tsai, H., Airan, R. D., Stuber, G. D., Adamantidis, A. R., de Lecea, L., Bonci, A., Deisseroth, K.
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 - **A Framework for Quantitative Modeling of Neural Circuits Involved in Sleep-to-Wake Transition.** *Frontiers in neurology*
Sorooshyari, S., Huerta, R., de Lecea, L.
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 - **Potential role of orexin and sleep modulation in the pathogenesis of Alzheimer's disease** *JOURNAL OF EXPERIMENTAL MEDICINE*
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 - **Hypocretin (orexin) neuromodulation of stress and reward pathways** *CURRENT OPINION IN NEUROBIOLOGY*
Giardino, W. J., de Lecea, L.
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 - **Basal Forebrain Cholinergic Modulation of Sleep Transitions** *SLEEP*
Irmak, S. O., de Lecea, L.
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Mosqueiro, T., de Lecea, L., Huerta, R.
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- **Light and chemical control of neuronal circuits: possible applications in neurotherapy.** *Expert review of neurotherapeutics*
Whittle, A. J., Walsh, J., de Lecea, L.
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- **Optogenetic control of hypocretin/orexin neurons**
de Lecea, L.
AMER CHEMICAL SOC.2014
- **Lack of Endogenous Cortistatin but Not Somatostatin Exacerbates Carcinogen-Induced Mammary Gland Tumorigenesis in Mice**
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- **Cortistatin Is a Key Factor Regulating the Gender-Dependent Response of the Growth Hormone (GH) and Adrenocorticotropin (ACTH) Axes to Fasting in Mice**
Cordoba-Chacon, J., Gahete, M. D., Pozo-Salas, A., de Lecea, L., Castaao, J. P., Luque, R. M.
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- **Hypocretin (orexin) regulation of sleep-to-wake transitions** *FRONTIERS IN PHARMACOLOGY*
de Lecea, L., Huerta, R.
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- **Establishing a fiber-optic-based optical neural interface.** *Cold Spring Harbor protocols*
Adamantidis, A. R., Zhang, F., de Lecea, L., Deisseroth, K.
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- **The hypocretins/orexins: integrators of multiple physiological functions** *BRITISH JOURNAL OF PHARMACOLOGY*
Li, J., Hu, Z., de Lecea, L.
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 - **Repeated in vivo exposure of cocaine induces long-lasting synaptic plasticity in hypocretin/orexin-producing neurons in the lateral hypothalamus in mice** *JOURNAL OF PHYSIOLOGY-LONDON*
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