

Selection of Funding and Grant Awards

Funding Information

Current:

- 2011–2018 Prime Investigator and Director
National Institutes of Health (NIH)
Grant No. 1R01HL098437-01A1
Self Organized Criticality as a new paradigm of sleep regulation
Support: US\$ 2,404,911
Major goal: investigate neuronal interactions involved in sleep regulation at the cellular level, neuronal network connectivity and topologies that lead to complex dynamical patterns of sleep-stage transitions and arousals. We will analyze a large database from (i) healthy human subjects; (ii) subjects with insomnia, narcolepsy, sleep apnea and other disorders; (iii) from healthy wild type mice and rats. We will also utilize data from experimental animal models of various sleep disorders, where specific sleep-related neuronal groups and brain areas are targeted, to discern which key elements of the neurobiological interactions may be responsible for the emergence of SOC complexity in sleep dynamics.
- 2014–2018 Prime Investigator and Director
USA-Israel Binational Science Foundation (BSF) Grant
BSF No. 2012219
Dynamical characteristics and phase transitions in physiologic interactions.
Support: US\$ 146,400
Major goals: To identify basic principles of integration between physiologic systems and investigate the effect of coupling and synchronization on their output dynamics.
- 2015–2019 Prime Investigator and Director
W. M. Keck Foundation Award
Atlas of dynamic interactions among organ systems
Support: US\$ 1,000,000
Major goals: To explore quantitatively the way in which organ systems interact as a network to produce distinct physiological states, both healthy and pathological. The research program will lay the foundations of a new emerging field, Network Physiology, which focuses on understanding physiological functions and conditions as emergent global behavior out of dynamical interactions among diverse systems with transient characteristics. The investigations will lead to the first Atlas of interactions among key systems in the human body.
- Past:**
- 1999–2004 Co-Investigator
National Institutes of Health / National Center for Research Resources
P41 RR13622

Research Resource for Complex Physiologic Signals

(PI: A.L. Goldberger, Co-PI: H.E. Stanley)

Support: US\$ 5,000,000 for Research at 3 institutions over 5 years

Major goals: data acquisition; multichannel ambulatory recordings and analysis; statistical analysis of physiologic signals and modeling of multiple-component integrated physiologic systems dynamics and their mechanisms of neural regulation.

2002–2004

Co-Investigator

National Institutes of Health/National Heart Lung and Blood Institute

1R01HL-71972-01

Circadian Role in Diurnal Pattern of Cardiovascular Risk (PI: H.E. Stanley)

Support: US\$ 200,000

Major goals: to identify mechanistic aspects of circadian regulation and autonomic neural control, leading to increased cardiovascular risk at specific circadian phases.

2003–2005

Co-Investigator

Spanish Ministerio de Ciencia y Tecnologia, Spain

BFM2002-00183

Study of transport of mechanical waves and electrical conduction in DNA.

Effect of long-range correlations (PI: P. Carpena)

Support: US\$ 15,000

Major goals: to identify the effects of fractal correlations on the mechanical and conducting properties of low-dimensional disordered nanomaterials and biological macromolecules.

2002–2005

Co-Investigator

Spanish Ministerio de Ciencia y Tecnologia, Spain

BIO2002-04014-C02-02

Correlations in DNA sequences and large-scale genome structure

(PI: Jose L. Oliver)

Support: US\$ 120,000

Major goals: to identify large-scale genomic structures (isochores) and quantify their statistics using novel segmentation algorithms.

2005–2008

Co-Investigator

National Institutes of Health/National Heart Lung and Blood Institute

2 RO1 HL071972

Circadian Role in Diurnal Pattern of Cardiovascular Risk (PI: H.E. Stanley)

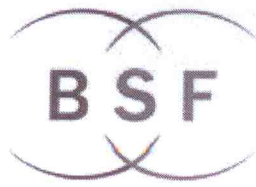
Support: US\$ 605,625

ranked in the top 3%; renewal based on the 2002–2004 award

Major goals: to identify independent contributions of circadian rhythms,

level of physical activity and age on increased cardiovascular risk at 9–11am.

- 2008–2012 Prime Investigator and Director
Grant from Mitsubishi Chemical Corporation, Yokohama, Japan
Support: US\$ 312,000
Major goal: to develop novel nonlinear dynamics measures of locomotion perform experiments and modeling of the neural mechanisms of human locomotion under different tasks and conditions.
- 2009–2011 Prime Investigator
Biomedical Research Institute, Brigham and Women's Hospital
Self-organized criticality in sleep regulation
Support: US\$ 115,000
Major goals: to investigate how local neuronal interactions involved in sleep regulation at the cellular level, neuronal network connectivity and topologies lead to complex dynamical patterns of sleep stage transitions and arousals
- 2009–2013 Prime Investigator and Director
USA-Israel Binational Science Foundation (BSF) Grant
BSF No. 2008137
Mechanisms of neural control: from nonequilibrium dynamics of single physiologic systems to integrated synchronization networks
Support: US\$ 120,000
Major goals: To (i) investigate the origin of the scale-invariant, multifractal and nonlinear temporal structure in physiologic fluctuations, and how it relates to underlying mechanisms of neural regulation of cardiac, respiration and locomotor dynamics; (ii) develop physiologically-motivated models to account for the complex temporal structure in the dynamics of these systems and the role of neural regulation in establishing nonlinear coupling and synchronization across systems.
- 2009–2015 Prime Investigator and Director
Office of Naval Research (ONR) Grant
ONR Grant N000141010078
Complex networks approach to critical transitions and self-organization in sleep.
Support: US\$ 405,000
Critical transitions and self-organization in sleep.
Major goal: To investigate the role of arousals in sleep, and to test whether brain dynamics exhibit critical behavior across sleep-stage and arousal transitions.



Ms. Sharon Lee

Brigham & Women's Hospital
Grants and Contracts Administrator
75 Francis Street
Boston MA 02115 USA

Research Grant Agreement **2008137** Physiologic complexity and networks

Research Year 1

Submitted By :

Prof.	Plamen	Ivanov	Brigham & Women`s Hospital Division of Sleep Medicine
Prof.	Shlomo	Havlin	Bar Ilan University Department of Physics

Dear Ms. Sharon Lee :

Enclosed please find the documents related to the research project(s) mentioned above. If Research Grant Agreement is included, please sign and return it to us at your earliest convenience so that we can activate the grant(s). If an Agreement was signed already for this grant (applicable only to the large Israeli institutions), please attach the present documents to the previously signed Agreement. Please note the following:

- [1] A BSF Agreement covers the entire grant period.
- [2] The Research Proposal constitutes an integral part of the Agreement as Annex I. As you have a copy, there is no reason for it to be sent. Please attach it.
- [3] Annex II-A details the estimated total budget for the entire duration of the project and the approved budget for the first year. Following receipt of each annual scientific report, you will be sent the approved budget for the current year (Annex II-B). Each annual budget will constitute an integral part of the Agreement.
- [4] Strict adherence to the terms of the Agreement (see our website for details) is vital for receipt of funds for the project.
- [5] **The BSF does not allow the grant to be used to pay any part of the salary of the PI, including summer salary.**
- [6] If a form for updated bank details is included please fill it out and send it to us by mail/email/fax so that we will be able to forward you the grant money.
- [7] For information only, a copy of the budget allocated to the collaborating PI(s) is enclosed.

Yours Sincerely,

Dr. R. Haring
Assistant Director

Research Authority - Authorizing Official

Please update and fill in missing data

8/19/2009

Grant Number 2008137

HMS2

[1] **AUTHORIZING OFFICIAL**

Organization

Ms. Sharon Lee

Brigham & Women's Hospital

Division

Grants and Contracts Administrator

Address

75 Francis Street

Boston MA USA 02115

Fax

617-954-9680

Email

slee50@partners.org

[2] **BANK DETAILS**

Name

Address

Account Number

Aba Number
(9 digits)

[3] **FINANCIAL OFFICIAL**

Official responsible for fiscal reports and payment notification

Title and Name

Division

Fax

Email

**RESEARCH GRANT AGREEMENT
BETWEEN
The UNITED STATES - ISRAEL BINATIONAL SCIENCE FOUNDATION**

(Hereinafter - the FOUNDATION)

AND

Ms. Sharon Lee	Brigham & Women's Hospital	75 Francis Street
		Boston
Research Management	Grants and Contracts Administrator	M USA

(Hereinafter - the GRANTEE)

Pursuant to an Agreement between the Governments of the United States of America and Israel to promote and support cooperation in science and technology for peaceful purposes on subjects of mutual interest, the FOUNDATION is awarding to the GRANTEE, research grant(s) for the project(s) described in the research proposal(s) (Annex I) and total estimated budget for each RESEARCH PROJECT(S) and approved first-year budget(s) (Annex II) hereto appended as an integral part hereof. (Each project hereinafter – the RESEARCH PROJECT)

The RESEARCH PROJECT(S) ARE:

1. PRINCIPAL OBLIGATIONS OF THE GRANTEE

(a) To carry out the RESEARCH PROJECT.

(b) The Principal Investigator is responsible for the implementation of the RESEARCH PROJECT during the period of this Agreement. Written approval of the FOUNDATION is required for changes involving the participation in a RESEARCH PROJECT of Principal Investigators and other key personnel. In cases when such personnel are withdrawn from or will be absent for more than three months (e.g., sabbatical), the GRANTEE must notify the FOUNDATION. The FOUNDATION will approve the leave if satisfied with the arrangements made for the smooth continuation of the RESEARCH PROJECT. The FOUNDATION will not approve a leave of over one year.

(c) To supply all reasonable means of support and assistance necessary for the implementation of the RESEARCH PROJECT, including manpower, raw materials, equipment, technical and administrative services and other services.

(d) To be responsible for all monies granted by the FOUNDATION pursuant to this Agreement, to draw such monies for the RESEARCH PROJECT only and in accordance with BSF guidelines as published in the Foundation website www.bsf.org.il, to return any money remaining at the termination of the Agreement, to maintain complete records of expenses relating to the RESEARCH PROJECT in a special and separate account and to submit an annual fiscal report within 2 months of the completion of each 12 months during the period covered by this Agreement.

(e) To permit the FOUNDATION to examine all books, documents, records and accounts relating to the RESEARCH PROJECT during the period of this Agreement and for three years thereafter, and to make inspections at the places where the research is conducted and receive from the research operators full information with regard to their activities.

(f) To submit to the FOUNDATION annual scientific reports in accordance with BSF Guidelines, as published on the FOUNDATION website, www.bsf.org.il.

(g) To inform the FOUNDATION of any other financial support received for the RESEARCH PROJECT or related research and of any obligations of the GRANTEE which may in any way affect the rights of the FOUNDATION or of the GOVERNMENTS of the UNITED STATES or ISRAEL under this Agreement.

(h) To acknowledge the support of the FOUNDATION for the RESEARCH PROJECT in all publications and reports summarizing the results of the research, as follows:

"This research was supported by a grant from the United States-Israel Binational Science Foundation (BSF), Jerusalem, Israel".

(j) The FOUNDATION does not assume any liability for accidents, illnesses or claims arising out of any work supported by the grant or for any unauthorized use of patented, copyrighted or other protected material or intellectual property rights. The GRANTEE shall bear full responsibility for all personal injury, damage to property and breaches of intellectual property rights which may result from the GRANTEE'S implementation of the RESEARCH PROJECT.

2. NO EMPLOYER - EMPLOYEE RELATIONSHIP

The GRANTEE agrees that persons employed by it in connection with the RESEARCH PROJECT shall be deemed to be solely its own employees and that no relationship of master and servant shall be created between such employees and the FOUNDATION, for the purposes of tort liability, social benefits or for any other matter. The GRANTEE shall be responsible for any payments which it may be obligated to make under law or contract based on the employer-employee relationship.

3. PRINCIPAL OBLIGATIONS OF THE FOUNDATION

(a) To reimburse the GRANTEE for the costs and obligations incurred in implementing the RESEARCH PROJECT to a sum not exceeding the Budget. The reimbursements will be in U.S. Dollars. Payments to GRANTEES in Israel may be made in Israeli currency at the representative exchange rate for the US Dollar published by the Bank of Israel, effective for the first day of the month preceding the month of reimbursement. Regarding grants under which more than one GRANTEE is to receive funds, the grant will enter into force only after all GRANTEES have signed and returned their Agreements to the FOUNDATION. Payment shall be transferred to the GRANTEE in installments as provided hereunder:

- (1) First year of the Agreement: Upon signing of the Agreement, 75% of the approved budget the first year.
- (2) Subsequent years:
 - a. Upon submission of the annual scientific report of the previous year, the FOUNDATION will notify the GRANTEE of the approved budget for the current year and will forward 25% of the said amount.
 - b. Upon submission of the previous year's annual fiscal report, 50% of the approved budget for the current year and the balance of the budget approved for the previous year.
 - c. Each approved annual budget will be appended to the Agreement as Annex II-B and as an integral part thereof.
- (3) Final payment: Upon submission of the final fiscal and scientific reports, the remaining 25% of the budget, subject to the expenditure of previous payments.

(b) Continuation of the grant beyond the first year is subject to satisfactory progress in the RESEARCH PROJECT; the annual budget will be in accordance with the research requirements and available funds as determined by the Board of Governors of the BSF.

(c) The FOUNDATION will not transfer to the GRANTEE any amount which the latter may expend in excess of that specified in paragraph (a) above, unless the Budget has been amended by the parties in writing. Payment in accordance with paragraph (a) above shall be made only after most of the amount from the previous payment has been expended. Unexpended balances in possession of the GRANTEE at the termination of the Agreement shall be refunded to the FOUNDATION without delay.

4. TERMINATION

The FOUNDATION shall be entitled, after consultation with the GRANTEE, to terminate this Agreement and cease making payments under paragraph 3 above, subject to fulfilling its undertakings as to expenditures and obligations incurred prior to the notice of termination, and which cannot be cancelled at the time of notification. The GRANTEE shall not be entitled to cancel this Agreement or to abandon the RESEARCH PROJECT, without prior written consent of the FOUNDATION.

5. EQUIPMENT AND MATERIALS

All permanent equipment purchased with grant funds shall be the property of the FOUNDATION. At the termination of the Agreement, title to equipment purchased under this Agreement shall transfer to the GRANTEE.

6. RIGHTS CONCERNING RESEARCH FINDINGS

(a) Subject to paragraphs 6(c), 7 and 8 below, results of research sponsored by the FOUNDATION shall be

made available by the FOUNDATION and the GRANTEE, to the world scientific community through customary channels, in accordance with the applicable procedures and policies of the institutions involved.

(b) There shall be no restrictions on the publication of information, subject to paragraph 6 (c) below and the provisions governing copyrights set forth in paragraph 8 below.

(c) Subject to paragraph 7(d) (2) below, the FOUNDATION shall ensure that proprietary information provided by and so marked by the GRANTEE shall be respected and shall not be disclosed without the consent of the GRANTEE. Information may be identified as 'proprietary' if a person having the information may derive an economic benefit from it or may obtain a competitive advantage over those who do not have it, the information is not generally known or publicly available from other sources, or the GRANTEE has not previously made the information available without imposing in a timely manner an obligation to keep it confidential.

7. PATENT RIGHTS

(a) The GRANTEE shall communicate to the FOUNDATION full information on any invention or discovery resulting from FOUNDATION sponsored or supported research within two months of becoming aware of the invention or discovery.

(b) Within two years of the communication to the FOUNDATION pursuant to paragraph (a) above, the GRANTEE shall inform the FOUNDATION whether it intends to file for patent protection and the countries in which it intends to file.

(c) Subject to paragraph 7 (d) (2) below, the FOUNDATION shall not disclose information acquired pursuant to paragraph 7 (a).

(d) (1) The GRANTEE shall be entitled to all rights, title and interest to the invention in all countries provided that the GRANTEE files: (i) its initial patent application within one year of informing the FOUNDATION of its intent in accordance with paragraph 7 (b) above, and with respect to applications in additional countries, within ten months of initial filing; (ii) prior to any statutory bar date under the applicable laws of the countries in which patent protection is sought, whichever is earlier.

(2) Once the time period specified paragraph 7 (d) (1) above has elapsed, the FOUNDATION shall be entitled to all rights, title and interest to the invention in all remaining countries, and the non-disclosure provision of paragraph 6 (c) will no longer apply.

(3) Patent rights of the GRANTEE and the FOUNDATION are subject to the applicable laws of the countries in which patent protection is sought.

(e) The FOUNDATION shall be entitled to 5% of the royalties (computed after payment of costs related to the patent application and its maintenance) from the manufacture, use or sale of the invention in that country. Royalties received by the FOUNDATION shall be used to further the purposes of the FOUNDATION.

(f) The Governments of the United States and Israel shall be entitled to irrevocable, non-exclusive, royalty-free licenses to use for non-commercial and government purposes any invention referred to in paragraph 7 (d) (1) above within their respective countries or within any third countries.

(g) The FOUNDATION shall have the right to require the GRANTEE, its assignee or exclusive licensee to grant a non-exclusive, partially exclusive or exclusive license to a responsible applicant(s) within the United States or Israel and upon terms that are reasonable, if the GRANTEE, its assignee or exclusive licensee has not taken or is not expected to take effective steps to achieve practical application of the invention in the United States or Israel. The term "practical application" shall mean: the manufacture in the case of a product, the practice in the case of a method, the operation in the case of a machine or system, under such conditions as to establish that the invention is being utilized and that its benefits are available to the public on reasonable terms.

(h) Any licensing agreement entered into by the GRANTEE or its assignee shall describe the FOUNDATION support for the research leading to the invention.

(i) GRANTEES shall execute or have executed and promptly deliver to the FOUNDATION all instruments necessary to: (1) enable the Governments of the United States and Israel to establish or confirm rights conferred under this Agreement; and (2) convey title to the FOUNDATION and enable the FOUNDATION to obtain patent protection pursuant to paragraph 7 (d) (2) above.

8. COPYRIGHTS

(a) Copyrights of FOUNDATION GRANTEES and other persons shall be in accordance and consistent with applicable international agreements and internationally recognized standards of protection.

(b) Except as otherwise specified in this Agreement, the GRANTEE may own or permit others to own copyright in all writings produced in the performance of work under this grant. The GRANTEE agrees that if it or anyone else owns copyright in a writing, the FOUNDATION and the Governments of the United States and Israel shall have non-exclusive, non transferable, irrevocable, royalty-free licenses to exercise or have exercised for or on their behalf throughout the world all exclusive rights provided by any copyright. Such licenses will not include the right to sell copies of the copyrighted work to the public.

9. The research shall be conducted in accordance with the highest ethical standards and all laws and regulations applicable and in such a manner as to minimize detrimental effects on humans, animals, plants and the environment.

10. The rights and obligations of the GRANTEE under this Agreement may not be transferred or assigned to a third party without the written consent of the FOUNDATION.

11. Notices sent by one party to the other by courier shall be deemed to have reached their destination at the end of 96 hours from the posting thereof.

IN WITNESS WHEREOF THE PARTIES HAVE SET THEIR HANDS AND SIGNATURES

THE FOUNDATION

הקרן הלאומי למדע
ארצות הברית - ישראל
UNITED STATES - ISRAEL
BINATIONAL SCIENCE FOUNDATION

THE GRANTEE

נ'י, ג' 2009



United States – Israel
Binational Science Foundation

ANNEX II-A

(Payment Schedule)

7/29/2009

Research Project 2008137
Title Physiologic complexity and networks
Area of Research Non-linear Physics; Soft Condensed Matter

Principle Investigators

Prof. Plamen Ivanov, Brigham & Women`s Hospital, Boston, MA USA
Prof. Shlomo Havlin, Bar Ilan University, Ramat Gan, Israel

Duration of Grant 4 years

Total Grant Budget Estimate 120,000 Dollars

Annual Budget (In US Dollars)

<u>Institution</u>	<u>Year-1</u>	<u>Year-2</u>	<u>Year-3</u>	<u>Year-4</u>	<u>Total</u>
Brigham & Women`s Hospital	21,952	23,082	21,780	21,043	87,857
Bar Ilan University	8,050	6,900	8,223	8,970	32,143
Grand Total	30,002	29,982	30,003	30,013	120,000

הקרן הדו-לאומית למדע
ארצות הברית - ישראל
UNITED STATES - ISRAEL
BINATIONAL SCIENCE FOUNDATION
ד"ר ש. ח. 1/10

United States – Israel
Binational Science Foundation
8 Hamarpeh Street, P.O.B 45086
Har Hotzvim, Jerusalem 91450, Israel

www.bsf.org.il
Tel. 972-2-582-8239 ט.ל
Fax. 972-2-582-8306 פ.ס
Email. bsf@bsf.org.il דוא"ל

הקרן הדו-לאומית למדע
ארצות הברית - ישראל
רחוב המרפא 8, ת.ד. 45086
הר חוצבים, ירושלים, 91450

Approved Budget (ANNEX II-B)

Year 2009

Budget Year 1

2008137

Physiologic complexity and networks

Start 01-Sep-2009

End 31-Aug-2010

Ivanov	Plamen	Brigham & Women`s Hospital	Boston	USA
Havlin	Shlomo	Bar Ilan University	Ramat Gan	Israel

Budget details for investigator

Ivanov Plamen

Brigham & Women`s Hospital

Boston

MA

USA

Category	Details	Amount In Dollars
1 - Salaries		
	Research assistant	16,639.00
		Subtotal 16,639.00
2 - Equipment		
		2,450.00
		Subtotal 2,450.00
9 - 2 Overhead		
	Overhead on ALL expenses is 15 %	2,863.00
		Subtotal 2,863.00
		Total 21,952.00

Approved Budget (ANNEX II-B) Year 2009 Budget Year 1

2008137 Physiologic complexity and networks Start 01-Sep-2009 End 31-Aug-2010

Ivanov	Plamen	Brigham & Women`s Hospital	Boston	USA
Havlin	Shlomo	Bar Ilan University	Ramat Gan	Israel

Budget details for investigator **Havlin Shlomo**
 Bar Ilan University Ramat Gan Israel

Category	Details	Amount In Dollars
1 - Salaries		
	Research assistant	6,000.00
	Subtotal	6,000.00
4 - Travel		
	Funds restricted to travel from Israel to US (Boston), Israeli PI or co-workers	1,000.00
	Subtotal	1,000.00
9 - 2 Overhead		
	Overhead on ALL expenses is 15 %	1,050.00
	Subtotal	1,050.00
Total		8,050.00



Grant Number: 1R01HL098437-01A1

Principal Investigator(s):
Plamen Christov Ivanov, SCD

Project Title: Self Organized Criticality as a new paradigm of sleep regulation

Lee, Sharon
Senior Grants Administrator
BRIGHAM & WOMEN'S HOSPITAL
75 Francis Street
Boston, MA 021156110

Award e-mailed to: bwhgc@partners.org

Budget Period: 04/05/2011 – 03/31/2012

Project Period: 04/05/2011 – 03/31/2016

Dear Business Official:

The National Institutes of Health hereby awards a grant in the amount of \$495,052 (see "Award Calculation" in Section I and "Terms and Conditions" in Section III) to BRIGHAM AND WOMEN'S HOSPITAL in support of the above referenced project. This award is pursuant to the authority of 42 USC 241 42 CFR 52 and is subject to the requirements of this statute and regulation and of other referenced, incorporated or attached terms and conditions.

Acceptance of this award including the "Terms and Conditions" is acknowledged by the grantee when funds are drawn down or otherwise obtained from the grant payment system.

Each publication, press release or other document that cites results from NIH grant-supported research must include an acknowledgment of NIH grant support and disclaimer such as "The project described was supported by Award Number R01HL098437 from the National Heart, Lung, And Blood Institute. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Heart, Lung, And Blood Institute or the National Institutes of Health."

Award recipients are required to comply with the NIH Public Access Policy. This includes submission to PubMed Central (PMC), upon acceptance for publication, an electronic version of a final peer-reviewed, manuscript resulting from research supported in whole or in part, with direct costs from National Institutes of Health. The author's final peer-reviewed manuscript is defined as the final version accepted for journal publication, and includes all modifications from the publishing peer review process. For additional information, please visit <http://publicaccess.nih.gov/>.

Award recipients must promote objectivity in research by establishing standards to ensure that the design, conduct and reporting of research funded under NIH-funded awards are not biased by a conflicting financial interest of an Investigator. Investigator is defined as the Principal Investigator and any other person who is responsible for the design, conduct, or reporting of NIH-funded research or proposed research, including the Investigator's spouse and dependent children. Awardees must have a written administrative process to identify and manage financial conflict of interest and must inform Investigators of the conflict of interest policy and of the Investigators' responsibilities. Prior to expenditure of these awarded funds, the Awardee must report to the NIH Awarding Component the existence of a conflicting interest and within 60 days of any new conflicting interests identified after the initial report. Awardees must comply with these and all other aspects of 42 CFR Part 50, Subpart F. These requirements also apply to subgrantees, contractors, or collaborators engaged by the Awardee under this award. The NIH website <http://grants.nih.gov/grants/policy/coi/index.htm> provides additional information.

If you have any questions about this award, please contact the individual(s) referenced in Section IV.

Sincerely yours,

Charmaine Parsad
Grants Management Officer
NATIONAL HEART, LUNG, AND BLOOD INSTITUTE

Additional information follows

SECTION I – AWARD DATA – 1R01HL098437-01A1

Award Calculation (U.S. Dollars)

Salaries and Wages	\$207,775
Fringe Benefits	\$64,954
Consultant Services	\$5,000

Federal Direct Costs	\$277,729
Federal F&A Costs	\$217,323
Approved Budget	\$495,052
Federal Share	\$495,052
TOTAL FEDERAL AWARD AMOUNT	\$495,052

AMOUNT OF THIS ACTION (FEDERAL SHARE) \$495,052

SUMMARY TOTALS FOR ALL YEARS		
YR	THIS AWARD	CUMULATIVE TOTALS
1	\$495,052	\$495,052
2	\$489,933	\$489,933
3	\$483,946	\$483,946
4	\$490,789	\$490,789
5	\$505,191	\$505,191

Recommended future year total cost support, subject to the availability of funds and satisfactory progress of the project

Fiscal Information:

CFDA Number: 93.838
 EIN: 1042312909A1
 Document Number: RHL098437A
 Fiscal Year: 2011

IC	CAN	2011	2012	2013	2014	2015
HL	8475150	\$495,052	\$489,933	\$483,946	\$490,789	\$505,191

Recommended future year total cost support, subject to the availability of funds and satisfactory progress of the project

NIH Administrative Data:

PCC: LLSK N / OC: 414A / Processed: PARSADC 04/04/2011

SECTION II – PAYMENT/HOTLINE INFORMATION – 1R01HL098437-01A1

For payment and HHS Office of Inspector General Hotline information, see the NIH Home Page at <http://grants.nih.gov/grants/policy/awardconditions.htm>

SECTION III – TERMS AND CONDITIONS – 1R01HL098437-01A1

This award is based on the application submitted to, and as approved by, NIH on the above-titled project and is subject to the terms and conditions incorporated either directly or by reference in the following:

- a. The grant program legislation and program regulation cited in this Notice of Award.
- b. Conditions on activities and expenditure of funds in other statutory requirements, such as those included in appropriations acts.
- c. 45 CFR Part 74 or 45 CFR Part 92 as applicable.
- d. The NIH Grants Policy Statement, including addenda in effect as of the beginning date of the budget period.
- e. This award notice, INCLUDING THE TERMS AND CONDITIONS CITED BELOW.

(See NIH Home Page at 'http://grants.nih.gov/grants/policy/awardconditions.htm' for certain references cited above.)

An unobligated balance may be carried over into the next budget period without Grants Management Officer prior approval.

This grant is subject to Streamlined Noncompeting Award Procedures (SNAP).

This award is subject to the requirements of 2 CFR Part 25 for institutions to receive a Dun & Bradstreet Universal Numbering System (DUNS) number and maintain an active registration in the Central Contractor Registration. Should a consortium/subaward be issued under this award, a DUNS requirement must be included. See <http://grants.nih.gov/grants/policy/awardconditions.htm> for the full NIH award term implementing this requirement and other additional information.

This award may be subject to the Transparency Act subaward and executive compensation reporting requirements of 2 CFR Part 170. See <http://grants.nih.gov/grants/policy/awardconditions.htm> for the full NIH award term implementing this requirement and additional award applicability information.

In accordance with P.L. 110-161, compliance with the NIH Public Access Policy is now mandatory. For more information, see NOT-OD-08-033 and the Public Access website: <http://publicaccess.nih.gov/>.

Treatment of Program Income:
Additional Costs

SECTION IV – HL Special Terms and Conditions – 1R01HL098437-01A1

SPECIAL BUDGET NOTICE

NIH is currently funded through a Continuing Resolution at the FY2010 level, (see NIH Guide Notice NOT-OD-11-037): <http://grants.nih.gov/grants/guide/notice-files/NOT-OD-11-037.html>

FUTURE YEAR COMMITMENTS

Generally, future year commitments on the Notice of Grant Award will reflect an annual 3 percent escalation on recurring costs (e.g., Personnel, Supplies). The annual 3 percent escalation does not apply to Modular Grants. Although the NHLBI remains committed at this time to funding at the recommended levels each fiscal year, fiscal constraints may necessitate future adjustments.

KEY PERSONNEL: In addition to the PI, any absence, replacement, or substantial reduction in effort of the following individual(s) below, requires written prior approval of the National Institutes of Health awarding component.

Dr. Shea
Dr. Havlin
Dr. Bartsch
Dr. Ma
Dr. Scammell
Dr. Semba

PERSONNEL COSTS

The Consolidated Appropriations Act, 2010 Public Law 111-117, restricts the amount of direct salary of an individual under an NIH grant to Executive Level I of the Federal Executive Pay scale. The Office of Personnel Management has recently released new salary levels for the Executive Pay scale <http://grants.nih.gov/grants/guide/notice-files/NOT-OD-10-041.html>. The Executive Level I annual salary rate was \$196,700 for the period January 1 through December 31, 2009. Effective January 1, 2010, the Executive Level I salary level increased to \$199,700. For a historical record of the salary cap, including effective dates see:

http://grants.nih.gov/grants/policy/salcap_summary.htm No salary increases will be provided on this grant for the remainder of this project period. The grantee institution has the authority to rebudget funds within the total costs awarded for this grant to accommodate the new salary cap.

GRADUATE STUDENT COMPENSATION

In accordance with the Notice: NOT-OD-02-017 entitled, GRADUATE STUDENT COMPENSATION published on December 10, 2001, in the NIH Guide for Grants and Contracts, total direct costs (salary, fringe benefits and tuition remission) for graduate students are provided at a level not to exceed the NIH maximum allowable amount (zero level of the Ruth L. Kirschstein National

Research Service Award stipend in effect at the time of the competing award). Support recommended for future years has been adjusted accordingly, if applicable. The full guide Notice describing the level of compensation allowed for a graduate student can be found at: <http://grants.nih.gov/grants/guide/notice-files/NOT-OD-02-017.html>. ZERO STIPEND LEVEL listed on the following notice <http://grants.nih.gov/grants/guide/notice-files/NOT-OD-10-047.HTML>

NHLBI ADJUSTMENTS FOR SALARY BASED AWARDS

Salary funds provided on NHLBI research grants will be adjusted if investigators receive career-type salary based awards. Examples of such awards include the Independent Scientist Award (K02, formerly K04) and other similar awards as described in the November 1993 Circulation article (Vol. 88, No. 5, Part 1). In the event that such an award is made for an investigator receiving salary support from an NHLBI grant, the Institute must be informed in writing within 30 days from the start date of the award so that any required adjustment can be made.

FOREIGN TRAVEL

U.S. Flag carriers must be used for departure from or entry into the U.S. and for any other portion of the trip where available.

STAFF CONTACTS

The Grants Management Specialist is responsible for the negotiation, award and administration of this project and for interpretation of Grants Administration policies and provisions. The Program Official is responsible for the scientific, programmatic and technical aspects of this project. These individuals work together in overall project administration. Prior approval requests (signed by an Authorized Organizational Representative) should be submitted in writing to the Grants Management Specialist. Requests may be made via e-mail.

Grants Management Specialist: Charmaine Parsad
Email: parsadrc@mail.nih.gov **Phone:** 301-451-0152 **Fax:** 301-451-5462

Program Official: Aaron D Laposky
Email: laposkya@mail.nih.gov **Phone:** 301-435-0193

SPREADSHEET SUMMARY


GRANT NUMBER: 1R01HL098437-01A1


INSTITUTION: BRIGHAM AND WOMEN'S HOSPITAL

Budget	Year 1	Year 2	Year 3	Year 4	Year 5
Salaries and Wages	\$207,775	\$201,648	\$199,210	\$205,187	\$211,341
Fringe Benefits	\$64,954	\$62,824	\$61,908	\$63,765	\$65,679
Consultant Services	\$5,000	\$7,000	\$7,000	\$6,000	\$6,000
Travel Costs		\$3,000	\$3,000		
TOTAL FEDERAL DC	\$277,729	\$274,472	\$271,118	\$274,952	\$283,020
TOTAL FEDERAL F&A	\$217,323	\$215,461	\$212,828	\$215,837	\$222,171
TOTAL COST	\$495,052	\$489,933	\$483,946	\$490,789	\$505,191

Facilities and Administrative Costs	Year 1	Year 2	Year 3	Year 4	Year 5
F&A Cost Rate 1	78%	78.5%	78.5%	78.5%	78.5%
F&A Cost Base 1	\$138,865	\$274,472	\$271,118	\$274,952	\$283,020
F&A Costs 1	\$108,315	\$215,461	\$212,828	\$215,837	\$222,171
F&A Cost Rate 2	78.5%				
F&A Cost Base	\$138,864				

2					
F&A Costs 2	\$109,008				

		<h1 style="margin: 0;">AWARD/ MODIFICATION</h1>			3a. ISSUED BY: Office of Naval Research 875 North Randolph Street Arlington, VA 22203-1995	
					1. INSTRUMENT TYPE: Grant	
2. AUTHORITY: 10 USC 2358, 31 USC 6304		5. MODIFICATION NO.: P00003			6. MODIFICATION TYPE: Renewal	
4. AWARD NO.: N00014-10-1-0078		5. MODIFICATION NO.: P00003		7. PR NO.: 12PR04267-01		
8. ACTIVITY/AGENCY PROPOSAL NO.: N/A		9. RECIPIENT PROPOSAL NO.: N/A		10. PROPOSAL DATE: 16-DEC-11	11. ACTIVITY TYPE: onr	
13. ISSUED TO 13a. ADDRESS: THE BRIGHAM AND WOMEN'S HOSPITAL, INC. 75 FRANCIS ST BOSTON, MA 02115-6110	13b. CAGE: OW3J1	13c. EDI/EFT NUMBER:	14. REMITTANCE ADDRESS (IF DIFFERENT FROM BLOCK 13): Same as block #13			
13d. BUSINESS OFFICE CONTACT: Martha Jones		13e. TELEPHONE NUMBER: (617) 954-9660				
13f. EMAIL ADDRESS: bwhgc@partners.org						
15. RESEARCH TITLE AND/OR DESCRIPTION OF PROJECT AND/OR PROPOSAL TITLE: Complex networks approach to critical transitions and self-organization in sleep						
16. FUNDING		ACTIVITY/AGENCY SHARE		RECIPIENT SHARE		
PREVIOUSLY OBLIGATED:		\$205,072.00		\$.00		
OBLIGATED BY THIS ACTION:		\$100,000.00		\$.00		
TOTAL OBLIGATED ON AWARD:		\$305,072.00		\$305,072.00		
FUTURE FUNDING:		\$99,594.00		\$99,594.00		
GRANT TOTAL:		\$404,666.00		\$404,666.00		
17. CURRENT FUNDING PERIOD N/A THROUGH N/A						
18. PERIOD OF PERFORMANCE 01-NOV-09 THROUGH 30-SEP-13						
19. ACCOUNTING AND APPROPRIATION DATA: See attached Financial Accounting Data Sheet (s)						
20a. PRINCIPAL INVESTIGATOR/RECIPIENT TECHNICAL REPRESENTATIVE: Plamen Ivanov		21. TECHNICAL REPRESENTATIVE 21a. NAME: Michael F. Shlesinger			21b. CODE: ONR 30	
20b. TELEPHONE NUMBER: (617) 353-4733		20c. EMAIL ADDRESS: plamen@buphy.bu.edu		21c. ADDRESS: Office of Naval Research 875 North Randolph Street Arlington, VA 22203-1995		
20d. TELEPHONE NUMBER: (617) 353-4733		20e. EMAIL ADDRESS: plamen@buphy.bu.edu		21d. TELEPHONE NUMBER:		
20f. TELEPHONE NUMBER: (617) 353-4733		20g. EMAIL ADDRESS: SHLESIM@ONR.NAVY.MIL		21e. EMAIL ADDRESS: SHLESIM@ONR.NAVY.MIL		
22. AWARDOFFICE CONTACT 22a. NAME: Diane Gales		22b. CODE: ONR BD025		23a. ADMINISTRATIVE OFFICE: ONR REG BOSTON N62879 495 SUMMER STREET ROOM 627 BOSTON, MA 02210-2109 PHONE: (617) 753-3283 FAX: (617) 753-4605		
22c. ADDRESS: Office of Naval Research 875 North Randolph Street Arlington, VA 22203-1995		22d. TELEPHONE NUMBER: (703) 696-2593		22e. EMAIL ADDRESS: GALES@ONR.NAVY.MIL		
22f. TELEPHONE NUMBER: (703) 696-2593		22g. EMAIL ADDRESS: GALES@ONR.NAVY.MIL		23b. CODE: N62879		
24. SUBMIT PAYMENT REQUEST TO: Same as block #23a		25a. PAYING OFFICE: DFAS COLUMB-NAVY ACQ HQ0251 COLUMBUS, OH 43213		25b. CODE: HQ0251		
25c. PAYING OFFICE: DFAS COLUMB-NAVY ACQ HQ0251 COLUMBUS, OH 43213		26a. PATENT OFFICE: Office of Naval Research ATTN: ONR BDCC One Liberty Center 875 North Randolph Street, Suite 1425 Arlington, VA 22203-1995		26b. CODE: N00014		

AWARD NO. N00014-10-1-0078		AWARD/MODIFICATION		MODIFICATION NO. P00003	
27. SPECIAL INSTRUCTIONS: See "Special Requirements" Attachment					
28. DELEGATIONS: The administration duties listed below have been delegated to the administrative office (block 23a). Upon request the awarding office contact (block 22) will make their full text available. Please direct questions to the contacts @: http://www.onr.navy.mil/Contracts-Grants/Regional-Contacts.aspx					
Full Delegation					
29. TERMS AND CONDITIONS: The following terms and conditions are incorporated herein by reference with the same force and effect as if they were given in full text. Upon request the awarding office contact named in block 22 will make their full text available, or they can be found as described below.					
DOCUMENT The following documents may be found at: http://www.onr.navy.mil/Contracts-Grants/submit-proposal/grants-proposal/grants-terms-conditions.aspx UAAC Acceptance C November 2003 Agency Specific February 2011 UAWA Award A November 2003 Basic Research Grant October 2010 Core June 2011					
30. OPTIONS		OPTION NO.	AMOUNT	PERIOD	
(1)					
(2)					
(3)					
(4)					
31. REPORTS: The following reports must be submitted to the indicated addressees, in the indicated quantities, within 90 days following the expiration or termination of the project. Final Technical Reports must have a SF298, Report Documentation Page, accompanying them. Unless otherwise stated in the award/modification, complete Block 12a of the SF298 as follows: "Approved for Public Release; distribution is Unlimited".					
ADDRESSEE		REPORT TYPE			COPIES
See block #21		Final Report is not required Interim Research Performance Report (As Required) with SF298			1 1
See block #23a		Report of Inventions and Subcontracts - DD 882 Final Report is not required Interim Research Performance Report (As Required) Final Federal Financial Status Report - SF425 - Including Line Item 11			1 1 1 1
Defense Technical Information Center 8725 John J Kingman Road Ste 0944 Fort Belvoir, VA 22060-6218		Final Report is not required Interim Research Performance Report (As Required) with SF298			1 1
See block #26a		Report of Inventions and Subcontracts - DD 882			1
Naval Research Laboratory ATTN: CODE 5596 4555 Overlook Avenue SW Washington, DC 20375-5320		Final Report is not required Interim Research Performance Report (As Required) with SF298			1 1
32. FOR THE RECIPIENT			33. FOR THE UNITED STATES OF AMERICA		
32a. SIGNATURE OF PERSON AUTHORIZED TO SIGN N/A - SIGNATURE NOT REQUIRED ON THIS AWARD			33a. SIGNATURE OF AWARDOFFICER 		
32b. NAME AND TITLE OF SIGNER		32c. DATE SIGNED	33b. NAME AND TITLE OF AWARDOFFICER		33c. DATE SIGNED
			Diane Gales		18-JAN-12

FINANCIAL ACCOUNTING DATA SHEET - NAVY

1. CONTRACT NUMBER (CRITICAL) N00014-10-1-0078			2. SPIIN (CRITICAL)			3. MOD (CRITICAL) P00003			4. PR NUMBER 12PR04267-01						
CLIN/SLIN	6. LINE OF ACCOUNTING												7. AMOUNT (CRITICAL)	NAVY INTERNAL USE ONLY REF DOC/ACRN	
	A. ACRN (CRITICAL)	B. APPROPRIATION (CRITICAL)	C. SUBHEAD (CRITICAL)	D. OBJ CLA	E. PARM	F. RFM	G. SA	H. AAA (CRITICAL)	I. IT	J. PAA	K. COST CODE				
											PROJ UNIT	MCC			PDLI & SUF
	AC	1721319	W1AE	410	RA	309	0	068342	2D	000000	00001	000	CPS0	\$100,000.00	PR#12PR04267-01 FRC:0CPS
PAGE TOTAL												\$100,000.00			
GRAND TOTAL												\$100,000.00			
PREPARED/AUTHORIZED BY:						COMPTROLLER APPROVAL: FOR FISCAL DATA AND SIGNATURE									
DATE:						BY _____ for COMPTROLLER, ONR CONTRACT REVIEWED									
DATE:						DATE:									

FINANCIAL ACCOUNTING DATA SHEET – NON-NAVY DoD ACTIVITIES

1. CONTRACT NUMBER (CRITICAL) N00014-10-1-0078		2. SPIIN (CRITICAL)		3. MOD (CRITICAL) P00003		4. PR NUMBER 12PR04267-01				
5. CLIN/SLIN	6. ACRN (CRITICAL)	7. ACCOUNTING CITATION					8. AMOUNT (CRITICAL)		NAVY INTERNAL USE ONLY REF DOC/ACRN	
<p style="font-size: 24px; font-weight: bold;">This page is intentionally blank</p>										
						PAGE TOTAL	\$.00			
						GRAND TOTAL	\$.00			
PREPARED/AUTHORIZED BY:					COMPTROLLER APPROVAL:					
DATE:					FOR FISCAL DATA AND SIGNATURE					
					BY _____ for COMPTROLLER, ONR CONTRACT REVIEWED					
					DATE:					

AWARD NO.
N00014-10-1-0078

SPECIAL REQUIREMENTS

MODIFICATION NO.
P00003

The purpose of this modification is to continue research.

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Profile Exists

No Profile

Name: [IVANOV, PLAMEN CHRISTOV](#) **Name:** LAPOSKY, AARON D

Not Applicable

Email: [Click to view Contact PI / Project Leader email address](#)**Email:** [Click to view PO email address](#)**Title:****Organization:****Department/ Educational Institution Type:****Congressional District:****Name:** BRIGHAM AND WOMEN'S HOSPITAL
City: BOSTON **Country:** UNITED STATES (US)Unavailable
Unavailable**State Code:** MA
District: 08**Other Information:****FOA:** [PA-10-067](#)**DUNS Number:** 030811269**CFDA Code:** 837**Study Section:** Special Emphasis Panel [ZRG1-IFCN-E (02)]**Project Start Date:** 5-APR-2011**Project End Date:** 31-MAR-2016**Fiscal Year:** 2012 **Award Notice Date:** 5-APR-2012**Budget Start Date:** 1-APR-2012**Budget End Date:** 31-MAR-2013**Administering Institutes or Centers:**

NATIONAL HEART, LUNG, AND BLOOD INSTITUTE

Project Funding Information for 2012:**Total Funding:** \$485,349

Year	Funding IC	FY Total Cost by IC
2012	NATIONAL HEART, LUNG, AND BLOOD INSTITUTE	\$485,349

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DESCRIPTION (provided by applicant): Humans and animals often exhibit brief awakenings from sleep (arousals), which are traditionally viewed as random disruptions of sleep caused by external stimuli or pathologic perturbations. However, our recent findings show that arousals exhibit complex temporal organization and scale-invariant behavior, characterized by a power-law probability distribution for their durations, while sleep stage durations exhibit exponential behavior. Such complex scale-invariant organization of the arousals makes it unlikely that they are merely a linear response to random external stimuli. The co-existence of both scale-invariant and exponential processes generated by a single regulatory mechanism has not been observed in physiological systems until now. Such co-existence resembles the dynamical features of non-equilibrium systems exhibiting self-organized criticality (SOC). Thus, we hypothesize that arousals are an integral part of sleep regulation and may be necessary to maintain and regulate healthy sleep by releasing accumulated excitations in the regulatory neuronal networks, following a SOC-type temporal organization. To address this hypothesis we propose to combine data from sleep physiology and bio-molecular/genetic experiments with modern concepts from statistical physics and the theory of complex networks. Utilizing the framework of SOC, our specific aim is: (i) to elucidate the mechanisms leading to scale-invariant organization of arousals during sleep; (ii) to uncover how pathologic conditions affect the SOC organization of arousals and sleep-stage transitions; (iii) to derive novel and more sensitive diagnostic markers of sleep disorders. We will analyze a large database from (i) healthy human subjects, and (ii) subjects with insomnia, narcolepsy, sleep apnea and other disorders; and (iii) from healthy wild type mice and rats. We will also utilize data from experimental animal models of various sleep disorders, where specific sleep-related neuronal groups and brain areas are targeted, to discern which key elements of the neurobiological interactions may be responsible for the emergence of SOC complexity in sleep dynamics at the system level. Establishing SOC-type complexity in sleep dynamics will challenge the current dominant homeostasis-based paradigm of sleep regulation, as it indicates the need of continuous fluctuations (arousals) over a broad range of time scales. How neuronal signaling interactions lead to SOC-type complexity at the system level is not known, and we will develop approaches based on the modern theory of scale-invariant networks to probe the role of the neuronal network topology in generating SOC in sleep dynamics. PUBLIC HEALTH RELEVANCE: Brief awakenings from sleep (arousals) are traditionally viewed as disruptions of sleep, and their temporal dynamics as well as the underlying mechanisms are not well understood. We have recently discovered that the temporal organization of arousal episodes and sleep-stage durations in healthy sleep exhibit a self-organized criticality (SOC) behavior, which has not been previously reported in integrated physiological systems, and is not accounted for by the current homeostasis-based framework of sleep dynamics. This proposal focuses on identifying the basic control mechanisms leading to SOC behavior by utilizing available data from bio-molecular and genetic animal experiments as well as modern concepts from statistical physics applied to data from animal models and human polysomnographic recordings, that will allow us to link biochemical signaling pathways at the cellular level, through functional neuronal networks of sleep- and wake-promoting neurons, with sleep dynamics at the system level, and to derive novel clinical diagnostic and prognostic markers of sleep disorders.

Public Health Relevance Statement::

Brief awakenings from sleep (arousals) are traditionally viewed as disruptions of sleep, and their temporal dynamics as well as the underlying mechanisms are not well understood. We have recently discovered that the temporal organization of arousal episodes and sleep-stage durations in healthy sleep exhibit a self-organized criticality (SOC) behavior, which has not been previously reported in integrated physiological systems, and is not accounted for by the current homeostasis-based framework of sleep dynamics. This proposal focuses on identifying the basic control mechanisms leading to SOC behavior by utilizing available data from bio-molecular and genetic animal experiments as well as modern concepts from statistical physics applied to data from animal models and human polysomnographic recordings, that will allow us to link biochemical signaling pathways at the cellular level, through functional neuronal networks of sleep- and wake-promoting neurons, with sleep dynamics at the system level, and to derive novel clinical diagnostic and prognostic markers of sleep disorders.

Project Terms:

Accounting; Address; Advisory Committees; Affect; American; Animal Experiments; Animal Model; Animals; Architecture; Area; Arousal; Atlases; base; Behavior; Biochemical; Biochemical Genetics; Biochemical Pathway; biological systems; Brain; Characteristics; Circadian Rhythms; Clinical; clinically relevant; Complex; Data; data modeling; Databases; Diagnostic; Disease; Elements; Equilibrium; Exhibits; Experimental Animal Model; Feedback; Functional disorder; Homeostasis; Hour; Human; human subject; improved; innovation; Laws; Lead; Lesion; Link; Measures; Modeling; Molecular Genetics; Mus; Narcolepsy; Neurobiology; neuronal circuitry; Neurons; neuroregulation; novel; novel diagnostics; novel marker; Output; Pathologic; Pathology; Pathway interactions; Pattern; Pharmacological Treatment; Physics; Physiological; Physiology; Polysomnography; Probability; Process; Prognostic Marker; public health relevance; Rattus; Regulatory Pathway; Reporting; research study; response; Role; Self Concept; self organization; Signal Pathway; Signal Transduction; Sleep; Sleep Apnea Syndromes; Sleep Architecture; Sleep Disorders; sleep regulation; Sleep Stages; Sleeplessness; Stimulus; Structure; System; Techniques; Testing; theories; Time; Transcend; Wild Type Mouse;

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Title (Link to full-text in PubMed Central)	Journal (Link to PubMed abstract)	Authors	Similar Publications By	Cited Publications By
Phase transitions in physiologic coupling.	Proceedings of the National Academy of Sciences of the United States of America. 2012 Jun 26; 109 (26) :10181-6	Bartsch, Ronny P; Schumann, Aicko Y; Kantelhardt, Jan W; Penzel, Thomas; Ivanov, Plamen Ch		
Phase transitions in the first-passage time of scale-invariant correlated processes.	Physical review. E, Statistical, nonlinear, and soft matter physics. 2012 Jan; 85 (1 Pt 1) :011139	Carretero-Campos, Concepcion; Bernaola-Galvan, Pedro; Ivanov, Plamen Ch; Carpena, Pedro		
Network physiology reveals relations between network topology and physiological function.	Nature communications. 2012; 3 :702	Bashan, Amir; Bartsch, Ronny P; Kantelhardt, Jan W; Havin, Shlomo; Ivanov, Plamen Ch		

Patents:**Patent Number****Patent Title**

No patents information available for 5R01HL098437-02

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Title: SELF ORGANIZED CRITICALITY AS A NEW PARADIGM OF SLEEP REGULATION Awardee Organization: BRIGHAM AND WOMENS HOSPITAL

Total project funding amount for 2 projects is \$980,401*

* Only NIH and CDC funding data for fiscal years 2000 and later are available.

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Project Number	Sub #	Project Title	Contact PI / Project Leader	Organization	FY	Admin IC	Funding IC	FY Total Cost by IC
5R01HL098437-02		SELF ORGANIZED CRITICALITY AS A NEW PARADIGM OF SLEEP REGULATION	IVANOV, PLAMEN CHRISTOV	BRIGHAM AND WOMENS HOSPITAL	2012	NHLBI	NHLBI	\$485,349
1R01HL098437-01A1		SELF ORGANIZED CRITICALITY AS A NEW PARADIGM OF SLEEP REGULATION	IVANOV, PLAMEN CHRISTOV	BRIGHAM AND WOMENS HOSPITAL	2011	NHLBI	NHLBI	\$495,052

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LOS ANGELES, CALIFORNIA 90071

(213) 680-3833

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FOUNDER & PRESIDENT 1954-1964

HOWARD B. KECK
CHAIRMAN & CEO 1964-1994

ROBERT A. DAY
CHAIRMAN & CEO

June 12, 2015

Robert A. Brown, Ph.D.
President
Boston University
One Silber Way, 8th Floor
Boston, MA 02215

Dear President Brown:

Thank you for submitting your proposal to the Medical Research Grant Program for consideration by the Board of Directors of the W. M. Keck Foundation during its June 2015 grant cycle. The Board of Directors recently met, and we are pleased to inform you that a grant in the amount of One Million Dollars (\$1,000,000) has been awarded to TRUSTEES OF BOSTON UNIVERSITY for the project titled *Atlas of Dynamic Interactions Between Organ Systems*. This grant is being approved by the Foundation in reliance on the statements, representations, criteria, and objectives set forth in your proposal and related materials, all of which are incorporated in and made a part of this grant agreement.

Enclosed you will find our check in the amount of One Million Dollars (\$1,000,000) representing payment in full. You will also find the Foundation's *Grantee Responsibilities* and a preprinted postcard. Please acknowledge receipt of this grant payment and the *Grantee Responsibilities* by completing and returning the enclosed postcard. In accepting this award, you are consenting to comply with the Foundation's requirements for awarded grants. Furthermore, the Foundation anticipates that you will honor, as appropriate, all offers of recognition for its support that were contained in your proposal or as otherwise approved by the Foundation. The first routine written progress report on grant activities and expenditures is expected at the Foundation no later than **July 31, 2016**. Information about reporting procedures, deadlines, submittal, and the required reporting form for download is available on our website at <http://wmkeck.us/grant-programs/reporting-requirements-21471>.

ROBERT DAY
PHONE: (213) 244-0004
EMAIL: CKUHN@OAKMONT.COM


President Robert A. Brown
Boston University
June 12, 2015
Page 2

We are pleased to support your endeavor. Should you have any questions concerning this grant, please direct all communications to the Program Director.

Sincerely,



Robert A. Day
Chairman and Chief Executive Officer



Maria Pellegrini, Ph.D.
Executive Director of Programs

Enclosures
MP:ll

cc: Dr. Plamen Ch. Ivanov
Dr. David Gillerman



Grantee Responsibilities

Potential applicants are advised that by submitting a request they are consenting to comply with the following requirements in the event that a grant is awarded:

- The grantee, as a condition of accepting the funds, affirms that the entire proceeds will be used to implement the charitable purposes of the project for which the grant is made. No general or administrative overhead expenses, indirect, or investment management fees may be charged to this award. The grantee further affirms that no funds have been or will be paid to either organization or consultants engaged in fundraising or public relations for services rendered in obtaining the grant.
- Should the grantee (a) become aware that the purposes for (and/or implementation of) this grant have become impracticable, (b) wish to terminate the charitable project funded, (c) wish to redirect the purpose of the grant, or (d) make a change in lead personnel, the grantee shall immediately notify the Foundation in writing. In such event, the Foundation may, in its sole discretion, among its other rights and remedies, terminate this grant and require the grantee to immediately repay the Foundation any unspent principal and accrued interest to date of repayment.
- Should the grantee wish to make alterations or additions to the approved budget totaling 10% or more in any budget category, prior approval from the Foundation is required.
- Grant funds shall be placed in a separate interest-bearing account until they are needed for the project for which the grant was made. The accrued interest must also be used only to support that project.
- Written progress reports and a financial accounting on the earnings and expenditure of grant funds must be submitted to the Foundation. Report forms and schedules will be provided by the Foundation.
- The grantee must secure Foundation approval in writing before releasing any public announcements or statements to the media regarding the grant, referencing it in internally produced publications, or making any commitments for permanent recognition of the W. M. Keck Foundation. Foundation staff is happy to assist in developing such material. The Foundation reserves the right to publish the abstract submitted by the grantee. In addition, we may include a link to the website of the recipient institution and/or grant project in Foundation publications.
- If a matching grant is awarded, the grantee is required to secure the matching funds necessary to fully implement the project. Upon raising the match, the grantee is asked to provide the Foundation with a detailed accounting of the sources of the matching gifts. Government grants, bonds, the institution's endowment or other existing support do not qualify as a match.
- If a grant for endowment is awarded, the principal must be maintained in perpetuity and earnings will be used solely to support the purpose for which the grant was made.
- For endowed fellowships, chairs and similar awards, the grantee is asked to provide the Foundation with periodic reports on the selection process, the progress of the search and the names and backgrounds of those receiving the awards. However, the Foundation does not wish to influence the selection in any way.
- Grant agreement will be deemed to have been entered into in the County of Los Angeles, State of California; and, California law will apply to the interpretation and enforcement of the grant provisions.
- The Foundation will monitor and assess the impact of prior grants to help determine the Foundation's future program objectives.

TRU111 TRUSTEES OF BOSTON UNIVERSITY

6/17/2015

Invoice number	Date	Description	Net check amount
DT061715	6/17/2015	MEDICAL RESEARCH	\$ 1,000,000.00

\$ 1,000,000.00

W.M. KECK FOUNDATION
 550 SOUTH HOPE STREET, SUITE 2500
 LOS ANGELES, CA 90071

BANK OF AMERICA
 PRIVATE BK-COM'L ACCTS SVCS-SOUTH #1428
 333 S. BEAUDRY AVE.
 LOS ANGELES, CA 90017-1466
 (800) 721-6043
 16-66-1220
 DATE

6353

AMOUNT

6/17/2015

\$ 1,000,000.00

PAY One Million Dollars and 00 Cents

TO THE ORDER OF TRUSTEES OF BOSTON UNIVERSITY

Maria Pelley

[Signature]

 AUTHORIZED SIGNATURE

Security features. Details on back.

⑈006353⑈ ⑆122000661⑆ 14283⑈01552⑈