



## Daniel V. Madison

Associate Professor of Molecular and Cellular Physiology

Molecular & Cellular Physiology

 NIH Biosketch available Online

 Curriculum Vitae available Online

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### Bio

#### BIO

Dr. Madison holds a Bachelor of Science from the University of California at Irvine (UCI), and a Ph.D. in Neurosciences from the University of California at San Francisco (UCSF). He completed postdoctoral fellowships at UCSF with Dr. Roger Nicoll, M.D. and at Yale University School of Medicine with Dr. Richard W. Tsien, DPhil. He joined the faculty of Stanford University School of Medicine in 1989.

#### ACADEMIC APPOINTMENTS

- Associate Professor, Molecular & Cellular Physiology
- Member, Bio-X
- Member, Wu Tsai Neurosciences Institute

#### ADMINISTRATIVE APPOINTMENTS

- Associate Chair, Department of Molecular & Cellular Physiology, (2016-3017)
- Chair, Admissions Committee, Dept. Molecular and Cellular Physiology, (2005-2020)
- Senator at large, Medical School Faculty Senate, (2004-2009)
- Director of Graduate Studies, Dept. Molecular and Cellular Physiology, (2003-2020)
- Committee on Graduate Admissions & Program (CGAP), School of Medicine, (2000-2020)
- Director of Admissions, Neurosciences Graduate Program, (1997-2003)
- Executive Committee, Neurosciences Graduate Program, (1995-2003)
- MSTP Admissions Committee, MSTP, (1995-1999)
- Committee of Five, School of Medicine, (1994-1995)
- Director of Graduate Studies, Dept. Molecular and Cellular Physiology, (1990-1997)
- Graduate Admission Committee, Dept. Molecular and Cellular Physiology, (1990-1997)
- Departmental Senator, Medical School Faculty Senate, (1990-1995)

#### HONORS AND AWARDS

- Lucille P. Markey Scholar, Lucile P. Markey Charitable Trust (.)
- Young Investigator Award, Society for Neuroscience (.)

#### PROFESSIONAL EDUCATION

- Ph.D., Univ. of Calif. San Francisco, Neurosciences (1984)

- B.S., University of California, Irvine , Biological Sciences (1979)

## COMMUNITY AND INTERNATIONAL WORK

- MBL Neurobiology Course, Woods Hole, MA

## LINKS

- Madison Lab Home Page: <http://www.stanford.edu/~madison/>

## Research & Scholarship

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### CURRENT RESEARCH AND SCHOLARLY INTERESTS

Our laboratory is interested in the basic function, plasticity and modulation of Central Nervous System synapses. Including studies of the detailed structure and protein content of synapses in different plastic states. We also have a strong interest in the pathophysiology in Alzheimer's disease as related to the functions of endocannabinoids. We use primarily electrophysiological techniques along with high-resolution imaging array tomographic imaging to dissect the function of synapses undergoing changes due either to external stimuli, disease states or internal modulation, with an eye to understanding how those changes may affect behavior and memory.

Recent projects in the laboratory include a study of the role of the amyloid peptide A-beta in modulating synaptic inhibition through an action on the endogenous cannabinoid system of the hippocampus; the role of the Fragile X mental retardation protein in the formation of neural circuits, an array tomographic study on the influence of synaptic plasticity on the number of synapses made in neural microcircuits, and on the localization of AMPA receptor subunits in different states of plasticity.

Studies in the lab are carried out using a full range of electrophysiological techniques including extracellular field potential recording, intracellular recording, whole cell and single channel recording in hippocampal slices and cultured neurons. In addition we utilize high resolution imaging of synaptically connected pairs of neurons using array tomography and CLARITY techniques.

## Teaching

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### COURSES

#### 2019-20

- MCP Journal Club and Professional Development Series: MCP 208 (Aut, Win, Spr)
- Neuro-Cellular Core: NEPR 201 (Win)
- Neuroscience Journal Club and Professional Development Series: NEPR 280 (Win, Spr)

#### 2018-19

- MCP Journal Club and Professional Development Series: MCP 208 (Aut, Win, Spr)
- Neuroscience Journal Club and Professional Development Series: NEPR 280 (Aut, Win, Spr)

#### 2017-18

- Neuroscience Journal Club and Professional Development Series: NEPR 280 (Aut, Win, Spr)

#### 2016-17

- Neuroscience Journal Club and Professional Development Series: MCP 300, NEPR 280 (Aut, Win, Spr)

### STANFORD ADVISEES

#### Postdoctoral Faculty Sponsor

Jason Clark

## GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Molecular and Cellular Physiology (Phd Program)
- Neurosciences (Phd Program)

## Publications

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### PUBLICATIONS

- **Multifaceted Changes in Synaptic Composition and Astrocytic Involvement in a Mouse Model of Fragile X Syndrome.** *Scientific reports*  
Simhal, A. K., Zuo, Y., Perez, M. M., Madison, D. V., Sapiro, G., Micheva, K. D.  
2019; 9 (1): 13855
- **Characterization of Brain Dysfunction Induced by Bacterial Lipopeptides That Alter Neuronal Activity and Network in Rodent Brains** *JOURNAL OF NEUROSCIENCE*  
Kim, K., Zamaleeva, A. I., Lee, Y., Ahmed, M., Kim, E., Lee, H., Pothineni, V., Tao, J., Rhee, S., Jayakumar, M., Inayathullah, M., Sivanesan, S., Red-Horse, et al  
2018; 38 (50): 10672–91
- **Characterization of brain dysfunction induced by bacterial lipopeptides that alter neuronal activity and network in rodent brains.** *The Journal of neuroscience : the official journal of the Society for Neuroscience*  
Kim, K., Zamaleeva, A. I., Woo Lee, Y., Ahmed, M. R., Kim, E., Lee, H., Raveendra Pothineni, V., Tao, J., Rhee, S., Jayakumar, M., Inayathullah, M., Sivanesan, S., Red-Horse, et al  
2018
- **The role of Olf78 in the breathing circuit of mice** *Reply NATURE*  
Chang, A. J., Kim, N. S., Hireed, H., de Arce, A., Ortega, F. E., Riegler, J., Madison, D. V., Krasnow, M. A.  
2018; 561 (7724): E41
- **Distinctive Structural and Molecular Features of Myelinated Inhibitory Axons in Human Neocortex.** *eNeuro*  
Micheva, K. D., Chang, E. F., Nana, A. L., Seeley, W. W., Ting, J. T., Cobbs, C., Lein, E., Smith, S. J., Weinberg, R. J., Madison, D. V.  
2018; 5 (5)
- **Focused Ultrasound Activates Task Potassium Channels, Increases Membrane Capacitance, and Modulates Action Potential Waveform and Firing Properties in Hippocampal Brain Slices**  
Prieto, M. L., Madison, D. V., Khuri-Yakub, B. T., Maduke, M.  
CELL PRESS.2018: 669A
- **Array tomography of physiologically-characterized CNS synapses** *JOURNAL OF NEUROSCIENCE METHODS*  
Valenzuela, R. A., Micheva, K. D., Kiraly, M., Li, D., Madison, D. V.  
2016; 268: 43-52
- **A deleterious Nav1.1 mutation selectively impairs telencephalic inhibitory neurons derived from Dravet Syndrome patients.** *eLife*  
Sun, Y., Pasca, S. P., Portmann, T., Goold, C., Worringer, K. A., Guan, W., Chan, K. C., Gai, H., Vogt, D., Chen, Y. J., Mao, R., Chan, K., Rubenstein, et al  
2016; 5
- **Oxygen regulation of breathing through an olfactory receptor activated by lactate** *NATURE*  
Chang, A. J., Ortega, F. E., Riegler, J., Adison, D. V., Krasnow, M. A.  
2015; 527 (7577): 240-?
- **Paired Whole Cell Recordings in Organotypic Hippocampal Slices** *JOVE-JOURNAL OF VISUALIZED EXPERIMENTS*  
Fourie, C., Kiraly, M., Madison, D. V., Montgomery, J. M.  
2014
- **$\beta$ -Amyloid inhibits E-S potentiation through suppression of cannabinoid receptor 1-dependent synaptic disinhibition.** *Neuron*  
Orr, A. L., Hanson, J. E., Li, D., Klotz, A., Wright, S., Schenk, D., Seubert, P., Madison, D. V.  
2014; 82 (6): 1334-1345
- **beta-Amyloid Inhibits E-S Potentiation through Suppression of Cannabinoid Receptor 1-Dependent Synaptic Disinhibition** *NEURON*

- Orr, A. L., Hanson, J. E., Li, D., Klotz, A., Wright, S., Schenk, D., Seubert, P., Madison, D. V.  
2014; 82 (6): 1334-1345
- **A Dramatic Increase of C1q Protein in the CNS during Normal Aging** *JOURNAL OF NEUROSCIENCE*  
Stephan, A. H., Madison, D. V., Mateos, J. M., Fraser, D. A., Lovelett, E. A., Coutellier, L., Kim, L., Tsai, H., Huang, E. J., Rowitch, D. H., Berns, D. S., Tenner, A. J., Shamloo, et al  
2013; 33 (33): 13460-13474
  - **A dramatic increase of C1q protein in the CNS during normal aging.** *journal of neuroscience*  
Stephan, A. H., Madison, D. V., Mateos, J. M., Fraser, D. A., Lovelett, E. A., Coutellier, L., Kim, L., Tsai, H., Huang, E. J., Rowitch, D. H., Berns, D. S., Tenner, A. J., Shamloo, et al  
2013; 33 (33): 13460-13474
  - **FoxO6 regulates memory consolidation and synaptic function** *GENES & DEVELOPMENT*  
Salih, D. A., Rashid, A. J., Colas, D., de la Torre-Ubieta, L., Zhu, R. P., Morgan, A. A., Santo, E. E., Ucar, D., Devarajan, K., Cole, C. J., Madison, D. V., Shamloo, M., Butte, et al  
2012; 26 (24): 2780-2801
  - **A role for C1q in normal brain aging**  
Stephan, A. H., Madison, D. V., Mateos, J., Fraser, D., Coutellier, L., Lovelett, E., Tsai, H., Huang, E., Rowitch, D., Kim, L., Tenner, A., Shamloo, M., Barres, et al  
ELSEVIER GMBH, URBAN & FISCHER VERLAG.2012: 1133–33
  - **Developmentally altered inhibition in Ts65Dn, a mouse model of Down syndrome** *BRAIN RESEARCH*  
Mitra, A., Blank, M., Madison, D. V.  
2012; 1440: 1-8
  - **Glutamate receptor subunit GluA1 is necessary for long-term potentiation and synapse unsilencing, but not long-term depression in mouse hippocampus** *BRAIN RESEARCH*  
Selcher, J. C., Xu, W., Hanson, J. E., Malenka, R. C., Madison, D. V.  
2012; 1435: 8-14
  - **Altered Hippocampal Synaptic Physiology in Aged Parkin-Deficient Mice** *NEUROMOLECULAR MEDICINE*  
Hanson, J. E., Orr, A. L., Madison, D. V.  
2010; 12 (3): 270-276
  - **Imbalanced pattern completion vs. separation in cognitive disease: network simulations of synaptic pathologies predict a personalized therapeutics strategy** *BMC NEUROSCIENCE*  
Hanson, J. E., Madison, D. V.  
2010; 11
  - **AMPA receptor subunits define properties of state-dependent synaptic plasticity** *JOURNAL OF PHYSIOLOGY-LONDON*  
Emond, M. R., Montgomery, J. M., Huggins, M. L., Hanson, J. E., Mao, L., Hugarir, R. L., Madison, D. V.  
2010; 588 (11): 1929-1946
  - **Presynaptic Fmr1 genotype influences the degree of synaptic connectivity in a mosaic mouse model of fragile X syndrome** *JOURNAL OF NEUROSCIENCE*  
Hanson, J. E., Madison, D. V.  
2007; 27 (15): 4014-4018
  - **The functional nature of synaptic circuitry is altered in area CA3 of the hippocampus in a mouse model of Down's syndrome** *JOURNAL OF PHYSIOLOGY-LONDON*  
Hanson, J. E., Blank, M., Valenzuela, R. A., Garner, C. C., Madison, D. V.  
2007; 579 (1): 53-67
  - **Toward a unified hypothesis of interneuronal modulation** *JOURNAL OF PHYSIOLOGY-LONDON*  
Madison, D. V., McQuiston, A. R.  
2006; 570 (3): 435-435
  - **Blocking polysynaptic inhibition via opioid receptor activation isolates excitatory synaptic currents without triggering epileptiform activity in organotypic hippocampal slices** *JOURNAL OF NEUROSCIENCE METHODS*  
Hanson, J. E., Emond, M. R., Madison, D. V.  
2006; 150 (1): 8-15

- **Dynamin-dependent NMDAR endocytosis during LTD and its dependence on synaptic state** *BMC NEUROSCIENCE*  
Montgomery, J. M., Selcher, J. C., Hanson, J. E., Madison, D. V.  
2005; 6
- **Discrete synaptic states define a major mechanism of synapse plasticity** *TRENDS IN NEUROSCIENCES*  
Montgomery, J. M., Madison, D. V.  
2004; 27 (12): 744-750
- **SNAP-25 Ser187 does not mediate phorbol ester enhancement of hippocampal synaptic transmission** *NEUROPHARMACOLOGY*  
Finley, M. F., Scheller, R. H., Madison, D. V.  
2003; 45 (6): 857-862
- **State-dependent heterogeneity in synaptic depression between pyramidal cell pairs** *NEURON*  
Montgomery, J. M., Madison, D. V.  
2002; 33 (5): 765-777
- **The core membrane fusion complex governs the probability of synaptic vesicle fusion but not transmitter release kinetics** *JOURNAL OF NEUROSCIENCE*  
Finley, M. F., Patel, S. M., Madison, D. V., Scheller, R. H.  
2002; 22 (4): 1266-1272
- **Preparation of hippocampal brain slices.** *Current protocols in neuroscience / editorial board, Jacqueline N. Crawley ... [et al.]*  
Madison, D. V., Edson, E. B.  
2001; Chapter 6: Unit 6 4-?
- **The grass roots of synapse suppression** *NEURON*  
Montgomery, J. M., Madison, D. V.  
2001; 29 (3): 567-570
- **Pair recordings reveal all-silent synaptic connections and the postsynaptic expression of long-term potentiation** *NEURON*  
Montgomery, J. M., Pavlidis, P., Madison, D. V.  
2001; 29 (3): 691-701
- **A novel SNAP25-caveolin complex correlates with the onset of persistent synaptic potentiation** *JOURNAL OF NEUROSCIENCE*  
Braun, J. E., Madison, D. V.  
2000; 20 (16): 5997-6006
- **Presynaptic protein kinase activity supports long-term potentiation at synapses between individual hippocampal neurons** *JOURNAL OF NEUROSCIENCE*  
Pavlidis, P., Montgomery, J., Madison, D. V.  
2000; 20 (12): 4497-4505
- **Muscarinic receptor activity has multiple effects on the resting membrane potentials of CA1 hippocampal interneurons** *JOURNAL OF NEUROSCIENCE*  
McQuiston, A. R., Madison, D. V.  
1999; 19 (14): 5693-5702
- **Muscarinic receptor activity induces an afterdepolarization in a subpopulation of hippocampal CA1 interneurons** *JOURNAL OF NEUROSCIENCE*  
McQuiston, A. R., Madison, D. V.  
1999; 19 (14): 5703-5710
- **Synaptic transmission in pair recordings from CA3 pyramidal cells in organotypic culture** *JOURNAL OF NEUROPHYSIOLOGY*  
Pavlidis, P., Madison, D. V.  
1999; 81 (6): 2787-2797
- **Impaired synaptic plasticity in mice carrying the Huntington's disease mutation** *HUMAN MOLECULAR GENETICS*  
Usdin, M. T., Shelbourne, P. F., Myers, R. M., Madison, D. V.  
1999; 8 (5): 839-846
- **Nicotinic receptor activation excites distinct subtypes of interneurons in the rat hippocampus** *JOURNAL OF NEUROSCIENCE*  
McQuiston, A. R., Madison, D. V.  
1999; 19 (8): 2887-2896

- **Excitatory actions of norepinephrine on multiple classes of hippocampal CA1 interneurons** *JOURNAL OF NEUROSCIENCE*  
Bergles, D. E., Doze, V. A., Madison, D. V., Smith, S. J.  
1996; 16 (2): 572-585
- **CALCIUM-CHANNEL INVOLVEMENT IN GABA(B) RECEPTOR-MEDIATED INHIBITION OF GABA RELEASE IN AREA CA1 OF THE RAT HIPPOCAMPUS** *JOURNAL OF NEUROPHYSIOLOGY*  
Doze, V. A., Cohen, G. A., Madison, D. V.  
1995; 74 (1): 43-53
- **REFLECTIONS ON CA2+-CHANNEL DIVERSITY, 1988-1994** *TRENDS IN NEUROSCIENCES*  
Tsien, R. W., Lipscombe, D., Madison, D., Bley, K., Fox, A.  
1995; 18 (2): 52-54
- **Diffusible messengers and intercellular signaling: locally distributed synaptic potentiation in the hippocampus.** *Current topics in microbiology and immunology*  
Madison, D. V., Schuman, E. M.  
1995; 196: 5-6
- **AN ADP-RIBOSYLTRANSFERASE AS A POTENTIAL TARGET FOR NITRIC-OXIDE ACTION IN HIPPOCAMPAL LONG-TERM POTENTIATION** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*  
Schuman, E. M., Meffert, M. K., Schulman, H., Madison, D. V.  
1994; 91 (25): 11958-11962
- **INHIBITION OF HIPPOCAMPAL HEME OXYGENASE, NITRIC-OXIDE SYNTHASE, AND LONG-TERM POTENTIATION BY METALLOPORPHYRINS** *NEURON*  
Meffert, M. K., Haley, J. E., Schuman, E. M., Schulman, H., Madison, D. V.  
1994; 13 (5): 1225-1233
- **NITRIC-OXIDE AND SYNAPTIC FUNCTION** *ANNUAL REVIEW OF NEUROSCIENCE*  
Schuman, E. M., Madison, D. V.  
1994; 17: 153-183
- **COMMUNICATION OF SYNAPTIC POTENTIATION BETWEEN SYNAPSES OF THE HIPPOCAMPUS** *Wenner-Gren International Symposium on Molecular and Cellular Mechanisms of Neurotransmitter Release*  
Schuman, E. M., Madison, D. V.  
LIPPINCOTT-RAVEN PUBL.1994: 507-520
- **PHORBOL ESTERS ENHANCE SYNAPTIC TRANSMISSION BY A PRESYNAPTIC, CALCIUM-DEPENDENT MECHANISM IN RAT HIPPOCAMPUS** *JOURNAL OF PHYSIOLOGY-LONDON*  
Parfitt, K. D., Madison, D. V.  
1993; 471: 245-268
- **NITRIC-OXIDE AS AN INTERCELLULAR SIGNAL IN LONG-TERM POTENTIATION** *SEMINARS IN THE NEUROSCIENCES*  
Schuman, E. M., Madison, D. V.  
1993; 5 (3): 207-215
- **PASS THE NITRIC-OXIDE** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*  
Madison, D. V.  
1993; 90 (10): 4329-4331
- **ENHANCEMENT OF TRANSMISSION AT THE DEVELOPING RETINOGENICULATE SYNAPSE** *NEURON*  
Mooney, R., Madison, D. V., Shatz, C. J.  
1993; 10 (5): 815-825
- **NITRIC-OXIDE AS A SYNAPTIC SIGNALING MOLECULE IN HIPPOCAMPAL LONG-TERM POTENTIATION** *1st International Meeting on Nitric Oxide: Brain and Immune System*  
Schuman, E. M., Madison, D. V.  
PORTLAND PRESS LTD.1993: 149-162
- **LONG-TERM POTENTIATION - KNOCKING OUT MEMORY DOOR** *NATURE*  
Madison, D. V.

1992; 358 (6388): 626-627

- **OPIOID INHIBITION OF GABA RELEASE FROM PRESYNAPTIC TERMINALS OF RAT HIPPOCAMPAL INTERNEURONS** *NEURON*  
Cohen, G. A., Doze, V. A., Madison, D. V.  
1992; 9 (2): 325-335
- **ISOPROTERENOL INCREASES THE PHOSPHORYLATION OF THE SYNAPSINS AND INCREASES SYNAPTIC TRANSMISSION IN DENTATE GYRUS, BUT NOT IN AREA CA1, OF THE HIPPOCAMPUS** *HIPPOCAMPUS*  
Parfitt, K. D., Doze, V. A., Madison, D. V., Browning, M. D.  
1992; 2 (1): 59-64
- **PROTEIN-KINASES AND LONG-TERM POTENTIATION** *ANNALS OF THE NEW YORK ACADEMY OF SCIENCES*  
Meffert, M. K., Parfitt, K. D., Doze, V. A., Cohen, G. A., Madison, D. V.  
1991; 627: 2-9
- **LTP, POST OR PRE - A LOOK AT THE EVIDENCE FOR THE LOCUS OF LONG-TERM POTENTIATION** *NEW BIOLOGIST*  
Madison, D. V., Schuman, E. M.  
1991; 3 (6): 549-557
- **SYNAPTIC LOCALIZATION OF ADRENERGIC DISINHIBITION IN THE RAT HIPPOCAMPUS** *NEURON*  
Doze, V. A., Cohen, G. A., Madison, D. V.  
1991; 6 (6): 889-900
- **MECHANISMS UNDERLYING LONG-TERM POTENTIATION OF SYNAPTIC TRANSMISSION** *ANNUAL REVIEW OF NEUROSCIENCE*  
Madison, D. V., Malenka, R. C., Nicoll, R. A.  
1991; 14: 379-397
- **PROTEIN-KINASES AND LONG-TERM POTENTIATION** *CONF ON ACTIVITY-DRIVEN CNS CHANGES IN LEARNING AND DEVELOPMENT*  
Meffert, M. K., Parfitt, K. D., Doze, V. A., Cohen, G. A., Madison, D. V.  
NEW YORK ACAD SCIENCES.1991: 2-9
- **PERSISTENT PROTEIN-KINASE ACTIVITY UNDERLYING LONG-TERM POTENTIATION** *NATURE*  
Malinow, R., Madison, D. V., Tsien, R. W.  
1988; 335 (6193): 820-824
- **MULTIPLE TYPES OF NEURONAL CALCIUM CHANNELS AND THEIR SELECTIVE MODULATION** *TRENDS IN NEUROSCIENCES*  
Tsien, R. W., Lipscombe, D., Madison, D. V., Bley, K. R., Fox, A. P.  
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- **IMAGING OF CYTOSOLIC CA-2+ TRANSIENTS ARISING FROM CA-2+ STORES AND CA-2+ CHANNELS IN SYMPATHETIC NEURONS** *NEURON*  
Lipscombe, D., Madison, D. V., Poenie, M., Reuter, H., Tsien, R. W., Tsien, R. Y.  
1988; 1 (5): 355-365
- **ENKEPHALIN HYPERPOLARIZES INTERNEURONES IN THE RAT HIPPOCAMPUS** *JOURNAL OF PHYSIOLOGY-LONDON*  
Madison, D. V., Nicoll, R. A.  
1988; 398: 123-130
- **SPATIAL-DISTRIBUTION OF CALCIUM CHANNELS AND CYTOSOLIC CALCIUM TRANSIENTS IN GROWTH CONES AND CELL-BODIES OF SYMPATHETIC NEURONS** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*  
Lipscombe, D., Madison, D. V., Poenie, M., Reuter, H., Tsien, R. Y., Tsien, R. W.  
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- **NOREPINEPHRINE DECREASES SYNAPTIC INHIBITION IN THE RAT HIPPOCAMPUS** *BRAIN RESEARCH*  
Madison, D. V., Nicoll, R. A.  
1988; 442 (1): 131-138
- **VOLTAGE CLAMP ANALYSIS OF CHOLINERGIC ACTION IN THE HIPPOCAMPUS** *JOURNAL OF NEUROSCIENCE*  
Madison, D. V., Lancaster, B., Nicoll, R. A.  
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- **PHORBOL ESTERS BLOCK A VOLTAGE-SENSITIVE CHLORIDE CURRENT IN HIPPOCAMPAL PYRAMIDAL CELLS** *NATURE*  
Madison, D. V., Malenka, R. C., Nicoll, R. A.  
1986; 321 (6071): 695-697
- **POTENTIATION OF SYNAPTIC TRANSMISSION IN THE HIPPOCAMPUS BY PHORBOL ESTERS** *NATURE*  
Malenka, R. C., Madison, D. V., Nicoll, R. A.  
1986; 321 (6066): 175-177
- **ACTIONS OF NORADRENALINE RECORDED INTRACELLULARLY IN RAT HIPPOCAMPAL CA1 PYRAMIDAL NEURONS, INVITRO** *JOURNAL OF PHYSIOLOGY-LONDON*  
Madison, D. V., Nicoll, R. A.  
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- **CYCLIC ADENOSINE-3',5'-MONOPHOSPHATE MEDIATES BETA-RECEPTOR ACTIONS OF NORADRENALINE IN RAT HIPPOCAMPAL PYRAMIDAL CELLS** *JOURNAL OF PHYSIOLOGY-LONDON*  
Madison, D. V., Nicoll, R. A.  
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- **PHORBOL ESTERS MIMIC SOME CHOLINERGIC ACTIONS IN HIPPOCAMPAL PYRAMIDAL NEURONS** *JOURNAL OF NEUROSCIENCE*  
Malenka, R. C., Madison, D. V., Andrade, R., Nicoll, R. A.  
1986; 6 (2): 475-480
- **FOLIC-ACID HAS A DIS-INHIBITORY ACTION IN THE RAT HIPPOCAMPAL SLICE PREPARATION** *BRAIN RESEARCH*  
OTIS, L. C., Madison, D. V., Nicoll, R. A.  
1985; 346 (2): 281-286
- **CONTROL OF THE REPETITIVE DISCHARGE OF RAT CA1 PYRAMIDAL NEURONS INVITRO** *JOURNAL OF PHYSIOLOGY-LONDON*  
Madison, D. V., Nicoll, R. A.  
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- **GENERAL-ANESTHETICS HYPER-POLARIZE NEURONS IN THE VERTEBRATE CENTRAL NERVOUS-SYSTEM** *SCIENCE*  
Nicoll, R. A., Madison, D. V.  
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- **NORADRENALINE BLOCKS ACCOMMODATION OF PYRAMIDAL CELL DISCHARGE IN THE HIPPOCAMPUS** *NATURE*  
Madison, D. V., Nicoll, R. A.  
1982; 299 (5884): 636-638