The Roman Reed Spinal Cord Injury Research Act

AB750/AB1794 - Dedicated to finding treatments for spinal cord injury and paralysis through research

Since its inception ten years ago, the Roman Reed Program has spent over 14.6 million on research

This unique program has attracted $63,867,216 million in additional grants from the National Institutes of Health and other sources: New money for California

The Roman Reed Program is administered by the Reeve-Irvine Research Center at the University of California at Irvine

Roman Reed
Spinal Cord Injury Research Act
of California

Table of Contents

The Roman Reed Spinal Cord Injury Research Act

A recent study commissioned by the Christopher and Dana Reeve Foundation (CDRF) and the Centers for Disease Control (CDC) reveals that approximately *Five Million Six Hundred Thousand* (5,600,000) Americans are afflicted by some form of paralysis, and *One Million Two Hundred Seventy-Five Thousand* *(1,275,000)* individuals are living with a catastrophic spinal cord injury (SCI)[2]. This is 5 times higher than earlier estimates of the prevalence of SCI in the United States.

The disability, loss of earning power, and loss of personal freedom resulting from spinal cord injury is devastating for the injured individual, and creates a huge financial burden for the state of California. In the late 1990's, it was estimated that care for individuals who are quadriplegic as a result of a cervical spinal cord injury (the most common type of injury) cost the state $340,000,000 annually. This number has obviously increased dramatically since the 1990's when the estimate was made.

Recognizing that research today creates cures for tomorrow that reduce long term health care expense, the California legislature passed the Roman Reed Spinal Cord Injury Research act in 2000 to establish a program to support scientific research. The original 5 year program was renewed for an additional 5 years through AB1794, which was signed by Governor Schwarzenegger in September 2004. Over its 10-year history, the fund provided approximately $1.5 million per year for spinal cord injury research in the State of California. The Roman Reed Research funds were allocated to the University of California (UC), and administered by the Reeve-Irvine Research Center at the University of California Irvine (see Appendix 1 for information on the Reeve-Irvine Research Center).

At the beginning of the program, the Reeve-Irvine Research Center (RIRC) established a Scientific Steering Committee (SSC) with multi-campus representation and an External Advisory Board (EAB) made up of leaders in the public, private, and nonprofit sectors (see Appendix 2 for a list of SSC and EAB members). The RIRC organized a "town meeting" in March 2001 that involved faculty from throughout the UC system and California with interest in spinal cord injury/nerve regeneration research. Out of that meeting came the outlines of the program (see Appendix 3 for the timeline of Roman Reed Program activity to date).

The Roman Reed Spinal Cord Injury Research Program

The Roman Reed Spinal Cord Injury Research Program had two components. One component was the Roman Reed Core Laboratory, sited within the Reeve Irvine Research Center of UC, Irvine. The Core allowed for the rapid translation of ideas into research, by making it possible for any scientist with a novel idea to immediately undertake experiments in well-developed animal models. The Core Laboratory has state-of-the-art equipment, animal facilities, dedicated laboratory space, and highly trained technical personnel dedicated to spinal cord injury research. This type of Core Laboratory for fast-tracking targeted research is without parallel. The Core Laboratory was dedicated "*The Roman Reed Laboratory for Spinal Cord Injury Research*" on March 1, 2002 in a ceremony marked in the United States Congressional Record.

The second component of the Roman Reed Spinal Cord Injury Research Program funded grants to launch unique, creative research projects by scientists throughout the state of California.

These seed funds for highly innovative projects were stepping-stones for new federal funding (see leverage section below). Each year, the RIRC sponsored meetings involving the Roman Reed grant recipients and other spinal cord injury / neural regeneration researchers from California. These meetings fostered communication, cooperation, and collaborations, thereby significantly enhancing the caliber and quantity of spinal cord injury research undertaken in the state of California.

Roman Reed Research Awards

Between 2000 and 2010, over 300 Californians participated in 129 Roman Reed Research projects. (Specific information on the projects may be found in Appendix 4).

Roman Reed Research Awards Overview

Funding Cycle	Total State Funds Available Per Year	Number of Applications	Total Funds Requested in Applications	Total Number of Grants Funded	Total Funding Spent on Grants
2000-2001	$1,000,000				
2001-2002	$2,000,000	27	$2,319,322	22	$2,096,346
2002-2003	$1,800,000	31	$2,793,225	18	$1,532,883
2003-2004	$1,539,000	29	$2,211,807	17	$1,313,968
2004-2005	$1,539,000	42	$3,361,416	14	$1,235,305
2005-2006	$1,539,000	35	$2,982,854	15	$1,371,675
2006-2007	$1,539,000	30	$2,563,467	11	$1,223,732
2007-2008	$1,539,000	34	$2,848,390	13	$1,177,586
2008-2009	$1,385,100	37	$3,150,351	10	$1,046,697
2009-2010	$1,246,000	24	$2,109,776	9	$797,100
Total	**$15,126,100**	**289**	**$23,340,608**	**129**	**11,795,292**

Please note the remainder of funds were dedicated to the Roman Reed Core Laboratory, see below.

2000-2001

In the first year of the program, funds were not received until Fall 2001, and so the first awards were made in the 2001-2002 funding cycle. Funds from 2000-2001 were pooled with funds for 2001-2002 for that funding cycle.

2001-2002

A mechanism for alerting California researchers about the Roman Reed Research program was established via e-mails to departments and development offices in California research institutions. In June 2001, letters of intent were solicited, and this was followed in August with a formal call for proposals. A committee from outside of California was established by the Reeve-Irvine Research Center, Roman Reed Program Director Oswald Steward, Ph.D., and the Scientific Steering Committee to provide expert reviews of the grants. The Scientific Steering Committee felt that the optimal strategy was to “front load” the program and try to get as many worthy projects launched as possible. Thus, two thirds of the pooled funds from 2000-

2001/2001-2002 were used for research awards. The remaining funds were used to establish the Roman Reed Core Laboratory.

Beginning in 2002, a private consulting firm was engaged to handle the proposal review process. The firm invited leading spinal cord injury researchers outside of California to evaluate all the proposals. Each proposal was ranked on the basis of scientific merit and appropriateness for the program goals of the Roman Reed Project. Moreover, the appropriateness of the budgetary requests was also assessed. A detailed report that included the reviewers' comments on each project was provided. The Scientific Steering Committee evaluated the report and made the final decisions regarding the distribution of funds.

Roman Reed Fellowships

Roman Reed Fellows were graduate students supported by Roman Reed funds whose work focuses on spinal cord injury. Roman Reed Fellowships were available through research grants, and additional fellowships were offered in 2002-2003/2003-2004 to qualified graduate students independent of research grants. Interested students submitted an application containing their CV, a research statement describing their dissertation work, and a letter of recommendation from their principal investigator. Of the 16 who submitted applications, 5 were awarded Roman Reed Fellowships, which covered stipend, tuition and fees, totaling $152,463. Limited funds have prevented the program from offering more Fellowships outside of research awards. Roman Reed Fellows presented posters highlighting work done while supported by Roman Reed funds at the Roman Reed Research Meetings held annually in March (see below).

Roman Reed Fellowships Through Research Awards

Funding Cycle	Number of Roman Reed Fellows	Roman Reed Fellow Costs
2000-2001		
2001-2002	14	$246,835
2002-2003	10	$230,283
2003-2004	7	$222,368
2004-2005	12	$249,064
2005-2006	9	$231,587
2006-2007	1	$29,940
2007-2008	4	$115,346
2008-2009	7	$224,528
2009-2010	4	$57,536
Total	68	1,607,487

Roman Reed Core Laboratory

The Roman Reed Core Laboratory provides a setting in which it is possible for scientists who are not doing spinal cord injury research to rapidly undertake spinal cord injury experiments in well-developed animal models. The Core Laboratory has state-of-the-art equipment, animal facilities, laboratory space, and trained technical personnel that allow "fast-tracking" of targeted research in spinal cord injury. In addition, the Core Laboratory provides training in spinal cord injury techniques to allow investigators who are new to the field to launch research programs in spinal cord injury in their own labs. Other functions of the Core Laboratory, include:

1) Helping investigators obtain critical preliminary data to support applications to the Roman Reed Spinal Cord Injury Program and other funding sources.
2) Developing novel assessment techniques for spinal cord injury research, and making these available to other investigators by providing technical support and training.
3) Taking advantage of opportunities arising that offer the potential of making key discoveries or rapid advancements in understanding of spinal cord injury/nerve regeneration and repair.

Dr. Oswald Steward is the Core Coordinator and Roman Reed Project Director. As Core Coordinator, he serves as project leader for each study undertaken in the Core lab. This includes discussing the protocol with the outside researchers and creating a detailed research plan, organizing and supervising core technicians, providing guidance and technical support while the experiments are underway, and overseeing data analysis.

Since its inception, the Roman Reed Core Laboratory supported 24 projects that were funded as Individual Roman Reed Research Grants. More than 18 additional projects involving collaborations with California scientists were also carried out in the Core Lab (See Appendix 5 for an overview of Roman Reed projects undertaken by the core).

Outreach and Public Education

Roman Reed Research Meeting
An important component of the Roman Reed Spinal Cord Injury Research Program is fostering collaboration and communication throughout California, both for scientists and the lay public. The primary mechanism for accomplishing this was the annual Roman Reed Research Meeting, which grew out of the California Spinal Cord Injury / Neural Regeneration Consortium Meeting, and involved more than 200 participants from throughout California. The meeting included presentations by Roman Reed grant recipients, a poster session, and the Meet the Scientists Forum for both scientists and the lay public.

Presentations outlined the rationale and experimental plans for the projects being launched, providing an opportunity for discussion and development of collaborations between participating investigators. This method, which is very much *not* the norm for scientific meetings, was well received and many projects were expanded as a result of collaborations developed at the meeting.

“Meet the Scientists” Forum
The Roman Reed Research Meeting also included a session devoted to education for both lay people and researchers, termed the "Meet the Scientists" forum. The forum was attended by individuals with spinal cord injury, their families and caretakers and scientists and clinicians who study spinal cord injury. The goal of the session was to foster communication between people living with spinal cord injury and the scientists who carry out research to find new cures. The SCI community had the opportunity to as questions of the scientists about progress in research and novel therapies. Through these discussions, the scientists who attended the forum came to have a much better idea of how to craft experiments that focus on the needs of people living with spinal cord injury.

Evaluations from participants revealed that the Meet the Scientists Forum had a major positive impact on people affected by spinal cord injury. The session has also had an impact on scientists. Several of the scientists have said that they modified their research to include issues discussed during the "Meet the Scientists" forum. Our forum served as the model for a similar activity at meetings sponsored by the Christopher and Dana Reeve Foundation. Indeed, Dr. Steward was the discussion leader at the first two of the meetings sponsored by the CDRF.

Leverage

An important goal of the Roman Reed Program was to launch new research projects that would lead to new federal research funding to the State of California. With data from a Roman Reed project, the scientist can go to major funding agencies, like the National Institutes of Health (NIH), and leverage their state funded project into a large grant.

Total State Funds Available 2000-2009	Total Spent on Research Grants	Total Number of Grants Funded	Total Roman Reed Core Costs	New Grants Obtained with Roman Reed Data	Total New Funding Brought into California
$15,126,100	$14,677,200	129	$3,798,023	71	**$63,867,216**

The program has achieved a remarkable degree of success. The total amount of Roman Reed funding from the program's beginning in 2000 through 2010 is $15,126,100. These funds have been leveraged into $63,867,216 (see Appendix 6) in new funds being brought into the state.

Conclusion

The Roman Reed Spinal Cord Injury Research Fund has made a significant impact on research within the state of California. Both the Roman Reed Core Laboratory and state funded research awards are expanding the number of scientists working on spinal cord injury research, which will accelerate progress towards treatments. Such treatments will significantly increase personal independence for people with spinal cord injury, increase earning capacity and financial independence, and thus decrease financial burden for the State of California.

Appendices

Appendix 1: Reeve-Irvine Research Center

Appendix 2: Members of the Roman Reed Program Scientific Steering Committee and External Advisory Board

Appendix 3: Timeline of Roman Reed Program Activity

Appendix 4: Roman Reed Spinal Cord Injury Research Projects

Appendix 5: Roman Reed Core Laboratory Projects

Appendix 6: New Funding Brought into California as of January 2009

Appendix 7: Publications List as of February 2010

Reeve-Irvine Research Center

The mission of the Reeve-Irvine Research Center is to find new treatments for spinal cord injury through the collaborative research and educational efforts of prominent scientists and clinicians both at the University of California, Irvine and around the world.

The Reeve-Irvine Research Center was established to study injuries to and diseases of the spinal cord that result in paralysis or other loss of neurologic function, with the goal of finding treatments. Directed by Dr. Oswald Steward, Ph.D., the Center promotes and coordinates research and training programs in spinal cord injury/ nerve regeneration research at the University of California, Irvine (UCI) and across the University of California system. It also encourages cooperation and collaboration of scientists around the world seeking treatments for spinal cord dysfunction produced by injury or disease. The core of the Center is the research laboratory of approximately 6,000 square feet located in the Gillespie Neuroscience Research Center at the UCI College of Medicine. Faculty housed in the Center use state state-of of-the the-art molecular biological, cellular biological, and genetic techniques to study responses of the nervous system to injury and basic cellular and molecular processes that are involved in nerve regeneration and repair. Faculty Associates of the Center are located in seven departments on the UCI campus, and participate in collaborative work as well as graduate and postdoctoral training programs that are coordinated by the Center. In addition, the Center offers the Spinal Cord Injury Research Techniques Course, which provides intensive hands-on training to an international group of students, medical doctors and professors wishing to learn how to carry out spinal cord injury research using animal models. The primary goal of the course is to provide students with the techniques, knowledge and skills needed to explore pieces of the SCI research puzzle.

The Reeve-Irvine Research Center serves as the hub of a University of California and statewide initiative in spinal cord injury/nerve cell regeneration research that was launched in 2000 and continues through the Roman Reed Spinal Cord Injury Research Act.

For more information about the Reeve-Irvine Research Center, visit our website, www.reeve.uci.edu

ROMAN REED RESEARCH PROGRAM
SCIENTIFIC STEERING COMMITTEE

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Director, Reeve-Irvine Research Center
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V. Reggie Edgerton, Ph.D.
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Laboratory of Genetics
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October 1, 2000 – September 30, 2004

Corey S. Goodman, Ph.D.
President and Chief Executive Officer
Director
Renovis
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October 1, 2000 – September 30, 2004

Zach Hall, Ph.D.
Biological Sciences Senior Associate Dean for Research
Professor of Cell & Neurobiology
December 1, 2004 – February, 5, 2005

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Investigator, Howard Hughes Medical Institute
October 1, 2000 – September 30, 2003
October 1, 2004 – September 30, 2007

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History of the Roman Reed Program

September 2000	Governor Signs AB750 • Reeve-Irvine Research Center to be administrators of funds • Os Steward, Ph.D. Director of program
December 2000	Scientific Steering Committee and External Advisory Board established
March 2001	Roman Reed Program "Town Meeting"
March 2001	$1 million allocated for FY2000-2001
June 2001	$2 million allocated for FY2001-2002
September 2001	27 applications received
November 2001	22 Grants funded at $2,096,346
March 2002	Roman Reed Spinal Cord Injury Core Laboratory dedicated and read into the Congressional Record
March 2002	Roman Reed Research Meeting and Meet the Scientists Forum
August 2002	$1.8 million allocated for FY2002-2003
October 2002	31 applications received
December 2002	18 grants funded at $1,532,883
December 2002	10 new grants based on data from Roman Reed Projects bring $9,257,156 in new funding into California
February 2003	Roman Reed Research Meeting and Meet the Scientist Forum
May 2003	16 Roman Reed Fellowship applications received
June 2003	5 Roman Reed Fellowships funded at $152,463
September 2003	$1.6 million allocated for FY2003-2004
October 2003	29 proposals received
December 2003	17 grants funded at $1,313,968
March 2004	Roman Reed Research Meeting and Meet the Scientists Forum

March 2004	20 new grants based on data from Roman Reed Projects bring $17,993,975 in new funding into California*
June 2004	$$1,539,000 million allocated for FY2004-2005
September 2004	Governor Signs AB1794, renewing program through 1/1/2011
October 2004	42 proposals received
December 2004	14 grants funded at $1,235,305
February 2005	28 new grants based on data from Roman Reed Projects bring $22,552,640 in new funding into California*
March 2005	Roman Reed Research Meeting and Meet the Scientists Forum
June 2005	$1,539,000 million allocated for FY2005-2006
October 2005	35 proposals received
January 2006	15 grants funded
March 2006	Roman Reed Research Meeting and Meet the Scientist Forum
April 2006	42 new grants based on data from Roman Reed Projects bring $31,264,464 in new funding into California*
June 2006	$1,539,000 million allocated for FY2006-2007
October 2006	30 proposals received
January 2007	11 proposals funded
February 2007	55 new grants based on data from Roman Reed Projects bring $38,963,844 in new funding into California*
August 2007	$1,539,000 million allocated for FY2007-2008
October 2007	34 proposals received
January 2008	13 proposals funded
March 2008	Roman Reed Research Meeting and Meet the Scientists Forum

Appendix 3

April 2008	63 new grants based on data from Roman Reed Projects bring $50,830,754 in new funding into California*
June 2008	$1,385,100 million allocated for FY2008-2009
October 2008	37 proposals received
January 2009	10 proposals funded
March 2009	Roman Reed Research Meeting and Meet the Scientists Forum
August 2009	$1,246,000 million allocated for FY2009-2010

** Please note, these are cumulative.*

Appendix 4

Roman Reed Research Projects, 2000-2009

Between 2000 and 2010, 129 Roman Reed Research awards were made for a wide range of research projects. What follows are brief descriptions of some major areas of spinal cord research and Roman Reed projects in each.

Preventing Secondary Damage

The human body does you no favors in its response to central nervous system (CNS) injury, and indeed, causes significant additional damage. The initial traumatic or mechanical insult to the spinal tissue is only the beginning. Within hours to days of injury, a cascade of immunological and other events takes place that can cause the enlargement of the injury site by several segments, resulting in additional loss of function. Seeking to prevent this secondary damage and protect the nervous system from additional damage immediately after SCI is a key area of research. The Roman Reed Fund has awarded 15 Roman Reed grants to scientists who are testing ways to prevent or limit the terrible wake of a spinal cord injury.

Several of the Roman Reed projects focus on changing how the immune system responds after injury, by changing the intracellular function of T cells to prevent cell death, preventing damaging immune cell invasion by modulating one small part of the immune response or inserting genes that may prevent cell death by mobilizing some of the body's own protective mechanisms. Other projects focus on protecting the myelin sheath through DNA vaccines that halt destruction of myelin or by inhibiting a molecule, called MMP, immediately after injury. One project is trying to prevent early infiltration of damaging inflammatory cells by maintaining the integrity of the blood-brain barrier, and another is working on increasing the naturally occurring levels of a molecule that may prevent scar formation around the injury and so enhance recovery of function. In a fascinating use of a fruit fly model, one project is looking at preventing cell death by examining a molecule that helps cells commit suicide after injury.

Promoting Axon Regeneration

Many Roman Reed projects have sought to better understand the road blocks to spinal cord repair by identifying the genes that are expressed and those that go silent in the spinal sensory neurons, by examining a cell death cycle where damage to motor neurons results in a wave of cell death or by determining the structure of a major inhibitory molecule, Nogo. One project explores the genetics that control spinal cord regeneration in salamanders, which can re-grow their spinal cord.

Several Roman Reed projects are exploring ways to promote axon regeneration through maximizing the beneficial effects of the immune system or preventing scar tissue formation. Others are grafting nerve growth factor secreting tissue into and beyond the injury site, as well as examining the various growth factors that seem to promote axon regeneration. One project suggests that exercise-conditioned neurons show increased nerve regeneration, and other projects are looking at a naturally occurring molecule critical for cellular function, cAMP, which when present at increased levels appears to promote regeneration.

Remyelinating Axons

Some axons that survive a spinal cord injury still lose their protective sheath of myelin, the fatty substance that insulates and protects them. Without myelin, the axons stop functioning. How to induce remyelination is one of the challenges in developing treatments. Roman Reed grants have been awarded five times to test approaches for remyelination, including exploring the role of an axon growth promoting chemical messenger, PACAP, which is active during the development of the spinal cord and which becomes active again after spinal injury. Another project examines the genetics of myelin and has demonstrated increase myelin production in both MS and spinal cord injury models with an antibody therapy. One particularly interesting series of projects use a specialized type of brain cell from federally approved human embryonic stem cells. This research has confirmed that the transplantation of these cells can produce functional myelin in a rat model of spinal cord injury and form part of the pre-clinical results that will be evaluated by the FDA to determine if this strategy will eventually be used in humans.

Replacing Cells

One strategy for repairing the damaged spinal cord and restoring function is to replace the lost neurons and the glial cells that support, protect, and nourish them. Some scientists are working on transplanting primitive cells that will give rise to the tissue needed to repair the spinal cord. Other researchers are concentrating on how best to pre-treat stem cells so that they become nerve cells or glia. Still others believe the body has the potential to repair itself and are focusing on restarting the mechanisms that first created the brain and the spinal cord. Ten grants have been awarded to researchers who are working on cellular replacement.

Several projects are exploring the reparative abilities of stem cells derived from adults, including adipose-derived stem cells, or adult stem cells from fat, and adult bone marrow stem cells, in an attempt to replace the lost nerve cells. Others are using federally approved human embryonic stem cells as discussed above. One project is implanting olfactory ensheathing glia, nerve support cells from the nose, into injured rat spinal cords and assessing recovery. Both stem cells and olfactory ensheathing glia have tremendous potential for human treatments and preliminary results suggest that in certain models these cell transplantation treatments result in some recovery of walk ability.

Implanting Artificial Substrates

Some scientists believe that therapies to repair nerve circuits will work better if they are combined with a device that actually spans the gap in the injured spinal cord. Seven Roman Reed grants are testing tiny bridges, tunnels, and scaffolding, fabricated from natural or synthetic biomaterials that would be placed between the two stumps of the injured spinal cord to support and guide regenerating axons as they travel toward their target connections. It appears the scaffold-like support guides the regenerating axons as they travel across the injury toward their target connections and the bridges are also a source of helpful substances, such as anti-inflammatory agents or growth factors.

Retraining and Rewiring the Spinal Cord

Certain forms of rehabilitation appear to do more than maintain bone mass, muscle strength, and cardio-vascular fitness in someone with a spinal cord injury. In fact, recent Roman Reed research has shown that some training protocols - including progressive weight bearing and repetitive stepping routines (called step training) - may restore function by promoting axon regeneration and the creation of new neuron-to-neuron connections, or synapses.

Several of the fifteen Roman Reed research projects in this area are looking to enhance stepping through electrical stimulation of the muscles or through a better understand of the neural circuitry that supports stepping. One project has successfully developed the techniques necessary to implant stimulating electrodes on the surface of the spinal cord in rats. It seems that electrical stimulation produced very effective weight bearing steps, with the coordination pattern similar to normal rats. Other studies are being carried out in humans. One series of projects is addressing whether weight bearing of the lower limbs using techniques that emphasize muscle activation during standing can induce a measure of functional recovery in humans with a severe spinal cord injury. Preliminary reports show some recovery of standing for individuals after SCI with this technique. In another study looking at humans, changes in the brain after spinal injury are being assess with fMRI by asking paralyzed individuals to imagine moving their leg and calculating where in the brain activity occurs.

Restoring Concomitant Function and Eliminating Complications

The complications and loss of function that accompany spinal cord injuries not only impair quality of life but also can be life threatening. In addition to paralysis, people living with spinal cord injuries can, among other problems, suffer infections, spasticity, irregularities in temperature and blood pressure, metabolism and intractable pain. Moreover, spinal cord injuries almost always interfere with bowel, bladder, and sexual function. Roman Reed awards have supported three projects examining bladder function, four exploring pain following SCI, and one examining carbohydrate metabolism impairments in chronic human SCI.

Using Robotics for Assessment and Training

Neuroscientists and engineers are collaborating to create clever robotic devices that help researchers to make objective, quantitative assessments of the loss of function and its recovery following a spinal cord injury. Robotics also can assist animals and humans during training routines by initiating and controlling limb movements. Nine Roman Reed awards have focused on robotic devices and recovery of locomotor function.

A small robotic device for rats is being perfected that accurately measures and controls thousands of hind limb movements. This robotic tool will enable scientists to identify which of their therapies restores limb movements, even very small limb movements, with a high degree of accuracy. The new device will be available for shared use at the Roman Reed Core Laboratory at the University of California at Irvine. Building on this, another set of projects found that robots can be used to generate important sensory signals that are necessary to improve hindlimb walking in spinally transected rats, and that a pharmacological agent, quipazine, further facilitated training by enhancing training-induced activity in the hindlimbs. The robotic device is also being adapted for mice.

Creating New Models For Spinal Cord Research

Before promising therapies can be tested on humans, scientists need to learn as much as possible about precisely what happens following a spinal cord injury and how well potential treatments work in animals. Fifteen Roman Reed Grants have been awarded to develop new SCI animal models and ways of assessing or understanding SCI. The California Primate Consortium involves noted scientists from five California universities, who are developing a practical but humane primate model of a partial SCI. Primate models may well be an important step between rats and humans for treatments. The Primate Consortium is also included in the regeneration numbers as the model is also being used to test potential regenerative strategies.

A second project developed a monkey model of a dorsal-root injury that disrupts sensory information from only the index finger and thumb of one hand. This model, while mild for the monkey, allows researchers to correlate anatomical and physiological changes within the nervous system with the recovery of function following a spinal cord injury. A better understanding of the post-injury reorganization of the underlying neural pathways in monkeys will pave the way for more effective treatments for people with these injuries.

Other projects involve developing tools to allow us to ask better questions and get clearer answers. Three such projects make use of microfluidic devices. Two look at a special chamber where individual neurons can be grown such that the axon and the cell body are isolated from each other, allowing researchers to mimic the injured spinal cord more closely. The other is developing more efficient ways to sort stem cells based on their electrical properties.

Pre-Clinical Studies

Bringing a potential treatment from bench to bedside is not only difficult scientifically, the cost is staggering. One project takes an approach that could bypass many years of pre-clinical testing and safety trials and save hundreds of millions of dollars. Specifically, drugs that are already approved by the FDA or that are in a late phase of development for other applications will be screen for use in SCI repair. Therapeutic efficacy of these agents will be tested in well-characterized animal models of cervical SCI that assess the kind of forelimb motor functions that are important for people (forelimb and digit use), and that have the potential of detecting the types of plasticity of circuitry that contribute to recovery of fine motor function.

Appendix 4

Roman Reed Awards

2001-2002 ROMAN REED AWARDS
22 one-year grants, totaling $2,096,346

Armin Blesch, Ph.D. University of California, San Diego	*GDNF and BDNF gene therapy after complete spinal cord transection*	$80,000
Michael D. Cahalan, Ph.D. University of California, Irvine	*Tracking and targeting lymphocytes in spinal cord injury* **	$87,329
Nathalie A. Compagnone, Ph.D. University of California, San Francisco	*Can neurosteroids restore bladder function after spinal cord injury?*	$79,440
Corinna Darian-Smith, Ph.D. Stanford University	*Cervical dorsal root lesions in monkeys; neuronal consequences and impairment of voluntary hand function*	$76,123
V. Reggie Edgerton, Ph.D. University of California, Los Angeles	*Robotic assisted assessment of locomotor physiology after spinal cord injury in transgenic mice*	$120,000
David M. Gardiner, Ph.D. University of California, Irvine	*Urodele spinal cord regeneration as a model for axonal survival and regrowth*	$63,804
Leif A. Havton, M.D., Ph.D. University of California, Los Angeles	*Use-dependent plasticity of spinal motorneuron synaptology*	$60,000
James G. Hecker, M.D., Ph.D. University of California, Davis	*Prevention of secondary injury via non-viral intrathecal delivery of neuroprotective and apoptosis inhibitory genes* **	$52,500
Marc Hedrick, M.D. University of California, Los Angeles	*Adipose-derived stem cells* **	$80,000
Jack W. Judy, Ph.D. University of California, Los Angeles	*Spatial and temporal studies of activation in the lumbosacral spinal cord using implantable multimicroelectrode arrays*	$105,011
Hans S. Keirstead, Ph.D. University of California, Irvine	*Role of T cells in secondary degeneration following contusion injury to the adult spinal cord* **	$75,000
David J. Reinkensmeyer, Ph.D. University of California, Irvine	*Robotic outcome assessment in spinal cord injury and regeneration* **	$61,293

Appendix 4

Michael Sofroniew, Ph.D. University of California, Los Angeles	*Genetically targeted astrocyte scar ablation and biopolymer tissue support after SCI*	$158,226
Marylou Solbrig, M.D. University of California, Irvine	*Gene therapy of SCI - adenoviral vector delivery of macrophage/microglia stimulating factors* **	$78,480
Lawrence Steinman, Ph.D. Stanford University	*Myelin tolerizing DNA vaccination in the treatment of spinal cord injury* **	$125,000
Shula Stokols, B.S. University of California, San Diego	*Synthetic polymer guidance channels for spinal cord injury*	$35,000
Marc Tessier-Lavigne, Ph.D. Stanford University	*Identification of regeneration-associated genes and their roles in stimulating and inhibiting axonal regeneration*	$168,946
Mark H. Tuszynski, M.D., Ph.D. University of California, San Diego	*Rolipram for spinal cord injury*	$125,000
Mark H. Tuszynski, M.D., Ph.D. University of California, San Diego	*University of California consortium to study axonal plasticity and regeneration in the primate spinal cord*	$191,500
Jeffery Twiss, M.D., Ph.D. University of California, Los Angeles	*Mechanisms of activity-dependent conditioning for rapid axon regeneration*	$96,694
Richard Vulliet, Ph.D., DVM University of California, Davis	*Treatment of spinal cord injury with mesenchymal stromal cells* **	$77,000
James A. Waschek, Ph.D. University of California, Los Angeles	*The role of PACAP in remyelination after experimental spinal cord injury* **	$100,000
	TOTAL	**$2,096,346**

** Will use the Roman Reed Core Laboratory

Appendix 4

2002-2003 ROMAN REED AWARDS

18 one-year grants, totaling $1,532,883

Allan Basbaum, Ph.D. University of California, San Francisco	*Anatomical and functional recovery after SCI: Contribution of cyclic nucleotides ***	$77,428
Corinna Darian-Smith, Ph.D. Stanford University	*Cervical dorsal root lesions in monkeys: Neuronal consequences and impairment of voluntary hand function*	$96,539
Ray de Leon, Ph.D. Cal State University, Los Angeles	*Combining pharmacological and robotic training approaches for improving locomotor recovery after a spinal transection*	$74,589
Candace Floyd, Ph.D. University of California, Davis	*Transplantation of olfactory ensheathing cells modified by non-viral gene therapy to secrete NT-3 following SCI in the rat*	$68,676
Alan Garfinkel, Ph.D. University of California, Los Angeles	*Computer simulation of a neuro-musculo-skeletal model of human locomotion*	$33,878
Susan Harkema, Ph.D. University of California, Los Angeles	*Activity-dependent plasticity after human spinal cord injury*	$131,452
Hans Keirstead, Ph.D. University of California, Irvine	*The remyelinating potential of human embryonic stem cell-derived oligodendrocytes*	$92,484
Harley Kornblum, M.D., Ph.D. University of California, Los Angeles	*Stem cell implantation in a chronic cauda equina / conus medullaris injury model*	$91,000
Thomas Lane, Ph.D. University of California, Irvine	*Mechanisms of remyelination following spinal cord damage and demyelination*	$56,200
Linda Noble, Ph.D. University of California, San Francisco	*Matrix metalloproteinases and demyelination after spinal cord injury*	$100,000
Paul Patterson, Ph.D. California Institute of Technology	*Using leukemia inhibitory factor to promote repair mechanisms after spinal cord injury*	$58,750
Roland Roy, Ph.D. University of California, Los Angeles	*Use of a minimally invasive stimulation device (BION^{tm} System) to induce stepping in completely spinal rats*	$59,237
Michael Sofroniew, M.D., Ph.D. University of California, Los Angeles	*Genetically targeted astrocyte scar ablation and biopolymer tissue support after spinal cord injury*	$100,650
Robert Stern, M.D. University of California, San Francisco	*The first human chondroitinase: Isolation and characterization of an enzyme that promotes recovery from severe nerve and SCI ***	$99,500
Shula Stokols, B.S. University of California, San Diego	*Polymer guidance channels for spinal cord injury*	$46,500
Laura Taylor, B.S. University of California, San Diego	*Regulated lentiviral gene therapy for spinal cord injury*	$46,000
Mark Tuszynski, M.D., Ph.D. University of California, San Diego	*University of California consortium to study axonal plasticity and regeneration in the primate spinal cord*	$200,000
James Waschek, Ph.D. University of California, Los Angeles	*The role of PACAP in remyelination after experimental SCI ***	$100,000

TOTAL $1,532,883

** Will use the Roman Reed Core Laboratory

Appendix 4

2003-2004 ROMAN REED AWARDS
17 one-year grants, totaling $1,313,968

Allan Basbaum, Ph.D. University of California, San Francisco	*Regeneration of injured dorsal column fibers: the contribution of re-priming*	$76,201
Armin Blesch, Ph.D. University of California, San Diego	*Combining Ex Vivo and In Vivo Gene Delivery to Promote Axonal Regeneration*	$46,000
Melanie Cocco, Ph.D. University of California, Irvine	*Structure of Proteins that Inhibit CNS Repair: Nogo and It's Receptor*	$51,542
Steven Cramer, M.D. University of California, Irvine	*Does mental practice of foot movement improve corticospinal conduction and motor status after spinal cord injury?*	$75,980
Ray de Leon, Ph.D. Cal State University, Los Angeles	*Combining bicuculline treatment and robotic locomotor training***	$98,260
V. Reggie Edgerton, Ph.D. University of California, Los Angeles	*Combining Pharmacology and Epidural Electrical Stimulation to Induce Locomotion in Adult Spinal Rats*	$67,315
Alan Garfinkel, Ph.D. University of California, Los Angeles	*Intrinsic dynamics of the vertebrate locomotor pattern generator: a computational study*	$33,149
Susan Harkema, Ph.D. University of California, Los Angeles	*Activity-Dependent Plasticity After Human Spinal Cord Injury*	$120,852
Leif Havton, M.D., Ph.D. University of California, Los Angeles	*Implantation of adult human neural stem cells in a chronic cauda equina/conus medullaris injury model*	$86,000
Hans S. Keirstead, Ph.D. University of California, Irvine	*The Functional Consequences of Remyelination Following Transplantation of Human Embryonic Stem Cell-Derived Oligodendrocyte Progenitors into the Injured Spinal Cord*	$81,684
Edwin Monuki, M.D., Ph.D. University of California, Irvine	*Novel microfluidic technology for sorting and differentiating neural stem cells*	$30,000
Linda Noble, Ph.D. University of California, San Francisco	*Matrix metalloproteinases and spinal cord injury*	$66,117
Michael Sofroniew, M.D., Ph.D. University of California, Los Angeles	*Genetic manipulation of scar forming astrocytes, and biopolymer tissue support after SCI*	$91,039
Mark Tuszynski, M.D., Ph.D. **Shula Stokols, B.S.** University of California, San Diego	*Nerve Guidance Scaffolds for Spinal Cord Injury*	$50,462
Mark Tuszynski, M.D., Ph.D. University of California, San Diego	*UC Consortium to study axonal plasticity and regeneration in the primate spinal cord*	$202,000
John Weiss, M.D., Ph.D. University of California, Irvine	*Motor neurons ROS production and disruption of astrocytic glutamate transport - injury progression in the subacute phase after SCI ** *	$74,787
William Whetstone, M.D. University of California, San Francisco	*Activated Protein C, coagulation and inflammation after spinal cord injury*	$62,580
	TOTAL	**$1,313,968**

** Will use the Roman Reed Core Laboratory

Appendix 4

2004-2005 ROMAN REED AWARDS

14 one-year grants, totaling $1,235,305

Allen Basbaum, Ph.D. University of California, San Francisco	*The Contribution of Protein kinase C □ to corticospinal tract regeneration*	$80,164.00
Melanie Cocco, Ph.D. University of California, Irvine	*Structure of Proteins that Inhibit CNS Repair: Nogo and It's Receptor*	$53,457.00
Corinna Darian-Smith, Ph.D. Stanford University	*Hand function and the involvement of descending motor pathways following a cervical dorsal root lesion in monkeys*	$88,284.00
V. Reggie Edgerton, Ph.D. University of California, Los Angeles	*Neural Mechanisms Underlying Locomotor Behavior Induced by Epidural Electrical Stimulation*	$98,254.00
Jack Feldman, Ph.D. University of California, Los Angeles	*Inducible long-term facilitation of motoneuronal discharge as a mechanism for recovery of motor function: the dependence on PKC activity*	$96,499.00
Candace Floyd, Ph.D. University of California, Davis	*Is 17□-estradiol protective after SCI in rats? ** *	$49,404.00
Leif Havton, M.D., Ph.D. University of California, Los Angeles	*Plasticity in Pain Behavior and in Nociceptive Projections to the Lumbosacral Spinal Cord in a Rat Cauda Equina Injury and Repair Model*	$69,700.00
Noo Li Jeon, Ph.D. University of California, Irvine	*Microfluidic Platform for High Throughput Screening of Agents for Spinal Cord Axonal Regeneration*	$90,000.00
Zhigang David Luo, Ph.D. University of California, Irvine	*Identifying new targets and pathways for management of spinal cord injury pain ** *	$99,610.00
Edwin Monuki, M.D., Ph.D. University of California, Irvine	*Novel Microfluidic Technologies for Sorting and Differentiating Neural Stem Cells*	$88,000.00
Michael Sofroniew M.D., Ph.D. University of California, Los Angeles	*Genetic manipulation of scar forming astrocytes, and biopolymer tissue support for acute and chronic SCI*	$60,479.00
Niranjala Tillakaratne, Ph.D. University of California, Los Angeles	*Biochemical Mechanisms involved in Spinal Learning*	$69,610.00
Mark Tuszynski, M.D., Ph.D. University of California, San Diego	*University of California Consortium to Study Axonal Plasticity and Regeneration in the Primate Spinal Cord*	$205,000.00
Binhai Zheng, Ph.D. University of California, San Diego	*Functional analysis of Nogo in CNS axon regeneration using a Nogo null mutant*	$86,844.00

TOTAL $1,235,305

** Will use the Roman Reed Core Laboratory

Appendix 4

2005-2006 ROMAN REED AWARDS
15 one-year grants, totaling $1,371,675

Allen Basbaum, Ph.D. University of California, San Francisco	*Genetic Enhancement of cAMP Signaling in Corticospinal Tract Neurons: a Novel Approach to Sustaining Intrinsic Growth Capacity in the Setting of Spinal Cord Injury*	$65,000
Armin Blesch, Ph.D. University of California, San Diego	*Axonal bridging and functional reinnervation after SCI*	$65,000
Melanie Cocco, Ph.D. University of California, Irvine	*Structure of Proteins that Inhibit CNS Repair: Nogo and It's Receptor*	$56,012
Ray de Leon, Ph.D. Cal State University, Los Angeles	*Possible Role for BDNF in the Locomotor Recovery of Spinal Rats Following Robotic-Assisted Treadmill Training*	$96,214
Candace Floyd, Ph.D. University of California, Davis	*Is Post-Injury Administration of Estrogen to Male Rats Protective?*	$55,053
Leif Havton, M.D., Ph.D. University of California, Los Angeles	*Effect of Spinal Cord Transection Injury on the Synaptology of Autonomic and Motor Neurons Innervating the Lower Urinary Tract in Rats*	$76,000
Noo Li Jeon, Ph.D. University of California, Irvine	*Microfluidic Platform for High Throughput Screening of Agents for Spinal Cord Axonal Regeneration*	$90,000
Jack W. Judy, Ph.D. University of California, Los Angeles	*Mapping the spatial-temporal pattern of neuronal activity in an injured spinal cord*	$61,731
Zhigang David Luo, Ph.D. University of California, Irvine	*The Contribution of $Ca_v\alpha_2\delta_1$ Protein to SCI Pain***	$98,926
Edwin Monuki, M.D., Ph.D. University of California, Irvine	*Novel Microfluidic Technologies for Sorting and Differentiating Neural Stem Cells*	$99,583
Michael Sofroniew M.D., Ph.D. University of California, Los Angeles	*Genetic Manipulation of Scar Forming Astrocytes, and Biopolymer Tissue Support for Acute and Chronic SCI*	$58,609
Mark Tuszynski, M.D., Ph.D. University of California, San Diego	*University of California Consortium to Study Axonal Plasticity and Regeneration in the Primate Spinal Cord*	$120,293
Mark Tuszynski, M.D., Ph.D. University of California, San Diego	*Neutralization and conversion of netrin-1 signaling from repulsion to attraction to promote axon regeneration after spinal cord injury*	$85,000
John Weiss, M.D., Ph.D. University of California, Irvine	*Motor Neurons ROS Production and Disruption of Astrocytic Glutamate Transport - Possible Roles in Injury Progression in the Subacute Phase after SCI***	$79,254
Binhai Zheng, Ph.D. University of California, San Diego	*Role of myelin inhibitors in spinal regeneration: functional redundancy and compensation*	$100,000

** Will use the Roman Reed Core Laboratory

TOTAL $1,371,675

Appendix 4

2006-2007 ROMAN REED AWARDS
11 one-year grants, totaling $1,223,732

Kim Anderson, PhD University of California, Irvine	*Carbohydrate Metabolism Impairments in Chronic Human Spinal Cord Injury*	$37,425
Allan Basbaum, Ph.D. University of California, San Francisco	*Contribution of PKCg to the Persistent Pain Produced by Spinal Cord Injury*	$78,190
V. Reggie Edgerton, Ph.D. University of California, Los Angeles	*Neural Regeneration and Functional Recovery Induced by Epidural Electrical Stimulation*	$84,718
Christine Gall, PhD. University of California, Irvine	*Ampakine Enhancement of Axonal Outgrowth*	$74,898
Leif Havton, M.D., Ph.D. University of California, Los Angeles	*Effect of Minocycline on Neuropathic Pain, Inflammation, and Axonal Degeneration in Rat Cauda Equina Spinal Cord Injury and Repair*	$82,000
Noo Li Jeon, Ph.D. University of California, Irvine	*High-Content Microfluidic Stripe Assay for SCI Drug Screening*	$90,000
Hans Keirstead, Ph.D. University of California, Irvine	*hESC-Derived Motor Neurons For the Treatment of Chronic Spinal Cord Injury*	$78,305
Oswald Steward, Ph.D. University of California, Irvine	*Testing FDA Approved Drugs in a Cervical Spinal Cord Injury Model***	$82,994
Mark Tuszynski, M.D., Ph.D. University of California, San Diego	*University of California Primate Consortium: Axonal Plasticity and Regeneration in Chronic Primate SCI*	$225,330
Mark Tuszynski, M.D., Ph.D. University of California, San Diego	*University of California Primate Consortium: Laboratory Trailer*	$300,000
Binhai Zheng, Ph.D. University of California, San Diego	*Role of EphA4 in Spinal Cord Injury and Axon Regeneration*	$89,872

** Will use the Roman Reed Core Laboratory

TOTAL $1,223,732

Appendix 4

2007-2008 ROMAN REED AWARDS
13 one-year grants, totaling $1,177,586

Corinna Darian-Smith, Ph.D. Stanford University	*Characterization of reactive neurogenesis in the rodent following a dorsal root transection injury. A comparison with a central dorsal column lesion.*	$71,693
V. Reggie Edgerton, Ph.D. UCLA	*Is the spinal circuitry that generates spinal stepping refined or expanded in response to locomotor training?*	$100,022
Christine Gall, Ph.D. UC Irvine	*Ampakine enhancement of axonal outgrowth and functional recovery following spinal cord damage ***	$89,768
Yuh Nung Jan, Ph.D. UC San Francisco	*Investigating the mechanisms of capase activation in nerve degeneration by using dendrite pruning of Drosophila sensory neurons as a model system*	$60,000
Thomas Lane, Ph.D. UC Irvine	*CXCR2 and spinal cord injury ***	$61,560
Edwin Monuki, M.D., Ph.D. UC Irvine	*Dielectrophoretic cell sorting directed to SCI transplant therapies*	$75,000
Linda Noble, Ph.D. UC San Francisco	*L-selectin and spinal cord injury*	$70,510
Lawrence Recht, M.D. Stanford University	*Replacing cortical motor neurons with embryonic stem (ES) cells: A potential adjuvant treatment for spinal cord injury*	$100,000
Roland Roy, Ph.D. UCLA	*Can maintaining hindlimb muscle mass improve locomotor recovery after a complete thoracic SCI?*	$115,655
Oswald Steward, Ph.D. UC Irvine	*Do cortical motoneurons undergo retrogade cell death after SCI? ***	$83,773
Niranjala Tillakaratne, Ph.D. UCLA	*Is cyclic AMP element binding protein (CREB) essential for spinal learning?*	$76,847
Mark Tuszynski, M.D., Ph.D. UC San Diego	*University of California Primate Consortium: Axonal plasticity and regeneration in chronic primate SCI*	$185,100
Binhai Zheng, Ph.D. UC San Diego	*Role of EphA4 in spinal cord injury and axon regeneration*	$87,658

*** Will use the Roman Reed Core Laboratory* *TOTAL* **$1,177,586**

Appendix 4

2008-2009 ROMAN REED AWARDS
10 one-year grants, totaling $1,046,697

Jacqueline Bresnahan, Ph.D. UC San Francisco	*Pre-Clinical Critical Care Analysis of Hypertonic Saline for Spinal Cord Injury*	$99,450
V. Reggie Edgerton, Ph.D. UCLA	*Can Different Stepping Tasks and the Learning of these Tasks in Chronic Spinal Rats be Linked to Unique Populations of Neurons?*	$99,394
Linda Hsieh-Wilson, Ph.D. Caltech & HHMI	*Role of Chondroitin Sulfate in Axon Regeneration and SCI*	$111,908
Thomas Lane, Ph.D. UC Irvine	*Spinal Cord Injury and Immune Response to Viral Pathogen***	$64,689
Zhigang D. Luo, M.D., Ph.D. UC Irvine	*Contribution of Thrombospondin to Chronic Spinal Cord Injury Pain*	$99,756
Zoran Nenadic, D.Sc. UC Irvine	*Brain Computer Interface (BCI) controlled walking stimulator*	$75,000
Michael Sofroniew, M.D., Ph.D. UC San Francisco	*Role of the Perineuronal Net in Obstructing Plasticity and Impairing Recovery after Incomplete Spinal Cord Injury*	$69,890
Oswald Steward, Ph.D. UC Irvine	*Do cortical motoneurons undergo retrogade cell death after SCI? ***	$83,814
Mark Tuszynski, M.D., Ph.D. UC San Diego	*University of California Primate Consortium: Axonal plasticity and regeneration in chronic primate SCI*	$167,825
Yimin Zou, Ph.D. UC San Diego	*WNT Signaling in Central Nervous System Regeneration*	$77,216
*** Will use the Roman Reed Core Laboratory*	*TOTAL*	**$1,046,697**

Appendix 4

2009-2010 ROMAN REED AWARDS
9 one-year grants, totaling $797,100

Oswald Steward, Ph.D. University of California, Irvine	*Use of Viral Vector Approach to Delete pTEN in Motor Cortex and Promote Axon Regenration After Spinal Cord Injury***	$97,918
Lawrence Recht, M.D. Stanford University	*Engineering the Corticospinal Tract as a High-Throughput Model to Study Spinal Cord Injury***	$100,000
Suzy Kim, M.D. University of California, Irvine	*Novel Quantitative and Functional Outcome Measures following Thoracic Spinal Cord Injury*	$106,360
Zoran Nenadic, Ph.D. University of California, Irvine	*Brain computer interface (BCI) controlled walking simulator*	$39,241
Reggie Edgerton, Ph.D. University of California, Los Angeles	*Development of an electronic bridge over the lesion between fore and hindlimbs to facilitate quadrupedal stepping after a complete spinal cord*	$78,379
Sophia Chun VA Long Beach Healthcare System	*The Effect of HBOT on Acute Spinal Cord Injury and Disorders Rehabilitation Outcome*	$75,000
Armin Blesch, Ph.D. University of California, San Diego	*An Inducible Receptor Tyrosine Kinase for Axonal Regeneration*	$75,202
Mark Tuszynski, M.D., Ph.D. University of California, San Diego	*UC Primate Consortium: Axononal Plasticity and Regeneration*	$145,000
Yimin Zou, Ph.D. University of California, San Diego	*Wnt signaling in sensory axon injury and regeneration*	$80,000

*** Will use the Roman Reed Core Laboratory* *TOTAL* **$797,100**

Roman Reed Core Laboratory Projects

A total of 22 Roman Reed Awards have used the Roman Reed Core laboratory to carry out research projects.

Funding Cycle	Primary Investigator	Title of Project	Total Award Amount
2002-2003	Allan Basbaum, Ph.D. University of California, San Francisco	*Anatomical and functional recovery after spinal cord injury: Contribution of cyclic nucleotides*	$77,428
2001-2002	Michael D. Cahalan, Ph.D. University of California, Irvine	*Tracking and targeting lymphocytes in spinal cord injury*	$87,329
2003-2004	Ray de Leon, Ph.D. Cal State University, Los Angeles	*Combining bicuculline treatment and robotic locomotor training*	$98,260
2004-2005	Candace Floyd, Ph.D. University of California, Davis	*Is 17b-estradiol protective after SCI in rats?*	$49,404
2007-2008	Christine Gall, Ph.D. University of California, Irvine	*Ampakine enhancement of axonal outgrowth and functional recovery following spinal cord damage*	$ 89,768
2001-2002	James G. Hecker, M.D., Ph.D. University of California, Los Angeles	*Prevention of secondary injury via non-viral intrathecal delivery of neuroprotective and apoptosis inhibitory genes*	$52,500
2001-2002	Hans S. Keirstead, Ph.D. University of California, Irvine	*Role of T cells in secondary degeneration following contusion injury to the adult spinal cord*	$75,000
2007-2008	Thomas Lane, Ph.D. University of California, Irvine	*CXCR2 and Spinal Cord Injury*	$ 61,560
2008-2009	Thomas Lane, Ph.D. University of California, Irvine	*Spinal cord injury and immune response to viral pathogen*	$ 64,689
2004-2005	Z. David Luo, M.D. University of California, Irvine	*Identifying new targets and pathways for management of spinal cord injury pain*	$99,610
2008-2009	Z. David Luo, M.D. University of California, Irvine	*Contribution of thrombospondin to chronic spinal cord injury pain*	$99,756
2001-2002	David J. Reinkensmeyer, Ph.D. University of California, Irvine	*Robotic outcome assessment in spinal cord injury and regeneration*	$61,293

Appendix 5

2001-2002	Marylou Solbrig, M.D. University of California, Irvine	*Gene therapy of spinal cord injury – adenoviral vector delivery of macrophage/microglia stimulating factors*	$78,480
2001-2002	Lawrence Steinman, Ph.D. Stanford University	*Myelin tolerizing DNA vaccination in the treatment of spinal cord injury*	$125,000
2002-2003	Robert Stern, M.D. University of California, San Francisco	*The first human chondroitinase: Isolation and characterization of an enzyme that promotes recovery from severe nerve and SCI*	$99,500
2006-2007	Oswald Steward, Ph.D. University of California, Irvine	*Testing FDA Approved Drugs in a Cervical Spinal Cord Injury Model*	$82,994
2007-2008	Oswald Steward, Ph.D. University of California, Irvine	*Do cortical motoneurons undergo retrogade cell death after spinal cord injury?*	$83,773
2001-2002	Richard Vulliet, Ph.D., DVM University of California, Davis	*Treatment of spinal cord injury with mesenchymal stromal cells*	$77,000
2001-2002	James Waschek, Ph.D. University of California, Los Angeles	*The role of PACAP in remyelination after experimental spinal cord injury*	$100,000
2002-2003	James Waschek, Ph.D. University of California, Los Angeles	*The role of PACAP in remyelination after experimental SCI*	$100,000
2003-2004	John Weiss, M.D., Ph.D. University of California, Irvine	*Motor neurons ROS production and disruption of astrocytic glutamate transport - Injury progression in the subacute phase after SCI*	$74,787
2005-2006	John Weiss, M.D., Ph.D. University of California, Irvine	*Motor Neurons ROS Production and Disruption of Astrocytic Glutamate Transport - Injury Progression in the Subacute Phase after SCI*	$79,254
2009-2010	Oswald Steward, Ph.D. University of California, Irvine	*Use of Viral Vector Approach to Delete pTEN in Motor Cortex and Promote Axon Regenration After Spinal Cord Injury*	$97,918
2009-2010	Lawrence Recht, M.D.	*Engineering the Corticospinal Tract as a High-Throughput Model to Study Spinal Cord Injury*	$100,000
		Total	$1667,208

Appendix 5

An additional 24 projects have been carried out through the Core that have helped investigators obtain critical preliminary data to support applications to the Roman Reed Spinal Cord Injury Program and other funding sources, develop novel assessment techniques, or take advantage of opportunities that offer the potential of making key discoveries or rapid advancements in understanding of spinal cord injury/nerve regeneration and repair.

New Funding Brought into California

Roman Reed Researchers have obtained **74** new grants based on data from their Roman Reed Projects, bringing **$63,867,216** in new funding into California.

Total Grant Funding 2009-2010 ***$15,126,100*** ***Total New Funding as of 2/2010*** ***$63,867,216***

Principal Investigator	Institution at time of award	Funding agency	Award Amount
Aileen Anderson	UCI	NIH/NINDS	$1,408,775
Armin Blesch	UCSD	International Spinal Research Trust	$169,578
		Christopher Reeve Paralysis Fdn	$74,800
		NIH/NINDS	$231,250
		NIH/NINDS	$750,000
Corinna Darian-Smith	Stanford	Whitehall Foundation Grant	$74,000
		Christopher Reeve Paralysis Fdn	$150,000
		NIH RO1 NS048425-01	$840,000
Ray de Leon	Cal State LA	NIH R01 (NS055911-04)	$1,312,482
V. Reggie Edgerton	UCLA	NIH Program Project	$4,499,898
		Christopher Reeve Paralysis Fdn	$819,000
		NIH	$6,250,000
		Craig H. Neilsen Foundation	$60,000
		NSF	$30,000
		Russian Foundation for Basic Research	$36,000
		NIH	$803,530
		NIH (8 R01 EB0020968-02)	$1,511,216
		VA	$453,000
		Army TATRC	$249,984
		NIH R01 NS062009	$1,815,191
		NIH 1R01 EB007615	$4,045,445
		Paralyzed Vets of America # 2527	$144,520
Jack Feldman	UCLA	NIH (RO1 NS-24742)	$1,063,852
Leon Hall	UC Davis	UCD Health System Award	$150,000
Susan Harkema	UCLA	NIH-NINDS R01 NS 049209	$955,352
Jack Judy	UCLA	NIH	$300,000
Leif Havton	UCLA	NIH/NINDS(RO1 NS42719)	$712,500

		NIH/NCRR (California Primate Consortium)	$20,000
		Stein-Oppenheimer Fund/ David Geffen School of Medicine at UCLA	$20,000
		Paralysis Project of America	$50,000
		Stein-Oppenheimer Fund/ David Geffen School of Medicine at UCLA	$20,000
		Dept of Defense/SCI Research Program/Translational Research Partnership	$2,250,000
		California Institute for Regenerative Medicine	$1,051,068
Hans S. Keirstead	UCI	Geron Corporation/BioSTAR, GC-10478	$498,564
		Families of SMA	$262,471
		Geron Corporation/BioSTAR, GC-104110	$493,524
		Geron Corporation/BioSTAR, GC-29615	$447,011
		Geron Corporation/BioSTAR, 00-10128	$374,375
		Geron Corporation/ UC Discovery	$366,797
		Christopher Reeve Foundation, KA1-0103-2	$146,262
		NIH (NS41484-01A1 (RO1)	$1,102,583
Harley Kornblum	UCLA	Ron Shapiro Charitable Fdn	$125,000
Z. David Luo	UCI	Christopher Reeve Paralysis Foundation	$136,000
	UCI	Christopher and Dana Reeve Foundation	$179,932
	UCI	NINDS, NIH R01 (NS064341-01A1)	$1,233,442
Edwin Monuki	UCI	NIH R21 award (R21 MH07059)	$200,000
	UCI	CIRM Tools and Technologies award, RT1-01074-1	$861,122
Linda Noble	UCSF	NIH/NINDS *NS39278*	$1,250,000
David Reinkensmeyer	UCI	NIH Sub-Contract	$675,000
RR Roy	UCLA	Paralyzed Vets of America	$289,040
Michael Sofroniew	UCLA	NIH	$362,188
Marylou Solbrig	UCI	NIH/NINDS R01 NS42307	$750,000
Larry Steinman	Stanford	Christopher Reeve Paralysis Fdn	$165,000
Oswald Steward	UCI	NIH NO1-NS-3-2354	$1,047,313
		NIH NO1-NS-3-2353	$1,608,751
		Oxnard Foundation	$60,000
Shula Stokols	UCSD	Christopher Reeve Paralysis Fdn	$75,000
		Christopher Reeve Paralysis Fdn	$74,000

New Funding Brought into California

Mark H. Tuszynski	UCSD	NIH (California Primate Consortium)	$5,000,000
		NIH (California Primate Consortium)	$3,774,400
		Veteran's Administration	$750,000
		NIH/NINDS	$660,000
		NIH/NINDS	$2,015,000
		VA Central Office	$665,000
		VA Central Office	$300,000
		VA RR&D (Tusszynski, Mark	133,000
		Swiss Institute for Research Into Paraplegia	$165,000
		NIH (R01 NS42291)	$2,325,000
James Waschek	UCLA	NICHD	$900,000
		NICHD	$700,000
Binhai Zheng	UCSD	Christopher Reeve Paralysis Fdn	$165,000
		NIH/National Institute of Aging	$35,000
		Dana Foundation	$300,000
		NIH/NINDS	$875,000
		TOTALS	**$63,867,216**

Appendix 7

Roman Reed Award Publications and Patents

Published Manuscripts

Aguilar, R.M., and Steward, O. (2009) A bilateral cervical contusion injury model in mice: assessment of gripping strength as a measure of forelimb motor function. Exp. Neurol.

Ahn, S.N, Guu, J.J, Tobin, A.J, Edgerton, V.R, and Tillakaratne, N.J. Use of c-fos to identify activity-dependent spinal neurons after stepping in intact adult rats. *Spinal Cord*. 44(9):547-59. 2006.

Akhavan M, Hoang TX, Havton LA (2006) Improved detection of fluorogold-labeled neurons in long-term studies. Journal of Neuroscience Methods 152: 156-162.

Alfa RW, Blesch A (2006). Murine and HIV-based retroviral vectors for in vitro and in vivo gene transfer. In: Wang Q (ed.): Methods in Molecular Medicine: 129:241-54.

Anderson, K.D., Abdul, M., and Steward, O. (2004). Quantitative assessment of deficits and recovery of forelimb motor function after cervical spinal cord injury in mice. Exp. Neurol. 190, 184-191.

Anderson, K. D., Gunawan, A., and Steward, O. 2005. Quantitative assessment of forelimb motor function after cervical spinal cord injury in rats: relationship to the corticospinal tract. Exp Neurol 194: 161-174.

Anderson, K.D., Gunawan, A., and Steward, O. (2007) Spinal pathways involved in the control of forelimb motor function in rats. Exp. Neurol. 206, 318-331.

Anderson, K.D., Sharp, K.G., Hofstadter, M., Irvine, K., Murray, M., and Steward, O. (2009) Forelimb locomotor assessment scale (FLAS): Novel assessment of forelimb dysfunction after cervical spinal cord injury. Exp. Neurol., 220, 23-33

Anderson, K.D., Sharp, and Steward, O. (2009) Bilateral cervical contusion spinal cord injury in rats. Exp. Neurol., 220, 9-22

Armstrong BD, Abad C, Chhith S, Cheung-Lau G, Hajji OE, Coute AC, Ngo DH, Waschek JA. Impairment of Axotomy-Induced Pituitary Adenylyl Cyclase-Activating Peptide Gene Expression in T Helper 2 Lymphocyte-Deficient Mice. Neuroreport. 2006; 17(3):309-12.

Armstrong BD, Abad C, Chhith S, Rodriguez W, Cheung-Lau G, Trinh V, Waschek JA. Restoration of axotomy-induced PACAP gene induction in SCID mice with CD4+ T-lymphocytes. Neuroreport. 2004;15(17):2647-50.

Armstrong, B.D., Hu, Z., Abad, C., Yamamoto, M., Rodriguez, W.I., Cheng, J., Lee, M., Chhith, S., Gomariz, R.P., Waschek, J.A. Induction of neuropeptide gene expression and blockade of retrograde transport in facial motor neurons following local peripheral nerve inflammation in severe combined immunodeficiency and BALB/C mice. Neuroscience. 2004;129(1):93-9.

Armstrong, B.D., Hu, Z., Abad, C., Yamamoto, M., Rodriguez, W.I., Cheng, J., Tam, J., Gomariz, R.P., Patterson, P.H., Waschek, J.A. Lymphocyte regulation of neuropeptide gene expression after neuronal injury. J Neurosci Res. 2003 Oct 15;74(2):240-7.

Bigbee AJ, Hoang TX, Havton LA (2007) At-level neuropathic pain is induced by lumbosacral ventral root avulsion injury and ameliorated by root reimplantation into the spinal cord. Experimental Neurology (In Press)

Bigbee A.J, Crown E.D, Ferguson A.R, Roy R.R, Tillakaratne N.J, Grau J.W, and Edgerton V.R. Two chronic motor training paradigms differentially influence acute instrumental learning in spinally transected rats. *Behav Brain Res.* 180(1):95-101.2007.

Blanco, J.E., Anderson, K.D., and Steward, O. (2007) Recovery of forepaw gripping ability and reorganization of cortical motor control following cervical spinal cord injuries in mice. Exp. Neurol., 203, 333-348.

Blesch A (2004). MLV based retroviral and lentiviral vectors for in vitro and in vivo gene transfer. Methods: 33:164-172.

Blesch A, Conner J, Pfeiffer A, Gasmi M, Britton W, Alfa R, Verma I, Tuszynski MH (2005). Regulated lentiviral NGF gene transfer controls rescue of medial septal cholinergic neurons. Molecular Therapy: 11: 916-925.

Blesch A, Tuszynski MH (2003). Cellular GDNF delivery promotes growth of motor and dorsal column sensory axons after partial and complete spinal cord transections, and induces remyelination. Journal of Comparative Neurology: 467:403-417.

Blesch A, Yang H, Weidner N, Hoang A, Otero D (2004). Axonal responses to cellularly delivered NT-4/5 after spinal cord injury. Molecular and Cellular Neuroscience: 27: 190-201.

Blesch A, Pfeiffer A, Conner JM, Britton W, Verma I, Tuszynski MH. Regulated lentiviral NGF genetransfer controls rescue of medial septal cholinergic neurons. Molec Ther, 2005;11:916-925.

Blesch A, Tuszynski MH. Neurotrophic factor therapy: NGF, BDNF and NT-3. Encyclopedia of Neuroscience. Elsevier, San Diego. 2007.

Blight A, Tuszynski MH. Clinical trials in spinal cord injury. J Neurotrauma. 2006; 23:586-593.

Blurton-Jones M, Tuszynski MH. Estradiol-induced modulation of estrogen receptor-ß and GABA within the adult neocortex: A potential trans-synaptic mechanism for estrogen modulation of BDNF. J Comp Neurol, 2006, 499:603-12.

Brock J., Yang, H., Rosenzweig, E.S., Lu, P., Mckay, H., Bemot, T., Moseanko, R., Keirstead, H., Steward, O., Gage, F.H., Edgerton, V.R., and Tuszynski, M.H. Modulation of endogenous cell proliferation by neurotrophic factors following primate spinal cord injury. Cell transplantation. 16(3):315-316. 2007.

Cai, L.L., Fong, A.J., Otoshi, C.K., Liang, Y.Q., Cham, J.G., Zhong, H., Roy, R.R., Edgerton, V.R., and Burdick, J.W. Effects of consistency vs. variability in robotically controlled training of stepping in adult spinal mice. *Proc. Int. Conference Rehab. Robotics*. pp. 575-579, 2005.

Cai, L.L., Burdick, J.W., Fong, A.J., Courtine, G., Roy, R.R., and Edgerton, V.R. Plasticity of functional connectivity in the adult spinal cord. *Phil. Trans. Roy. Soc. B: Biol. Sci.* Sep 29;361(1473):1635-46, 2006.

Cai, L.L., Fong, A.J., Otoshi, C.K., Liang, Y.Q., Cham, J.G., Zhong, H., Roy, R.R., Edgerton, V.R., and Burdick, J.W. Implications of assist-as-needed robotic step training after a complete spinal cord injury on intrinsic strategies of motor learning. *J Neurosci;* 26(41):10564-8 Oct., 2006.

Cha J, Heng C, Reinkensmeyer D.J, Roy R.R, Edgerton V.R, and DeLeon R.D. Locomotion ability in spinal rats is dependent on the amount of activity imposed on the hindlimbs during treadmill training. *J. Neurotrauma*. 24(6)1000-1012.2007.

Chao, T., Pham, K., Steward, O., and Gupta, R. (2008) Chronic nerve compression injury induces a phenotypic switch of neurons within the dorsal root ganglia. J. Comp. Neurol. 506, 180-193.

Chaovipoch, P., Bozak Jelks, KA, Gerhold, LM, West, EJ, Chongthammakun, S, Floyd, CL. 17B-estradiol is protective in spinal cord injury in post- and pre-menopausal rats. Journal of Neurotrauma (in press).

Chaovipoch P. Jelks K.A., Gerhold L.M., West, E.J., Chongthammakun S., Floyd, C.L. (2006) 17b-Estradiol is protective in spinal cord injury in post- and pre-menopausal rats. Journal of Neurotrauma 23(6):830-52.

Chung BG, Flanagan LA, Rhee SW, Schwartz PH, Lee AP, Monuki ES, Jeon NL. Human neural stem cell growth and differentiation in a gradient-generating microfluidic device. Lab Chip, 2005; 5:401-406.

Conner JM, Chiba AA, Tuszynski MH. The basal forebrain cholinergic system is essential for cortical plasticity and functional recovery following brain injury. Neuron, 2005, 46:173-9.

Conner JM, Tuszynski MH. Neurotrophins: physiology and pharmacology. Encyclopedia of Neuroscience. Elsevier, San Diego. 2007.

Courtine G, Roy RR, Hodgson J, McKay H, Yang H, Zhong H, Tuszynski MH, Edgerton R. Performance of locomotion and foot grasping following a unilateral thoracic corticospinal tract lesion in monkeys (Macaca Mulatta). Brain, 2005;128:2338-2358.

Courtine G, Roy RR. Hodgson J, McKay HM, Zhong H, Yang H, Tuszynski MH,Edgerton VR. Kinematic and EMG determinants in quadrupedal locomotion of a non-human primate. J Neurophysiol, 2005, 93:3127-3145.

Courtine, G., Roy, R.R., Raven, J., Hodgson, J., McKay, H., Yang, H., Tuszynski, M.H., and Edgerton, V.R. Performance of locomotion and foot grasping following a unilateral thoracic corticospinal tract lesion in the Rhesus monkey. *Brain* 2338-58. 2005.

Courtine G, Binge M.B, Fawcett J.W, Grossman R.G, Kaas J.H, Lemon R, Maier I, Nudo R.J, Ramon-Cueto A, Rouiller E.M, Schnell L, Wannier T, Schwab M.E, and Edgerton V.R. Can experiments in nonhuman primates expedite the translation of treatments for spinal cord injury in humans? *Nature Medicine.* 13(2):561-566.2007.

Courtine, G., Song, B., Roy, R.R., Zhong, H., Herrmann, J.M., Ao, Y., Edgerton, V.R., Sofroniew, M.V. Recovery of supraspinal control of stepping via indirect propriospinal relay connections after spinal cord injury. Nature Medicine 14:69-74 (2007).

Courtine, G., Gerasimenko, Y.P., van den Brand, R., Yew, A., Musienko, P., Zhong, H., Song, B., Ao, Y., Ichiyama, R.M., Lavrov, I., Roy, R.R., Sofroniew, M.V., and Edgerton, V.R. Transformation of nonfunctional spinal circuits into functional and adaptive states after the loss of brain input. *Nat Neurosci.* 12:1333-1342, 2009 PMC2828944.

Cramer, SC, Lastra, L, Lacourse, M and Cohen, M. Brain motor system function after chronic, complete spinal cord injury. Brain, 2005.

Cramer, Steven C., Orr, Elizabeth, L.R., Cohen, Michael J., Lacourse, Michael G. Effects of Motor Imagery Therapy after Chronic, Complete Spinal Cord Injury Exp Brain Res 2007; 177:233-42.

Cummings, B. J., Uchida, N., Tamaki, S. J., Salazar, D. L., Summers, R., Gage, F. H., and Anderson, A. J. (2005) Human neural stem cells differentiate and promote behavioral improvements in spinal cord injured mice. PNAS, 102: 14069.

Darian-Smith, C. (2004) Primary afferent terminal sprouting following a cervical dorsal root section in the macaque monkey. J. Comp. Neurol. 470:134-150.

Darian-Smith, C., and M. Ciferri (2005). Loss and recovery of voluntary hand movements in the macaque following a cervical dorsal rhizotomy. .J Comp Neurol. 491:27-45.

Das, Koel, Aditi Majumder, Monica Siegenthaler, Joerg Meyer, Hans Keirstead, M. Gopi. (2006) Progressive Isocontour Analysis for Remyelination Detection and Classification IEEE Visualization (in press).

Davalos, D. *, Lee, J. K. *, Smith, W. B., Brinkman, B., Ellisman, M. H., Zheng, B., and Akassoglou, K. (2007). Stable in vivo imaging of densely populated glia, axons and blood vessels in the mouse spinal cord using two-photon microscopy. **J Neurosci Methods** (Epub ahead of print). * Equal contributors.

De Leon RD, Acosta CN. Effect of robotic-assisted treadmill training and chronic quipazine treatment on hindlimb stepping in spinally transected rats. J Neurotrauma. 2006 Jul;23(7):1147-63.

De Leon, R.D., Kubasak, M.D., Phelps, P.E., Timoszyk, W.K., Reinkensmeyer, D.J., Roy, R.R., and Edgerton, V.R. Using robotics to teach the spinal cord to walk. *Brain Research Reviews.* 40:267-273, 2002.

Dobkin BH, Havton LA (2004) Basic advances and new avenues in therapy for spinal cord injury. Annual Review of Medicine 55: 255-82.

Dy, C., Gerasimenko, Y., Edgerton, V.R., Dyhre-Poulsen, P., Courtine, G., and Harkema, S. Phase dependent modulation of percutaneously elicited multisegmental muscle responses after spinal cord injury. *J. Neurosci.* 103(5): 2808-20 May 2010 PMC2867577

Edgerton, V.R., and Roy, R.R. Paralysis recovery in humans and model systems. *Current Opinion in Neurobiology.* 12:658-667, 2002.

Edgerton, V.R., Roy, R.R., Allen, D.L. and Monti, R.J. Adaptations in skeletal muscle disuse or decreased use atrophy. *American Journal of Medicine and Rehabilitation.* 81 (Suppl. 11):S127-S147, 2002.

Edgerton, V.R., Harkema, S.J., Dobkin, B.H. Retraining the Human Spinal Cord. In: *Spinal Cord Medicine: Principles and Practices*. V. Lin (ed). Demos Medical Publishing, Ch. 60, 817-826, 2003

Edgerton, V.R., Tillakaratne, N.J.T., Bigbee, A.J., de Leon, R.D. and Roy, R.R. Plasticity of the spinal circuitry after injury. *Ann. Rev. Neurosci.* 27:145-167, 2004.

Edgerton, V.R., Kim, S.H., Ichiyama, R.M., Gerasimenko, Y.P. and Roy, R.R. Rehabilitative therapies after spinal cord injury. *J.Neutrotrauma*. 23 (3-4): 560-570. Mar-Apr 2006.

Edgerton, V.R, Courtine, G., Gerasimenko, Y., Lavrov, I., Ichiyama, R., Fong, A., Cai, L., Otoshi, C., Tillakaratne, N., Burdick, J., and Roy, R.R. Training Locomotor Networks. *Brain Research Reviews*. 57(1):241-256. 2008.

Edgerton, V.R., and Roy, R.R. Activity-dependent plasticity of spinal locomotion: Implications for sensory processing. *Exerc. Sports Sci. Rev.* 37:171-178, 2009, PMC2790155.

Faulkner, J.R., Herrmann, J.E., Woo, M.J., Tansey, K.E., Doan, N.B., and Sofroniew, M.V., (2004). Reactive astrocytes protect tissue and preserve function after spinal cord injury. J. Neurosci. 24:2143-2155.

Faulkner, Jill and Hans S. Keirstead (2005) Human Embryonic Stem Cell-Derived Oligodendrocyte Progenitors for the Treatment of Spinal Cord Injury. Transplant Immunology 15:131-142.

Fawcett JW, Curt A, Steeves JD, Coleman WP, Tuszynski MH, et al. Guidelines for the conduct of clinical trials for spinal cord injury as developed by the ICCP panel: spontaneous recovery after spinal cord injury and statistical power needed for therapeutic clinical trials. Spinal Cord, 2006, (in press).

Feldman, J.L., Neverova, N., Saywell, S.A. (2005) Modulation of hypoglossal motoneuron excitability by intracellular signal transduction cascades. Respiratory Physiology & Neurobiology 147:131-143.

Fong, A.J., Roy, R.R., Ichiyama, R.M., Lavrov, I., Courtine, G., Gerasimenko, Y., Tai, Y.C., Burdick, J., and Edgerton, V.R. Recovery of control of posture and locomotion after a spinal cord injury: Solutions staring us in the face. IN: *Neurotherapy: Progress in Restorative Neuroscience and Neurology: Prog. Brain Res.* Volume 175, Chapter 30. J. Verhaagen, E.M. Hol, I. Huitenga, J. Winjnholds, A.B. Bergen, G.J. Boer, and D.F. Swaab (eds.), Elsevier Science B.V., Netherlands, pp. 393-418, 2009 PMC2904312

Fong AJ, Cai LL, Otoshi CK, Reinkensmeyer DJ, Burdick JW, Roy RR, Edgerton VR. Spinal cord-transected mice learn to step in response to quipazine treatment and robotic training. J Neurosci.; 25:11738-47, 2005.

Fontoura P., Ho, P., DeVoss J., Zheng B., Lee B., Kidd B., Garren H., Raymond A. Sobel R., Robinson W., Tessier-Lavigne M., and Steinman L. Immunity To The Extracellular Domain Of Nogo-A Modulates Experimental Autoimmune Encephalomyelitis. Journal of Immunology, 173: 6981-6992, 2004

Franz S., Weidner N. and Blesch A. Gene therapy approaches to enhancing plasticity and regeneration after spinal cord injury. Exp. Neurol 2011 Jan 31 [Epub ahead of print].

Galbraith G, Waschek J, Armstrong B, Edmond J, Lopez I, Liu W, Kurtz I. Murine auditory brainstem evoked response: Putative two-channel differentiation of peripheral and central neural pathways. J Neurosci Methods. 2006 Jan 4; [Epub ahead of print]

Gerasimenko, Y.P., Lavrov, I.A., Courtine, G., Ichiyama, R.M., Zhong, H., Roy, R.R., and Edgerton, V.R. Spinal cord reflexes induced by epidural spinal cord stimulation in normal rats. *J. Neurosci. Methods*. 30: 157(2): 253-63, 2006

Gerasimenko Y.P., Ichiyama, R.M., Lavrov, I.A., Courtine, C., Cai, L., Zhong, H., Roy, R.R., and Edgerton, V.R. Epidural spinal cord stimulation plus quipazine administration enable stepping in complete spinal adult rats. *Journal of Neurophysiology*. 98(5):2525-2536. 2007.

Gerasimenko Y, Roy R.R, and Edgerton V.R. Epidural stimulation: Comparison of the spinal circuits that generate and control locomotion in rats, cats and humans. *Experimental Neurology*. 209(2):417-25.2008.

Gerasimenko Y., Musienko, P., Bogacheva, I., Moshonkina, T., Savochin, A., Lavrov, I., Roy, R.R., and Edgerton, V.R. Propriospinal bypass of the seroronergic system that can facilitate stepping. *J. Neurosci.* 29:5681-5689, 2009. PMC2940277

Gerasimenko, Y., Gorodnichev, R., Machueva, E., Pivovarova, E., Semyenov, D., Savochin, A., Roy, R.R., and Edgerton, V.R. Novel and direct access to the human locomotor spinal circuitry. *J. Neuroscience* 30(10): 3700-3708 March 2010 PMC2847395

Glaser, J., Gonzalez, R., Perreau, V., Cotman, C., Keirstead, H., (2004). Neutralization of the Chemokine CXCL10 Enhances Tissue Sparing and Angiogenesis Following Spinal Cord Injury. J Neur Res 77:701-708.

Glaser, Janette, Rafael Gonzalez, Ellika Sadr and Hans S. Keirstead (2006) Neutralization of the Chemokine CXCL10 Reduces Apoptosis and Increases Axon Sprouting Following Spinal Cord Injury. J. Neurosci. Res. (in press).

Gonzalez, R., Glaser, J., Liu, M., Lane, T., Keirstead, H., (2003). Reducing Inflammation Decreases Secondary Degeneration and Functional Deficit After Spinal Cord Injury. Exp Neur 184: 456-463

Gupta, R., Rummler, L.S., Palispis, W.A., Truong, L.N., Chao, T., Rowshan, K., Mossafar, T., and Steward, O. (2006) Local down-regulation of myelin-associated glycoprotein permits axonal sprouting with chronic nerve compression injury. Exp. Neurol., 200, 418-429.

Harwin, W.S., Patton, J., Edgerton, V. R. Challenges and opportunities for robot mediated neurorehabilitation. *Proceedings of the IEEE*, Vol 94, No. 9, 1717-1726. September, 2006.

Havton LA, Kellerth J-O (2004) Plasticity of lumbosacral monosynaptic reflexes after a ventral root transection injury in the adult cat. Experimental Brain Research 155: 111-114.

Havton LA, Broman J (2005) Systemic administration of cholera toxin B subunit conjugated to horseradish peroxidase in the adult rat labels preganglionic autonomic neurons, motoneurons, and select primary afferents for light and electron microscopic studies. Journal of Neuroscience Methods 149: 101-109.

Ho P, Fontoura P, Platten M, Sobel RA, DeVoss JJ, Lee, LY, Kidd, BA, Tomooka BH, Capers J, Agrawal A, Gupta R, Zernik J, Yee MK, Lee BJ, Garren H, Robinson WH, and Steinman L. A suppressive oligodeoxynucleotide enhances the efficacy of myelin cocktail/IL-4 tolerizing DNA vaccination and treats autoimmune disease. Journal of Immunology, 175:6226-6234, 2005

Hoang TX, Pikov V, Havton LA (2006) Functional reinnervation of the rat lower urinary tract after cauda equina injury and repair. Journal of Neuroscience 26: 8672-8679.

Hoang TX, Nieto JH, Tillakaratne NJK, Havton LA (2003) Autonomic and motor neuron death is progressive and parallel in a lumbosacral ventral root avulsion model of cauda equina injury. Journal of Comparative Neurology 467: 477-486.

Hoang TX, Nieto JH, Havton LA (2005) Regenerating supernumerary axons are cholinergic and emerge from both autonomic and motor neurons in the rat spinal cord. Neuroscience 136: 417-423.

Hoang TX, Havton LA (2006) Novel repair strategies to restore bladder function following cauda equina/ conus medullaris injuries. Progress in Brain Research 152: 195-204.

Hoang TX**,** Havton LA (2006) A single re-implanted ventral root exerts neurotropic effects over multiple spinal cord segments in the adult rat. Experimental Brain Research 169: 208-217.

Hoang TX, Nieto JH, Dobkin BH, Tillakaratne NJ, Havton LA (2006) Acute implantation of an avulsed lumbosacral ventral root into the rat conus medullaris promotes neuroprotection and graft reinnervation by autonomic and motor neurons. Neuroscience 138: 1149-1160.

Hodgson, J.A., Roy, R.R., Higuchi, N., Monti, R.J., Zhong, H., Grossman, E., and Edgerton, V.R. Does daily activity level determine muscle fiber phenotype? *J. Exp. Biol.* 208:3761-3770, 2005.

Hu, W-P., Zhang, C., Li, J-D., Luo, Z.D., Amadesi, S., Bunnett, N., and Zhou, Q-Y. Impaired pain sensation in mice lacking prokineticin 2. (2006) *Mol. Pain,* 2:35, 1-9

Hyatt, J.P., Roy, R.R., Baldwin, K.M., Wernig, A., and Edgerton, V.R. Activity related neural control of myogenic factors in slow muscle. *Muscle Nerve* 33:49-60, 2006.

Ichiyama, R.M., Yu. P. Gerasimenko , H. Zhong, R.R. Roy & V.R.Edgerton. Hindlimb Stepping Movements in Complete Spinal Rats Induced by Epidural Spinal Cord Stimulation 2005, Neuroscience Letters, 383(3):339-44.

Ichiyama RM, Broman J, Edgerton VR, Havton LA (2006) Ultrastructural synaptic features differ between alpha and gamma motoneurons innervating the tibialis anterior muscle in the rat Journal of Comparative Neurology 499: 306-315.

Ichiyama, R.M., Roy, R.R., Edgerton, V.R. Chapter 30: Assessment of sensorimotor function after spinal cord repair. In: *Textbook of Neural Repair and Rehabilitation*. M. Selzer, S. Clarke, L. G. Cohen, P.W. Duncan and F.H. Gage (eds), Cambridge University Press. Feb. 2006

Ideguchi, M., Palmer, T.D., Recht, L.D., and Weimann, J.M. Murine Embryonic Stem Cell-Derived Pyramidal Neurons Integrate into Cerebral Cortex and Appropriately Project Axons to Subcortical Targets. Journal of Neuroscience 30(3) 894-904

Jedrzejas, M. J., and Stern, R. 2005. Structures of vertebrate hyaluronidases and their unique enzymatic mechanism of hydrolysis. Proteins 61**:** 227-238, 2009.

Jindrich, D.L., Joseph, M.S., Otoshi, C.K., Wei, R.Y., Zhong, H., Roy, R.R., Tillakaratne, N.J.K., and Edgerton, V.R. Spinal learning in the adult mouse using the Horridge paradigm. *J. Neurosci. Methods.* 182:250-254, 2009, PMC2727573.

Keirstead, H. S., Nistor, G., Bernal, G., Totoiu, M., Cloutier, F., Sharp, K., and Steward, O. 2005. Human embryonic stem cell-derived oligodendrocyte progenitor cell transplants remyelinate and restore locomotion after spinal cord injury. J Neurosci 25**:** 4694-4705.
(Keirstead, et al., 2005)

Keirstead, Hans S., Vadim Fedulov, Frank Cloutier, Oswald Steward and Barry P. Duel (2005) A non-invasive ultrasonographic method to evaluate bladder function recovery in spinal cord injured rats. Exp. Neurol. 194, (1): 120-127.

Kerr, B and Patterson, P (2004) Potent pro-inflammatory actions of leukemia inhibitory factor (LIF) in the spinal cord of the adult mouse. Exper. Neurol. 188: 391-407.

Kerr, B and Patterson, P (2005) Leukemia Inhibitory Factor Promotes Oligodendrocyte Survival After Spinal Cord Injury. GLIA 51:73–79 (2005)

Kim, S.J., Haddad, F., Roy, R.R., Zhong, H., Ambartsumyan, L., Edgerton, V.R., and Baldwin, KM. (2005) Short bouts of electromechanical stimulation are effective in ameliorating cellular deficits associated with chronic inactivity. *Med. Sci. Sports Exerc.* 37:S71. 2005.

Kim, S.J., Roy, R.R., Zhong, H., Ambartsumyan, L., Baldwin, K.M., and Edgerton, V.R. Efficacy of functional electrical stimulation in ameliorating inactivity-induced atrophy in a fast hindlimb muscle in rat. *Proc. IFESS Soc*., pp. 370-372, 2005.

Kim. S.J., Roy, R.R., Ju, E., Suzuki, H., Zhong, H., Haddad, F., Baldwin, K.M., and Edgerton, V.R. Efficacy of electromechanical stimulation in blunting inactivity-induced fiber size and type adaptations. *Med. Sci. Sports Exerc.* 38 (Suppl.):S52, 2006.

Kim S.J, Roy R.R, Zhong H, Suzuki H, Ambartsumyan L, Haddad F, Baldwin K.M, and Edgerton V.R. Electromechanical stimulation ameliorates inactivity-induced adaptations in the medial gastrocnemius of adult rats. *J Appl Physiol.* 103(1):195-205.2007.

Kim, J.A., Roy, R.R., Kim, S.J., Zhong, H., Haddad, F., Baldwin, K.M. and Edgerton, V.R. Electromechanical modulation of catabolic and anabolic pathways in chronically inactive, but neurally intact, muscle. *Muscle Nerve* 42(3):410-21 2010 PMC2950751

Kwon BK, Liu J, Lam C, Plunet W, Oschipok LW, Hauswirth W, Di Polo, A, Blesch A, Tetzlaff W (2006). Brain derived neurotrophic factor gene transfer with adeno-associated viral and lentiviral vectors prevents rubrospinal neuronal atrophy and stimulates regeneration associated gene expression after acute cervical spinal cord injury. Spine: in press.

Lacroix S, Havton LA, McKay H, Yang H, Brant A, Roberts J, Tuszynski MH (2004) Bilateral corticospinal projections from unilateral cortical motor areas in macaque monkeys: a quantitative study. Journal of Comparative Neurology 473: 147-161.

Lammertse D, Tuszynski MH, Steeves JD, Curt A, Fawcett JW, et al. Guidelines for the conduct of clinical trials for spinal cord injury as developed by the ICCP panel: clinical trial design. Spinal Cord, 2006, in press.

Lapanantasin S., Chongthammakun S., Floyd C.L., Berman, R.F. (2006) Effects of 17beta-estradiol on intracellular calcium changes and neuronal survival after mechanical strain injury in neuronal-glial cultures. Synapse 60 (5):406-410.

Lavrov, I., Gerasimenko, Y.P., Ichiyama, R.M., Courtine, G., Zhong, H., Roy, R.R., and Edgerton, V.R. Plasticity of Spinal Cord Reflexes after a Complete Transection in Adult Rats: Relationship to Stepping Ability. *J Neurophysiol*. 96(4):1699-710, Oct., 2006.

Liu, Y., Wang, X., Lu, C.-C., Sherman, R., Steward, O., Xu, X.-M. and Zou, Y. (2008) Repulsive Wnt signaling inhibits axon regeneration following central nervous system injury. J. Neurosci., 28, 8376-8382.

Liu, K., Lu, Y., Lee, J.D., Samara, S., Willenberg, R., Sears-Kraxberger, I., Tedeschi, A., Park, K.K., Jin, D., Cai, B., Xu, B., Connolly, L., Steward, O., Zheng, B., & He, Z. (2010) PTEN deletion enhances regenerative ability of adult corticospinal neurons. Nature Neurosci., 13, 1075-1083. PMCID: PMC2928871

Lu P, Yang H, Jones LL, Filbin MT, Tuszynski MH. Combinatorial therapy with neurotrophins and cAMP promotes axonal regeneration beyond sites of spinal cord injury. Journal of Neuroscience, 2004; 24:6402-6409.

Lu P, Jones LL, Tuszynski MH. BDNF-expressing marrow stromal cells support extensive axonal growth at sites of spinal cord injury. Exp Neurol, 2005 191:344-60.

Lu P, Yang H, Culbertson M, Graham L, Roskams AJ, Tuszynski MH. Olfactory ensheathing cells do not exhibit unique migratory or axonal growth-promoting properties after spinal cord injury. Journal of Neuroscience, 2006: 26:11120-11130.

Lu P, Jones LL, Tuszynski MH. Axon regeneration through scars and into sites of chronic spinal cord injury. Exp Neurol, 2007; 203:8-21.

Lu P, Tuszynski MH. Can bone marrow-derived stem cells differentiate into functional neurons? Exp Neurol, 2005.

Maneuf, Y.M., Luo, Z.D., and Lee, K. alpha-2-delta and mechanism of action of gabapentin in the treatment of pain. (2006) *Semi. Cell Dev. Biol.* 17:565-570.

Mingorance-Le Meur, A., Zheng, B., Soriano, E., and Del Rio, J. A. (2007). Involvement of the Myelin-Associated Inhibitor Nogo-A in Early Cortical Development and Neuronal Maturation. Cerebral Cortex (Epub ahead of print).

Molteni, R., Zheng, Q-J., Ying, Z., Chang, B., Gomez-Pinilla, F., and Twiss, JL., Voluntary Exercise Increases the Axonal Regeneration from Sensory Neurons, Proc. Natl. Acad. Sci. USA, 101(22) (2004):8473-8.

Nieto JH, Hoang TX, Warner EA, Franchini BT, Westerlund U, and Havton LA (2005) Titanium mesh implantation – A method to stabilize the spine and protect the spinal cord following a multilevel laminectomy in the adult rat. Journal of Neuroscience Methods, 147: 1-7.

Nagahara A, Tuszynski MH. Growth factors in Alzheimer's disease. In: Alzheimer's Disease, eds. Sisodia A and Tanzy R. Elsevier, San Diego. 2007.

Nessler JA, Timoszyk W, Merlo M, Emken JL, Minakata K, Roy RR, DeLeon RD, Edgerton VR, Reinkensmeyer DJ (2005), A robotic device for studying rodent locomotion following spinal cord injury, IEEE Transactions on Neural Systems and Rehabilitation Engineering, 13:4, 497 – 506

Nessler JA, de Leon RD, Sharp K, Kwak E, Minakata K, Reinkensmeyer DJ (2005) Robotic gait analysis of bipedal treadmill stepping by spinal contused rats: characterization of intrinsic recovery and comparison with BBB, Journal of Neurotrauma, in press.

Nessler JA, Reinkensmeyer DJ, Timoszyk WK, Nelson K, Acosta C, Roy RR, Edgerton VR, de Leon RD "The Use of a Robotic Body Weight Support Mechanism to Improve Outcome Assessment in the Spinal Cord Injured Rodent", Proceedings of the 2003 IEEE Engineering in Medicine and Biology Society Meeting, Cancun, Mexico, Sept 17-21, pp. 1629-1632

Neumann S, Skinner K, Basbaum AI. Sustaining intrinsic growth capacity of adult neurons promotes spinal cord regeneration. Proc Natl Acad Sci U S A. 2005 Nov 15;102(46):16848-52.

Nielson, J.L., Sears-Kraxberger, I., Strong, M.K., Wong, J.K., Willenberg, R., and Steward, O. (2010) Unexpected survival of neurons of origin of the pyramidal tract after spinal cord injury, J. Neurosci. 30, 11516-11528. PMCID: PMC2941508

Nistor, Gabriel, Minodora O. Totoiu, Nadia Haque, Melissa K. Carpenter and Hans S. Keirstead (2005) Differentiation of oligodendrocytes in high-purity from human embryonic stem cells. Glia, 49; 385-396. (journal cover)

Ohab JJ, Fleming S, Blesch A, Carmichael ST (2006). A neurovascular niche for neurogenesis after stroke. Journal of Neuroscience: . 26: 13007-13016.

Ohlsson M, Hoang TX, Havton LA (2006) Glial reactions in a rodent cauda equina injury and repair model. Experimental Brain Research 170: 52-60.

Ohlsson M, Havton LA (2006) Complement activation after lumbosacral ventral root avulsion injury. Neuroscience Letters 394: 179-183.

Orr ELR, Lacourse MG, Cohen MJ, Cramer SC. Cortical activation during executed, imagined, and observed foot movements. Neuroreport (in press).

Orr ER, Rodriguez RW, Cramer SC. Recovery from stroke. In: Frank Hillary and John DeLuca, eds. Functional Neuromiaging of Neurologic Disorders. (in press).

Pandorf C.E, Haddad F, Roy R.R, Qin A.X, Edgerton V.R, Baldwin K.M. Dynamics of myosin heavy chain gene regulation in slow skeletal muscle: role of natural antisense RNA.*J Biol Chem.* 281(50): 38330-38342.2006.Harwin W.S, Patton J.L, and Edgerton V.R. Challenges and Opportunities for Robot-Mediated Neurorehabilitation. *Proceedings of the IEEE*.94(9):1717-1726.2006.

Pfeiffer K, Vroemen M, Blesch A, Weidner N (2004). Adult neural progenitor cells provide a permissive guiding substrate for corticospinal axon growth following spinal cord injury. European Journal of Neuroscience: 20: 1695-1704

Radojicic, M., Reier, P.J., and Steward, O., and Keirstead, H.S. (2005) Septations in chronic spinal cord injury cavities contain axons. Exp. Neurol., 196, 339-341

Ramanathan D, Conner JM, Tuszynski MH. A novel form of motor cortical plasticity that correlates with recovery of function after brain injury. Proc Natl Acad Sci, 2006;103 30:11370-11375

Reinkensmeyer, D., Aoyagi, D., Emken, J., Galvez, J., Ichinose, W., Kerdanyan, G., Maneekobkunwong, S., Minakata, K., Nessler, J., Weber, R., Roy, R.R., de Leon, R., Bobrow, J., Harkema, S., and Edgerton, V. Tools for understanding and optimizing robotic gait training. *J. Rehab. Res. Devel.* Sep-Oct; 43(5):657-70. 2006

Rodger, D.C; Fong, A.J; Li, W; Ameri, H; Ahuja, A.K; Gutierrez, C; Lavrov, I; Zhong, H; Menon, P.R; Meng, E; Burdick, J.W; Roy, R.R; Edgerton, V.R; Weiland, J.D; Humayun, M.S; and Tai, Y.C. Flexible Parylene-based Multielectrode Array Technology for High-density Neural Stimulation and Recording. *Sensors and Actuators: B. Chemical.* 1385-1388 .2007.

Rosenzweig, E.S., Courtine, G., Jindrich, D., Brock, J.H., Strand, S., Ferguson, A.R., Nout, Y., Roy, R.R., Miller, D., Beattie, Havton, L.A., Bresnahan, J., Edgerton, V.R., and Tuszynski, M.H. Extensive spontaneous plasticity of corticospinal projections after primate spinal cord injury. *Nature Neurosci.* 13:1505-1510, 2010. PMC – IN PROGRESS

Roy, R.R., Zhong, H., Hodgson, J.A., Grossman, E.J., Siengthai, B., Talmadge, R.J., and Edgerton, V.R. Influences of Electromechanical Events in Defining Skeletal Muscle Properties. *Muscle & Nerve* 26:238-251, 2002.

Roy, R.R., Zhong, H., Monti, R.J., Vallance, K.A. and Edgerton, V.R. Mechanical properties of the electrically silent adult rat soleus muscle. *Muscle & Nerve*. 26:404-412, 2002.

Roy, R.R., Zhong, H., Siengthai, B, and Edgerton, V.R. Activity-dependent influences are greater for fibers in rat medial gastrocnemius than tibialis anterior muscle. *Muscle Nerve* 32:473-482, 2005.

Sacheck J.M, Hyatt J.P, Raffaello A, Jagoe RT, Roy R.R, Edgerton V.R, Lecker S.H, and Goldberg A.L. Rapid Disuse and Denervation Atrophy Involve Transcription Changes Similar to Those of Muscle Wasting during Systemic Disesases. *FASEB J.* 21(1):140-155.2007.

Schachtrup, C., Lu, P., Jones, L. L., Lee, J. K., Lu, J., Sachs, B. D., Zheng, B. and Akassoglou, K. (2007). Fibrinogen inhibits neurite outgrowth via ¾3 integrin-mediated phosphorylation of the EGF receptor. Proc. Natl. Acad. Sci. USA. *104*, 11814-9.

Sofroniew, M.V., Reactive astrocytes in neural repair and protection. Neuroscientist 5:400–407 (2005).

Steeves J, Fawcett J, Tuszynski MH. Report of International clinical trials workshop on spinal cord injury. Spinal Cord, 2004;42:591-597.

Stern, R. Devising a pathway for hyaluronan catabolism: are we there yet? Glycobiology, vol. 13, 2003.

Stern, R. A new metabolic pathway: hyaluronan catabolism. Eur. J. Cell Biol., 83, 1-9, 2004.

Stern, R., Mammalian Hyaluronidases, An Update . Glycoforum website. Science of Hyaluronan http://www.glycoforum.gr.jp , 2004.

Stern, R. Devising a pathway for hyaluronan catabolism: How the goo gets cut. In: Hyaluronan: Structure, Metabolism, Biological Activities, Therapeutic Applications. Eds: E.A Balazs and V.C. Hascall, MBI Press, Edgewater, NJ. 2005, pp. 257-266.

Stern, R., Soltes, L., Stankovska, M., and Kogan, G. Hyaluronan catabolism: hypoxia and reoxygenation in the joint. Chem. Biodivers. 2, 1242-1246, 2005.

Stern, R. and Jedrzejas, M. The Hyaluronidases: genomics, structures, and mechanisms of action. Chem. Reviews, 106, 818-839, 2006.

Steward, O., Zheng, B., and Tessier-Lavigne, M. (2003) False resurrections: Distinguishing regenerated from spared axons in the injured CNS. Commentary, J. Comp. Neurol., 459, 1-8.

Steward, O., Zheng, B., Ho, C., Anderson, K., Tessier-Lavigne, M. (2004) The dorsolateral corticospinal tract in mice: an alternative route for corticospinal input to caudal segments following dorsal column lesions. Journal of Comparative Neurology 472(4):463-77.

Steward, O., Zheng, B., Banos, K., and Yee, K. M. (2007). Response to: Kim et al., "Axon Regeneration in Young Adult Mice Lacking Nogo-A/B." Neuron *54*, 191-5.

Steward, O., Sharp, K., Selvan, G., Hadden, A., Hofstadter, M., Roskams, J., and Au, E. (2006) A re-assessment of the consequences of delayed transplantation of olfactory ensheathing cells following complete spinal cord transection in rats. Exp. Neurol., 198, 483-499.

Steward, O., Zheng, B., Tessier-Lavigne, M., Hofstadter, M., Sharp, K., Yee, K.M. (2008) Regenerative growth of corticospinal tract axons via the ventral column after spinal cord injury in mice. J. Neurosci., 28, 6836-

Steward, O., Sharp, K., Yee, K.M., and Hofstadter, M. (2008) A re-assessment of the effects of a Nogo-66 receptor antagonist on regenerative growth of axons and locomotor recovery after spinal cord injury in mice. Exp. Neurol., 209, 446-468. A special issue on Regeneration and Rehabilitation after Spinal Cord Injury (J. Silver Guest Editor). **Selected for evaluation in the Faculty of 1000 Biology".

Steward, O., Zheng, B., Tessier-Lavigne, M., Banos, K., and Yee, K. M. Artifactual BDA labeling of axons in the white matter of the injured spinal cord: A cautionary note for studies of regeneration and possible resolution of discrepant findings in Nogo knockout mice. Neuron (in press).

Stokols S, Tuszynski MH. The fabrication and characterization of linearly oriented nerve guidance scaffolds for spinal cord injury. Biomaterials, 2004;25:5839-5846.

Stokols, S., and Tuszynski, M. H. 2006. Freeze-dried agarose scaffolds with uniaxial channels stimulate and guide linear axonal growth following spinal cord injury. Biomaterials 27: 443-451.

Stokols S, Tuszynski MH. Freeze-dried agarose scaffolds with uniaxial channels stimulate and guide linear axonal regeneration following spinal cord injury. Biomaterials, 2006;27:443-51.

Steward, O., Zheng, B., Tessier-Lavigne, M., Hofstadter, M., Sharp, K., Yee, K.M. (2008) Regenerative growth of corticospinal tract axons via the ventral column after spinal cord injury in mice. J. Neurosci. 28, 6836-6847. PMCID: PMC2745399

Stokols S, Sakamoto J, Breckon C, Holt T, Weiss J, Tuszynski MH. Templated agarose scaffolds support linear axonal regeneration. Tissue Engineering, 2006, in press.

Strong, M.K., Blanco, J.E., Anderson, K.D., Lewandowski, G., and Steward, O. (2009) An investigation of the cortical control of forepaw gripping after cervical hemisection injuries in rats. Exp. Neurol. 217, 96-107.

Strong, M.K., Blanco, J.E., Anderson, K.D., Lewandowski, G., and Steward, O. (2009) An investigation of the cortical control of forepaw gripping after cervical hemisection injuries in rats. Exp. Neurol., 217, 96-107. PMCID: PMC2679860

Taylor L, Jones L, Tuszynski MH, Blesch A (2006). NT-3 gradients established by lentiviral gene transfer promote short-distance axonal bridging into and beyond cellular grafts in the injured spinal cord. Journal of Neuroscience, 2006; 26: 9713-9721.

Timoszyk, W.K., de Leon, R.D., London, N., Roy, R.R., Edgerton, V.R., Reinkensmeyer, D.J. The Rat Lumbosacral Spinal Cord Adapts to Robotic Loading Applied During Stance. *Journal of Neurophysiology*. 88:3108-3117, 2002.

Timoszyk, W.K., de Leon, R.D., London, N., Joynes, R., Minakata, K., Roy, R.R., Edgerton, V.R. and Reinkensmeyer, D.J. Comparison of virtual and physical treadmill environments for training stepping after spinal cord injury. *Robotica* 21:25-32, 2003.

Timoszyk, W., Nessler, J.A., Nelson, K., Acosta, C., Roy, R.R., Edgerton, V.R., de Leon, R., and Reinkensmeyer, D.J. Hindlimb loading determines stepping quantity and quality following spinal transection. *Brain Res.* 1050:180-9. 2005

Totoiu, Minodora and Hans S. Keirstead (2005) Spinal cord injury is accompanied by chronic progressive demyelination. J. Comp. Neurol. 486: 373-383.

Trivedi A, Hsu J-Y,Lin Y, Goussev S,Gan J,Topp S, and Noble-Haeusslein L J. The effects of acute and extended inhibition of matrix metalloproteinases on demyelination and functional recovery after spinal cord injury. International Journal of Neuroprotection and Neuroregeneration, 2005; 2:30-38.

Tuszynski MH, Grill R, Jones LL, McKay HM, Blesch A. Spontaneous and augmented growth of axons in the primate spinal cord: Effects of local injury and NGF-secreting cell grafts. J Comp Neurol, 2002; 449:88-101.

Tuszynski MH, corresponding author: Spinal Cord Translational Study Group. Recommended guidelines for studies of human subjects with spinal cord injury. Spinal Cord, 2005, 43:453-458.

Tuszynski MH, Thal L, Pay M, Salmon DP, U H-S, Bakay R, Patel P, Blesch A, Vahlsing HL, Ho G, Tong G, Potkin SG, Fallon J, Hansen L, Mufson EJ, Kordower JH, Gall C, Conner JM. A phase I clinical trial of nerve growth factor gene therapy for Alzheimer's disease. Nature Medicine, 2005, 11:551-555.

Tuszynski MH. Challenges to the report of nogo antibody effects in primates. Nat Med 2006, 12:1231-1232. (letter)

Tuszynski MH, Steeves JD, Fawcett JW, Lammertse D, et al. Guidelines for the conduct of clinical trials for spinal cord injury as developed by the ICCP Panel: clinical trial inclusion/exclusion criteria and ethics. Spinal Cord, 2006, (in press).

Tuszynski MH. New strategies for CNS repair. LE-TeX. In: Schering Foundation Workshop 53 - Opportunities and Challenges of the Therapies Targeting CNS Regeneration. Springer-Verlag, 2005.

Tuszynski MH. Growth factor gene delivery: Animal models to clinical trials. J Neurobiol. 2006, in press.

Tuszynski MH. Nerve growth factor gene therapy in Alzheimer's disease. Alzheimer's Disease and Associated Disorders. 2007, in press.

vondem Bussche M, Tuszynski MH. Growth Factor and Neuron Atrophy. Encyclopedia of Neuroscience. Elsevier, San Diego. 2007.

Wang, P.T., King, C.E., Do, A.H. and Nenadic, Z. A durable, low-cost electrogoniometer for dynamic measurement of joint trajectories, Med. Eng. Phys. (in press, DOI: 10.1016/j.medengphy.2010.12.008).

Wang, P.T. , King, C., Chui, L.A., Nenadic, Z. and Do, A. BCI controlled walking simulator for a BCI driven FES device, In Proc. of RESNA Annual Conference, Las Vegas, Nevada, June 26-30, 2010.

Wang L, Flanagan L, Lee Abraham P. , "Side-Wall Vertical Electrodes for Lateral Field Microfluidic Applications", *Journal of Microelectromechanical Systems*, JMEMS-2006-0106.R1, Accepted for publication - October 2006.

Warner EA, De Young DZ, Hoang TX, Franchini BT, Westerlund U, Havton LA (2005) Differential distribution of growth associated protein (GAP-43) in the motor nuclei of the adult rat conus medullaris. Experimental Brain Research, 161: 527-531.

Wisniewski, H.-G., Sweet, M.H., and Stern, R. An assay for bacterial and eukaryotic chondroitinases using a chondroitin sulfate-binding protein. Anal. Biochem. 347, 42-28, 2005.

Wong, J., Sharp, K., and Steward, O. (2009) A straight alley version of the BBB locomotor scale. Exp. Neurol., 217, 417-420.

Xiao, W., Boroujerdi, A., Bennett, G.J., and Luo, Z.D. Chemotherapy-evoked painful peripheral neuropathy: analgesic effects of gabapentin and effects on expression of the alpha-2-delta type-1 calcium channel subunit. (2007) *Neuroscience* 144:714-720. (in press)

Xie, F., and Zheng, B. (2007). White matter inhibitors in CNS axon regeneration failure. Exp. Neurol. (Epub ahead of print).

Yang H, Lu P, McKay HM, Bernot T, Keirstead H, Steward O, Gage FH, Edgerton ER, Tuszynski MH. Endogenous neurogenesis replaces oligodendrocytes and astrocytes after primate spinal cord injury. J Neurosci, 2006;26:2157-2166

Yaron, A, and Zheng, B. (2007). Navigating their way to the clinic: emerging roles for axon guidance molecules in neurological disorders and injury. Dev. Neurobiol. *67*, 1216-31.

Zheng, B. Ho, C., Keirstead, H., Steward, O. and Tessier-Lavigne, M. (2003) Lack of enhanced spinal regeneratyion in Nogo-deficient mice. Neuron 38, 213-224.

Zheng B, Atwal J, Ho C, Case L, He XL, Garcia KC, Steward O, Tessier-Lavigne M. (2005) Genetic deletion of the Nogo receptor does not reduce neurite inhibition in vitro or promote corticospinal tract regeneration in vivo. Proc Natl Acad Sci U S A. 102:1205-1210.

Zheng, B., Lee, J. K., and Xie, F. (2006). Genetic Mouse Models for Studying Inhibitors of Spinal Axon Regeneration. Trends in Neuroscience *29*, 640-6.

Zhong, H., Roy, R.R., Hodgson, J.A., Talmadge, R.J., Grossman, E.J. and Edgerton, V.R. Activity-independent neural influences on cat soleus motor unit phenotypes. *Muscle & Nerve*. 26:252-264, 2002

Zhong, H. Roy, R.R., Siengthai, B, and Edgerton, V.R. Effects of inactivity on fiber size and myonuclear number in rat soleus muscle. *J. Appl. Physiol.* 99:1494-1499, 2005.

Submitted/In Preparation Manuscripts

Anderson, K.D., Jewell, R., Perrone-Bizzozero, N.I., and Steward, O. Comparison of the pattern of expression of the RNA-binding protein HuD and a binding partner GAP-43 in axotomized neurons of the facial nucleus and red nucleus (in preparation).

Angeli, CA, Ferreira CK, Harkema SJ, Alvarado LR. Effects of Stand Training on Bone Mineral Density following Spinal Cord Injury. Spinal Cord (In Preparation).

Courtine G, Harkema SJ, Dy CJ, Gerasimenko YP, Dyhre-Poulsen P. Modulation of Multisegmental Monosynaptic responses (MMR) in leg muscles during human walking and running. J Physiol. (In Review)

Darian-Smith, C. and Ciferri, M. (2005) Reorganization of the cuneate nucleus in the macaque following the deafferentation of the thumb and fingers. (in preparation).

Darian-Smith, C., and Ciferri, M. Cuneate nucleus reorganization following a cervical dorsal rhizotomy in the macaque monkey. (in preparation).

De Leon, R. The Combined Effect of Quipazine treatment and Robotic Training on Locomotor Recovery in Spinally Transected Rats (in preparation).

De Leon, R. Robotic Treadmill Training Improves Hindlimb Stepping in Severe Contused Rats (in preparation).

Hall, L., Overman, J., Najera, R. Heat Shock Protein 25 is Up-Regulated in Reactive Astrocytes in Spinal Cord Contusion Injury (Submitted).

Dy CJ, Beres-Jones JA, Lukacs RU, Joaquin R, Johnson TD, Harkema SJ. Functionally isolated spinal interneuronal circuits can mediate alternation of antagonist muscles during stepping after human spinal cord injury. Nat Neurosci (In Preparation)

Hall, L., Overman, J., Najera, R. Non-viral gene therapy for the treatment of spinal cord injury: HSP27 or XIAP over-expression improves functional recovery following moderate spinal cord contusion injury. Spine, (under revision).

Harkema SJ, Hu PB, Krassioukov AV, van den Brand R. Improvements in orthostatic instability with stand training using body weight support in individuals with spinal cord injury. Spinal Cord (In Preparation)

Harkema SJ, Poulsen P, Beres-Jones JA, Simonsen EB. Modulation of the H-reflex during stepping in humans after training in the absence of supraspinal input. Nat Neurosci. (In Preparation)

Hoang TX, Pikov V, Havton LA. Functional reinnervation of the rat lower urinary tract after cauda equina injury and repair (Submitted)

Ichiyama RM, Broman J, Edgerton VR, Havton LA. Ultrastructural synaptic features differ between alpha and gamma motoneurons innervating the tibialis anterior muscle in the rat (Submitted)

Ichiyama, R., Y Gerasimenko, I. Lavrov, G. Courtine, H Zhong, R R. Roy & V. R Edgerton. Daily Locomotor Training under Epidural Stimulation and Serotonin Agonist Improves Locomotor Behavior in Completely Spinal Adult Rats. (in preparation)

Ichiyama, R., Y Gerasimenko, D Law, H Zhong, R R. Roy & V. R Edgerton. Combining epidural stimulation and 5-HT agonist induces acute plantar stepping after a complete spinal cord transection in adult rats. (in preparation)

Jung-Yu C. Hsu, Robert McKeon, Staci Goussev, Zena Werb, Jun-Euk Lee, Alpa Trivedi and Linda J. Noble-Haeusslein. Matrix metalloproteinase-2 deficiency results in wound healing events that limit functional recovery after spinal cord injury (In preparation)

Kachadroka S., Hall, A.E., and Floyd, C.L. (In progress) Post-SCI administration of 17b-estradiol is equally protective in gonad-intact and gonadectomized male rats.

Kelly, T., Nakano, I., Kornblum, H.I. Comparison of spinal cord and brain-derived neural stem cells (in preparation).

S.J. Kim, R.R. Roy, H. Zhong, H. Suzuki, L. Ambartsumyan, F. Haddad, K. Baldwin, and V.R. Edgerton.“Electromechanical stimulation ameliorates inactivity-induced adaptations in the medial gastrocnemius of adult rats” Journal of Applied Physiology (submitted Dec 2006)

Krassioukov AV, Harkema SJ. Effect of harness application and postural changes on cardiovascular parameters of individuals with spinal cord injury. Spinal Cord. (In Review)

Lavrov, I.A., Y.P. Gerasimenko, R.M. Ichiyama, G. Courtine, H. Zhong, R.R. Roy & V.R. Edgerton. Plasticity of Spinal Cord Reflexes after a Complete Transection in Adult Rats: Relationship to Stepping Ability. Journal of Neurophysiology (submitted).

Li, C-Y, Zhang, X-L, Matthews, E. A., Li, K-W., Kurwa, A., Gold, M., Dickenson, A. H., Feng, G. and Luo, Z.D. Calcium Channel a2d1 Subunit Mediates Spinal Hyperexcitability in Pain Modulation. (2006) (Submitted, in revision).

Monuki, E.S., Lee, A.P., Jeon, N.L. Novel Microfluidic Technologies for Sorting and Differentiating Neural Stem Cells (Submitted).

Neverova, N., Saywell, S.A., Mitchell, G.S., Feldman, J.L. (2006) Episodic stimulation of a1-adrenoreceptors induces PKC-dependent persistent changes in motoneuronal excitability. J Neurosci (In preparation).

Otoshi CK, Mikhaeil, Y, Khristy, W, Hui Zhong, Roland R. Roy, V. Reggie Edgerton, Niranjala J.K. Tillakaratne. 5-HT-mediated facilitation of stepping and AMPAR signaling in adult spinal mice; Manuscript in preparation

Patel, U.K., Garfinkel, A., and Edgerton, V.R. Computer simulation of the vertebrate locomotor pattern generator: I. Ontogeny and the emergence of fetal motor patterns (in preparation).

Patel, U.K., Garfinkel, A., and Edgerton, V.R. Computer simulation of the vertebrate locomotor pattern generator: II. Sensory feedback and the modulation of basic motor patterns (in preparation).

Patel, U.K., Garfinkel, A., and Edgerton, V.R. Computer simulation of the vertebrate locomotor pattern generator: III. Learning and relearning of gait patterns (in preparation).

Patel, U.K., Garfinkel, A., and Edgerton, V.R. Computer simulation of the vertebrate locomotor pattern generator: IV. Phylogenetic changes from swimming to bipedal walking (in preparation).

Patel, U.K., Garfinkel, A., and Edgerton, V.R. Coordination of hindlimb motor pools for stepping by a rostrocaudal pattern of activation (in preparation).

Schulz , J., Cocco, M. The Structure of the Soluble Domain of Nogo (in preparation).

Sintuu, C., Faulkner, J.R., Chang, M.-F., Khosravi, A., Junge, C., Herrmann, J.E., Lin, Y.-P., Jewett, A., Sofroniew M.V., and Wu, B., Polymer microspheres for tissue support and axon regeneration in the CNS (in preparation).

Smith, J., Anderson, R., Pham, T., Bhatia, N., Steward, O., and Gupta, R. (in press) The role of early surgical decompression of the intra-dural space following cervical spinal cord injury in an animal model. J. Bone and Joint Surgery,

Stern, R., and Jedrzejas, M.J. The Unusual Enzymology of Vertebrate Hyaluronidases: Structure Kinetics, and Mechanisms of Action (submitted).

Vessal, M. and Darian-Smith, C. Neurogenesis in the adult monkey dorsal horn following cervical dorsal rhizotomy (in preparation).

Whetstone, W. Role of Activated Protein C and the protease activated receptor -1 in barrier protection, inflammation and motor recovery following spinal cord contusion injury (in preparation).

Wisniewski, H.-G., Sweet, M.H. and Stern, R. A rapid microtiter-based assay for chondroitinase activity (submitted).

Zheng, B. Of mice and men: regenerating injured spinal axons. Trends in Neuroscience Submitted.

Ziegler, M.D., Zhong, H, Roy, R.R., and Edgerton, V.R. Why variability facilitates spinal learning. *J. Neurosci* 30: 10720-10726. 2010 PMC – IN PROGRESS

R. Edgerton: Paper under review with Journal of Neural Engineering (Special issue) Title: Forelimb-based EMG to control an electronic spinal bridge to enable hindlimb stepping after a complete spinal cord lesion.

Do, A.H., Wang, P.T., King, C.E. ,Abiri, A. and Nenadic, A. Brain-computer interface controlled functional electrical stimulation system for ankle movement. (submitted)

Published Abstracts

Acosta, C., Nelson, K., Timoszyk, W., Reinkensmeyer, D., Roy, R., Edgerton, V.R., de Leon, R. Robotic control of hindlimb weight bearing during locomotor training improves stepping in spinal transected rats. Society for Neuroscience Abstracts, 2003.

Acosta, C., Leung, J., Heras, A., Joseph, M., Young, T., Lim, C., Duran, P., de Leon, R. Combining Robotic Training and Quipazine Treatment for Improving Locomotion in Spinally Transected Rats. Society for Neuroscience Abstracts, 2004.

Akhavan M, Hoang TX, Havton LA. Improved detection of fluorogold-labeled neurons in long-term studies. Annual Meeting of Society for Neuroscience, 2005, 35:

Akhavan M, Hoang TX, Havton LA. A method to enhance the detection of fluorogold-prelabeled neurons in long-term studies. Annual Meeting of The Society for Neuroscience, 2004, 34:

Beres-Jones J, Harkema SJ, Simonsen E, Dyhre-Poulsen P. Phase dependent modulation of H-reflex during stepping by the functionally isolated human spinal cord. Soc Neurosci 2004; 30(PN 601.6).

Bigbee AJ, Hoang TX, Havton LA. Nociceptive plasticity in a rat cauda equina/ conus medullaris spinal cord injury and repair model. Annual Meeting of Society for Neuroscience, 2005, 35:

Bigbee AJ, Hoang TX, Havton LA. Possible role of inflammation in the development of at-level pain following a cauda equina/conus medullaris injury in the rat. Annual Meeting of the Society of Neuroscience, 2006, 36:

Blesch A, Tuszynski MH (2001). Differential effects of NT-4/5 and GDNF on behavioral recovery and axonal growth after complete spinal cord transection. Society for Neuroscience Abstracts 27: 802.3.

Broman J, Wu J, Hoang TX, Havton LA. VGLUT1 and VGLUT2 in the rat sacral intermediolateral nucleus. Annual Meeting of Society for Neuroscience, 2005, 35:

Boyd, C., Lyeth, B., Floyd, C. Comparing Transplantation of olfactory ensheathing glia, bone marrow stromal cell or astrocytes into dorsal hemisectioned lesioned rat spinal cord. Society for Neuroscience Abstract, 2004.

Dy CJ, Beres-Jones JA, Harkema SJ. Functionally isolated spinal interneuronal circuits can mediate alternation of antagonist muscles during stepping after human spinal cord injury. 35th Congress of the International Union of Physiological Sciences, 2005.

Dy CJ, Dyhre-Poulsen P, Courtine G, Gerasimenko YP, Harkema SJ. Modulation of multisegmental monosynaptic responses during walking in spinal cord injured and non-disabled humans. Neursci Abstr 2005.

Ferreira CK, Beres-Jones JA, Harkema SJ. Neural reorganization of the functionally isolated human spinal cord occurs after stand training. Soc Neurosci 2003;29(PN 824.19).

Forrest GF, Sisto SA, Kirshblum S, Wilen J, Bond Q, Bentson S, Harkema S. The effects of locomotor training on muscle activation, body composition, bone density. 51st American Paraplegia Society Annual Conference 2005.

Franchini BT, Broman J, Havton LA. Systemic administration of cholera toxin subunit B – HRP conjugate labels efferent spinal cord neurons for electron microscopy. Annual Meeting of The Society for Neuroscience, 2003, 33:

Franchini BT, Hoang TX, Nieto JH, Tillakaratne NJK, Havton LA. Neuronal nitric oxide synthase expression is increased in the lumbosacral spinal cord in a cauda equina injury model. Annual Meeting for the Society for Neuroscience, 2002, 32:

Franchini BT, Hoang TH, Nieto JH, Tillakaratne NJK, Havton LA. Increased neuronal nitric oxide synthase expression precedes progressive death of autonomic neurons in a cauda equina injury model. Pacific Grove, CA, 2003.

Faulkner, J.E., Herrmann, J., Woo, M.J., Doan, N.B., Sofroniew, M.V. Reactive Astrocytes Protect Tissue and Preserve Function After Spinal Cord Stab Injury I. Society for Neuroscience Abstracts No. 744.1 (2003)

Faulkner, J.E., Woo, M.J., Sislak, M.D. and Sofroniew, M.V. Genetically targeted astrocyte scar ablation results in modest local growth of axons after spinal cord injury. Neuroscience Abstracts No. 107.13 (2004).

Figueroa, K. W., and Luo, Z.D. Multilevel genomic identification of potential target genes and pathways contributing to neuropathic pain. The 11th World Congress on Pain Abstracts. 1502-P5.

Gad P[1], Woodbridge J[2], Lavrov I[3], Gerasimenko Y[6], Zhong V[3], Ronald R Roy[3,4], Sarrafzadeh M[2],V R Edgerton [3,4,5]. Development of an electronic bridge over the lesion between the Forelimbs and the Hindlimbs to facilitate quadrupedal stepping after a complete Spinal Cord Transection. [1]Biomedical Engineering IDP, [2]Department of Computer Science, [3]Departments of Integrative Biology and Physiological Science, [4]Neurobiolog, [5]Brain Research Institute, University of California, Los Angeles, California 90095, [6] Pavlov Institute of Physiology, St. Petersburg, 199034, Russia

Gerasimenko, Y., Musienko, P., Ichiyama, R., Zhong, H., Roy, R., Edgerton, V.R. Peripheral feedback plays a key role in stepping during epidural spinal cord stimulation in decerebrated and spinalized animals. XXXV International Congress of Physiological Sciences, San Diego, 2005.

Greenfield AL, Bigbee AJ, Hoang TX, Havton LA. Distribution of vesicular glutamate transporters (VGLUT1 and VGLUT2) in the rat conus medullaris after cauda equina injury and repair. Annual Meeting for the Society for Neuroscience, 2006, 36:

Hall, L., Overman, J. Non-viral gene therapy for the treatment of spinal cord injury: HSP27 or XIAP over-expression improves functional recovery following moderate spinal cord contusion injury. Society for Neuroscience Abstract, 2004.

Harkema SJ, Beres-Jones J, Ferreira CK. Neural adaptation with locomotor training in the functionally isolated human spinal cord. Soc Neurosci 2003;29(PN 493.10).

Herrmann, J., Faulkner, J.E., Woo, M.J., Doan, N.B., Sofroniew, M.V. REACTIVE ASTROCYTES PROTECT TISSUE AND PRESERVE FUNCTION AFTER SPINAL CORD STAB INJURY II. Society for Neuroscience Abstracts No. 744.2 (2003)

Herrmann, J.E., Faulkner, J.R., Imura, T., Woo, M.J., Tansey, K.E., Doan, N.B., Sofroniew, M.V. REGULATION AND FUNCTIONS OF REACTIVE ASTROCYTES AFTER CRUSH SPINAL CORD INJURY IN TRANSGENIC MICE. National Neurotrauma Society (2003).

Herrmann, J.E., Faulkner, J.R., Woo, M.J., Sislak, M. D., Sofroniew, M.V. ROLES OF REACTIVE ASTROCYTES AFTER CRUSH SPINAL CORD INJURY. Society for Neuroscience Abstracts No. 232.4 (2004)

Herrmann, J.E., Faulkner, J.R., Woo, M.J., Sislak, M. D., Sofroniew, M.V. ROLES OF ASTROCYTE REACTIVITY AFTER CRUSH SPINAL CORD INJUR. International Neurotrauma Society (2004)

Hoang TX, Franchini BT, Pikov V, Nieto JH, Havton LA. Implantation of avulsed ventral roots promotes recovery of lower urinary tract function in a cauda equina injury model. Annual Meeting for the Society for Neuroscience, 2002, 32:

Hoang TX, Franchini BT, Warner EA, Westerlund U, Havton LA. Implantation of avulsed ventral roots into the spinal cord promotes functional recovery of the lower urinary tract. Annual Meeting of The Society for Neuroscience, 2003, 33:

Hoang TX, Nieto JH, Havton LA. Regeneration of supernumerary axons in the adult rat spinal cord in a cauda equina injury and repair model. 10th International Symposium on Neural Regeneration. Pacific Grove, CA, 2003.

Hoang TX, Pikov V, Havton LA. Functional reinnervation of the rat lower urinary tract after implantation of avulsed lumbosacral ventral roots into the conus medullaris. Annual Meeting of Society for Neuroscience, 2005, 35:

Hoang TX, Nieto JH, Havton LA. Regeneration of supernumerary axons in an adult rat cauda equina injury and repair model. Annual Meeting of The Society for Neuroscience, 2004, 34:

Hoang TX, Akhavan M, Wu J, Havton LA. Minocycline provides neuroprotection of motoneurons but not autonomic neurons after cauda equina injury. Annual Meeting of the Society for Neuroscience, 2006, 36:

Hsu, J.-Y.C., Goussev, S., Mahuvakar. A., Werb, Z., Noble, L.J. The role of matrix metalloproteinase-2 (MMP-2) following contusive spinal cord injury. Society for Neuroscience Abstracts, 2004.

Ichiyama RM, Franchini BT, Crown ED, Roy RR, Edgerton VR, Broman J, Havton LA. Electron microscopic studies of tibialis anterior motor neurons after spinal cord injury and locomotor training in the rat. Annual Meeting of The Society for Neuroscience, 2003, 33:

Ichiyama RM, Broman J, Roy RR, Zhong H, Edgerton VR, Havton LA. Plasticity of alpha- and gamma- motoneuron synaptology in the rat after spinal cord transection and locomotor training. Annual Meeting of Society for Neuroscience, 2005, 35

Ichiyama RM, Broman J, Roy RR, Zhong H, Edgerton VR, Havton LA. Inhibitory synapses apposing motoneurons increase after spinal cord injury. Annual Meeting of The Society for Neuroscience, 2004, 34:

Ichiyama RM, Broman J, Roy RR, Zhong H, Edgerton VR, Havton LA. Synaptic plasticity of alpha and gamma motoneurons after spinal cord injury and locomotor training. Annual Meeting for the Society for Neuroscience, 2006, 36:

S. Kachadroka, E. West, S. Chongthammakun, and C.L. Floyd. Does gonadectomy affect estrogen-mediated neuroprotection in SCI in male rats? International Neurotrauma Symposium 2006

S. Kachadroka, E. West, C.L. Floyd. Delayed post-SCI administration of 17b-estradiol is protective in male and female rats. National Neurotrauma Society Annual Meeting 2006

Li, C-Y., Zhang, X., Li, K-W., Kurwa, A., Gold, M. Feng, G., and Luo, Z.D. Cava2d1 is an essential modulator for neuropathic pain like behaviors at the spinal level. The 11th World Congress on Pain Abstracts 81-P58.

Lomonaco, J.R., Herrmann, J., Doan, N. B., Lane, R.A. and Sofroniew, M.V. Genetically targeted astrocyte scar ablation results in limited, local growth of corticospinal tract axons after spinal cord injury. Society for Neuroscience Abstracts (2002)

Luo, Z.D., Li, C-Y., Zhang, X-L., Li, K-W., /Feng, G., and Gold, M.S. Cav a2d1 modulation of sensory neuron calcium channel activities correlates with spinally mediated neuropathic pain-like behaviors. The 11th World Congress on Pain Abstracts 406-P12.

Nessler JA, Reinkensmeyer DJ, Timoszyk WK, Nelson K, Acosta C, Roy RR, Edgerton VR, de Leon RD “The use of a robotic body weight support mechanism to improve outcome assessment in the spinal cord injured rodent”, Proceedings of the 2003 IEEE Engineering in Medicine and Biology Society Meeting, Cancun, Mexico, Sept 17-21, pp. 1629-1632

Nessler JA, Reinkensmeyer DJ, Sharp J, Kwak E, Minakata K, DeLeon RD (2004) Robotic assessment of locomotor recovery in spinal contused rats, Proceedings of the 2004 IEEE Engineering in Medicine and Biology Society Meeting, San Francisco, California, September 1-5, pp. 2687-6290

Nessler JA, Minakata K, Sharp K, Reinkensmeyer DJ (2005) Gait activity depends on limb extension and phasing in spinal cord contused rodents: implications for robotic gait training and assessment. Proceedings of the 2005 IEEE International Conference on Rehabilitation Robotics, June 28-July 1, Chicago, Illinois, 556-560

Nieto JH, Hoang TX, Franchini BT, Tillakaratne NJK, Havton LA. Lumbosacral spinal cord neurons reinnervate implanted avulsed ventral roots in a cauda equina injury and repair model. Annual Meeting for the Society for Neuroscience, 2002, 32:

Nieto JH, Hoang TX, Franchini BT, Warner EA, Westerlund U, Havton LA. Stabilization of the spine and protection of nervous tissues in a cauda equina/ conus medullaris injury and repair model. Annual Meeting of The Society for Neuroscience, 2003, 33:

Ohlsson M, Hoang TX, Havton LA. Glial and microglial reactions in a rodent cauda equina injury and repair model. Annual Meeting of The Society for Neuroscience, 2004, 34:

Ohlsson M, Nieto JH, Hoang TX, Imamura V, Haack K, McKay H, Christie K, Havton LA. Studies on neural repair in a primate cauda equina/ conus medullaris injury model. Annual Meeting of Society for Neuroscience, 2005, 35:

Park J, Vahidi B, Rhee, S W, Steward O, Jeon, N L. Quantitative analysis of regeneration of CNS axons using microfluidic neuron culture device. Society for Neuroscience, 2006

Park J, Vahidi B, Steward O, Jeon, N L. Assessing CNS Axon Regeneration Using Microfluidic Techniques. Cold Spring Harbor, 2006.

Patel, U. K., Garfinkel, A., and Edgerton, V. R. A Minimalistic Open-Loop Model of Central Pattern Generation Produces Efferent Activity Patterns Resembling Locomotion. Society for Neuroscience Abstracts, 2002.

Patel, U.K., Garfinkel, A., and Edgerton, V.R. Towards a model of locomotion pattern generation by traveling waves. Society for Neuroscience Abstracts, 2003.

Patel, U.K., Garfinkel, A., and Edgerton, V.R. Modeling the embryological development of the vertebrate locomotor pattern generator. Society for Neuroscience Abstracts, 2004.

Patel, U.K., Garfinkel, A., and Edgerton, V.R. Computational Modeling of Plasticity in the Vertebrate Locomotor Pattern Generator with Sensory Feedback. Society for Neuroscience Abstracts, 2005.

Patel, U.K., Garfinkel, A., and Edgerton, V.R. A neuro-musculo-skeletal model of cat hindlimb stepping: emergence of gait components by rostro-caudal motorneuron activation. Society for Neuroscience Annual Meeting, 2006.

Taylor, L., Tuszynski, M.H., Blesch, A. NT-3 gradients generated by lentiviral gene delivery promote axonal bridging into and beyond sites of spinal cord injury. Society for Neuroscience Abstracts, 2004.

Timoszyk WK, Merlot M, de Leon RD, Emken JL, Roy R, London N, Fong A, Edgerton VR, Reinkensmeyer DJ (2002) Second generation robotic systems for studying rodent locomotion following spinal cord injury. Proceedings of the Second Joint Meeting of the IEEE Engineering in Medicine and Biology Society and the Biomedical Engineering Society, Oct 23-26, Houston, TX, pp. 2358-2359

Trivedi A, Hsu Y, Lin Y, Gan K, Topp K, Noble-Haeusslein L. Matrix metalloproteinases as modulators of early white matter damage and functional recovery after spinal cord injury. Annual Meeting of the Neurotrauma Society 2005. Abstract p44.

van den Brand RJ, Krassioukov AV, Harkema SJ. Improvements in cardiovascular regulation with stand training in clinically complete spinal cord injured humans. Neurosci Abstr 2005.

Warner EA, Hoang TX, Franchini BT, Voskuhl RR, Havton, LA. Axonal self-destruction and regeneration in the adult mouse lumbosacral spinal cord. Annual Meeting of The Society for Neuroscience, 2003, 33:

Westerlund U, Warner EA, Hoang TX, Franchini BT, Havton LA. Differential expression of the p75 neurotrophin receptor in autonomic and motor nuclei of the adult rat conus medullaris. Annual Meeting of The Society for Neuroscience, 2003, 33:

Westerlund U, Hoang TX, Havton LA. P75 is expressed in CGRP immunoreactive primary afferents innervating the rat conus medullaris. Annual Meeting of The Society for Neuroscience, 2004, 34:

Yang, C., Roy, R.R., Zhong, H., Edgerton, V.R., Judy, J.W. Neural Ensemble Activity of Rat Spinal Cord L1/L2 During Fictive Locomotion Society for Neuroscience Abstract, 2004.

Yang, C., Vaca, L., Roy, R., Zhong, H., Edgerton, V.R., Judy, J., Neural-Ensemble Activity of Spinal Cord L1/L2 During Stepping in a Decerebrate Rat Preparation", 2nd International IEEE EMBS Conference on Neural Engineering, Washington, DC (March 16-19, 2005). Submitted

Posters and Presentations

Ali NJ, Melikian R, Kumaratne S, Guu JJ, Liu CT, Roy RR, Zhong H, Tobin AJ, Edgerton VR, Tillakaratne NJK. Biochemical and cellular changes associated with learning in spinally-transected rats immediately after stepping Program No. 396.14. *2005 Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience, 2005. Online

Ashjian, P., Jimenez, J.Z., Elbarbary, A., Edmonds, B., DeUgarte, D., Zuk, P., Keirstead, H., Evans, G.R.D., Hedrick, M. Neural progenitors from human adipose tissue. Third annual California Neural Regeneration/Spinal Cord Injury Consortium. Irvine, California, 2002.

Boyd, CG, BG LYeth, CL Floyd. Comparing transplantation of olfactory ensheathing glia, bone marrow stromal cells, or astrocytes into dorsal hemisection lesioned rat spinal cord. National Neurotrauma Society 2004. Journal of Neurotrauma (2004) 21(9):1307.

Chaovipoch, P., S Chongthmmakun, EJ West, CL Floyd. 17b-estradiol is neuroptotective in spinal cord injury in young and middle-aged rats. National Neurotrauma Society 2005. Journal of Neurotrauma (2005) 22(10):1241.

de Leon, R. Combining Pharmacological and Robotic Training Approaches for Improving Locomotor Recovery after a Spinal Cord Transection. 2004 Spinal Cord Conference, Long Beach Renaissance Hotel, Long Beach, June 3-5, 2004.

Do, A.H., Wang, P.T., King, C.E., Chui, L.A. and Nenadic, Z. Asynchronous BCI control of walking simulator, the Fourth International BCI Meeting, Asilomar, CA, May 31-June 4, 2010.

V.Edgerton ; J.C.Petruska; N.J.K.Tillakaratne; D.J.Fuller; Y.P.Gerasimenko; S.J.Harkema; H.S.Keirstead Evolving Strategies to Regain Neuromotor Function Following Spinal Cord Injury Society for Neuroscience, 2005.

Gardiner, D.M. (2002). Urodele spinal cord regeneration: Insights from studies of limb regeneration. California Neural Regeneration/Spinal Cord Injury Consortium Meeting, UC Irvine

Gerasimenko, Y.P., I. Lavrov, G. Courtine, R.M.Ichiyama, H. Zhong, R.R.Roy & V.R. Edgerton. Evaluation of Spinal Cord Reflex Activity in Chronically Spinalized Rats. Society for Neuroscience November, 2005

Ghosh, S. and Gardiner, D.M. (2002). Urodele spinal cord regeneration as a model for axonal survival and regrowth. California Neural Regeneration/Spinal Cord Injury Consortium Meeting, UC Irvine

Hall, L. Lipid-Mediated HSP27 Delivery Improves Functional Recovery Following Moderate Spinal Cord Contusion Injury. American Society of Gene Therapy, Minneapolis, MN. June 2004 (Invited speaker).

Hall LL, et al. Hecker JG, Tarantal AF, Nantz MH. Non-Viral DNA and mRNA Gene Delivery to the CNS for Neuroprotection and Following Neurotrauma. Selected for Oral Presentation at the 7th Annual Meeting of the American Society of Gene Therapy, Minneapolis, MN, May. 2004.

Hecker JG, Tarantal AF, Nantz MH. Non-Viral DNA and mRNA Gene Delivery to the CNS for Neuroprotection and Following Neurotrauma. Selected for Oral Presentation at the Society for Neuroscience 34th Annual Meeting, San Diego, CA, October. 2004.

Herrmann, J.E., R.B. Abelowitz, T. K. Nguyen, M.J. Woo, T. Chiem, M.V. Sofroniew. Deletion of STAT3 Attenuates Astrocyte Reactivity After Crush Spinal Cord Injury. Department of Neurobiology, UCLA, Los Angeles, CA
UCLA Neurobiology annual retreat, 2005

Herrmann, J.E., R.B. Abelowitz, T. K. Nguyen, M.J. Woo, T. Chiem, M.V. Sofroniew. Deletion of STAT3 Attenuates Astrocyte Reactivity and Functional Recovery After Crush Spinal Cord Injury. Department of Neurobiology, UCLA, Los Angeles, CA International Symposium on Neural Regeneration, Asilomar, CA 2005 (received one of the student prizes)

Herrmann, J.E., Faulkner, J.R., Imura, T., Woo, M., Doan, N.B., Sofroniew, M.V. Regulation and Functions of Reactive Astrocytes After Crush Spinal Cord Injury in Transgenic Mice. National Neurotrauma Society meeting, Biloxi, 2003

Herrmann, J.E., Faulkner, J.R., Sofroniew, M.V. Roles of astrocyte reactivity after crush spinal cord injury International Neurotrauma Society meeting, Adelaide, Australia, 2004 (selected for oral presentation)

Herrmann, J.E., Faulkner, J.R., Woo, M., Doan, N.B., Sofroniew, M.V., Reactive Astrocytes Protect Tissue and Preserve Funtion After Crush Spinal Cord Injury. Society for Neuroscience meeting, New Orleans, 2003

Herrmann, J.E., Faulkner, J.R., Woo, M., Khosravi, A.H., Doan, N.B., Sofroniew, M.V. Roles of reactive astrocytes in the crush model of spinal cord injury UCLA Neurobiology Annual retreat, 2003

Herrmann, J.E., Faulkner, J.R., Woo, Sislak, M.D., Sofroniew, M.V. Roles of Reactive Astrocytes After Crush Spinal Cord Injury. Dept. of Neurobiology and Brain Research Institute, UCLA, Los Angeles, CA Society for Neuroscience meeting, San Diego, 2004

Herrmann J.E., J.R. Lomonaco, C. E. Junge, A.E. Khosravi, Y.-P. Lin, C. Sintuu, B., and M.V. Sofroniew. Genetic manipulation of astrocytes and biopolymer tissue support after spinal cord injury 1Department of Neurobiology, 2Department of Materials Science and Engineering, 3Brain Research Institute, and 4Bioengineering, UCLA, Los Angeles CA 90095 Roman Reed meeting, 2004

Ichiyama, R., Gerasimenko, Y., Zhong, H., Roy, R., Edgerton, V.R. Combining Epidural Electrical Stimulation and Pharmacology to Induce Locomotion in Spinal Rats. Podium presentation at Pennington Scientific Symposium – “The Neurobiology of Exercise", Baton Rouge, LA, 2004.

Ichiyama, R., Roy, R., Zhong, H., Edgerton V.R. Combining Epidural Electrical Stimulation and Pharmacology to Induce Locomotion in Spinal Rats. Presented at the Ist Christopher Reeve Paralysis Foundation Symposium in Chicago, March 2004

Ichiyama, R.M., Y.Gerasimenko, R.R.Roy, H.Zhong & V.R. Edgerton Pennington Scientific Symposium - Louisiana State University System The Neurobiology of Exercise Pharmacological and Epidural Electrical Stimulation in Spinal Adult Rats December, 2004

Ichiyama R.M., Yu. Gerasimenko, G. Courtine, I. Lavrov, H. Zhong, R.R.Roy & V.R. Edgerton.The 23rd Annual National Neurotrauma Society Symposium. Locomotor Performance is Enhanced by Training Using a Combination of Epidural Stimulation and Quipazine in Completely Transected Adult Rats November, 2005. Top 6 presentation competition, Top 16 post-doc/graduate students abstracts.

Ichiyama, R.M., Yu. Gerasimenko, G. Courtine, I. Lavrov, H. Zhong, R.R.Roy & V.R. Edgerton. Locomotor Performance is Enhanced by Training Using a Combination of Epidural Stimulation and Quipazine in Completely Transected Adult Rat. The 23rd Annual National Neurotrauma Society Symposium November, 2005.

Ichiyama , R.M., R.R. Roy, H. Zhong & V.R. Edgerton. Combining Pharmacology and Epidural Electrical Stimulation to Induce Locomotion in Adult Spinal Rats. Ist Christopher Reeve Paralysis Foundation Symposium March, 2004.

Jimenez JC, Ashjian PH, Hendrick M, Evans GRD. Growth and survival of rat processed lipoaspirate cells following autologous hind leg in-vivo culture. American Society of Aesthetic Plastic Surgery, Las Vegas, Nevada, 2002.

King , C. Wang, P.T., Nenadic, Z. and Do, A. BCI controlled walking simulator for a BCI driven FES device, the 39th Neural Interfaces Conference, Long Beach, CA, June 21-23, 2010.

Lavrov, I., Yu. Gerasimenko, R.M.Ichiyama, G.Courtine, H.Zhong, R.R.Roy & V.R.Edgerton. Segmentary Mechanisms of Bipedal Stepping Regulation in Normal and Spinal Rats. Society for Neuroscience November, 2005

Li, C-Y., Zhang, X, Matthews, E. A., Li, K-W., Kurwa, A., Gold, M.S., Dickenson, T., Feng, G., Luo, Z.D. Calcoum channel a2d1 subunit mediates spinal hyperexcitability in pain modulation. Abstract submitted to the American Pain Society's 25th Annunal Scientific Meeting, San Antonio, TX

Michael, J., de Leon, R. Robotic Training with Full Assistance during the Step Cycle Does Not Improve Stepping in Spinally Transected Rats. California Spinal Cord/Neural Regeneration Consortium Roman Reed Meeting, 2004.

McConnell MP, Awandy SL, Hedrick MA, Keirstead H, Evans GRD. Application of adipose-derived stem cells in spinal cord repair. American Society of Plastic Surgeons, Plastic Surgery, San Diego, CA, 2003.

Y. Mikhaeil, C.K. Otoshi, A.J. Fong, Cai LL, et al., Changes in pCREB and AMPA Receptor Distribution after Spinal Cord Transection: Effects of Chronic Serotonergic Agonist Administration and Robotic Training. *2006 Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience, 2006. Online

Y. Mikhaeil, C.K. Otoshi, A.J. Fong, Cai LL, Khristy W, Chitsazzadeh V, Nguyen C, Zhong H, Roy RR, Tillakaratne NJK, Edgerton VR. Changes in pCREB and AMPA receptor

distribution after spinal cord transection: effects of chronic serotonergic agonist administration and robotic training. UCLA Brain Research Institute Poster sessions, 2006.

Nenadic, Z. Wang, P.T. King, C.E., Do, A.H. and Chui, L.A. Asynchronous brain-computer interface control of ambulation simulator, 40th Annual Meeting of the Society for Neuroscience, San Diego, CA, November 13-17, 2010.

C.K.Otoshi; A.J.Fong; L.L.Cai; H.Zhong; R.R.Roy; N.J.K.Tillakaratne; V.R.Edgerton 5-HT Receptor Distribution After Spinal Cord Transection: Effects of Chronic Serotonergic Agonist Administration and Robotic Training (Society for Neuroscience, 2005)

Jessica R. Schulz, Rengrong Da, Melanie J. Cocco. Structural Characterization of Nogo-66. 50th Biophysical Society Meeting, Salt Lake City, Utah, February 2006.

Niranjala Tillakaratne, Ray de Leon, Allison Bigbee, Noore Ali, Sarah Ahn, Chad Otoshi, Charlotte Liu, Jason Guu, Matthias Ziegler, H Zhong, Roland Roy, Allan Tobin, Reggie Edgerton. Biochemical Changes Associated with Spinal Learning Mechanisms of network function in spinal cord - brainstem. University of Wisconsin, Madison, Nov. 2005.

Wang, L., Marchenko S., Jeon, N.L., Monuki, E. Flanagan, L.A. Lee, A.P. "Lateral Cell Separation in Microfluidic Channel by 3D Electrode Dielectrophoresis," The Tenth International Conference on Miniaturized Systems for Chemistry and Life Sciences (uTAS 2006), Tokyo, Japan, November 5-9, 2006

Wang, P.T. King, C., Chui, L.A. Nenadic, Z. Do, A. BCI controlled walking simulator for a BCI driven FES device, RESNA Annual Conference, Las Vegas, NV, June 26-30, 2010.

Yang C, Vaca L, Roy R.R., Zhong H, Edgerton VR, Judy JW, "Neural-Ensemble Activity of Spinal Cord L1/L2 During Stepping in a Decerebrate Rat Preparation," The 2nd International IEEE EMBS Special Topic Conference on Neural Engineering, 2005.

Yoon ES, Dhar S, Evans GRD. Neuronal Differentiation of Human adipose tissue-derived stromal cells and maintenance of long-term neuronal cultures. American Society of Peripheral Nerve, Puerto Rico, 2005

<u>Patents</u>

U.S. Provisional Patent Application No. 60/558,462 Entitled “Oriented polymer fibers with functional gradients by electropulling”, Inventors M.V. Sofroniew, K.N. Tu, B.M. Wu, Y. Xu, filed March 31, 2004, UCLA Ref. No. 1540 (patent pending).

MICROFLUIDIC DEVICE FOR CELL AND PARTICLE SEPARATION, US patent to be filed Feb. 2nd, 2007, by Lisen Wang, A.P. Lee, Lisa A. Monuki, Edwin S. Monuki, Svyatoslav A. Marchenko.

“High Density Epidural Stimulation for Facilitation of Locomotion Recovery after Spinal Cord Injury.” V.R. Edgerton, J. Burdick, R. Roy, I. Lavrov, Y. Gerasimenko, S. Harkema, J. hodes, Y. Tai. Provisional patent submitted to USPTO.

Yu, F., Recht, L.D. and Weimann, J.D. “Using Mouse Embryonic Stem Cells to Generate Layer 5 Cortical Pyramidal Neurons. Presented findings at the International Society for Stem Cell Research June, 2010.

Yu, F., Recht, L.D. and Weimann, J.D. “Generation of Mouse Embryonic Stem Cell-derived Corticospinal Motor Neurons. Presented findings at the Society for Neuroscience Conference, San Diego, November 2010.

Yu, F., Recht, L.D. and Weimann, J.D. “New Developments in Neuroscience” live interviews with NPR and the Australian Public Broadcasting, 2010.