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Dr William J. Schwartz

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Univ of Mass Medical Center
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55 Lake Avenue, North
Worcester, MA 01655

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AFOSR/NL
110 DUNCAN AVE SUITE B115
BOLLING AFB DC 20332-0001
Dr Haddad

93-26216



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The Gordon Research Conference on Chronobiology was held from August 9, 13, 1993 at Colby-Sawyer College, New London, New Hampshire. There were 169 applications to attend (to my knowledge, the largest number since the Chronobiology conference began in 1978). Of the 150 which could be accommodated and accepted, a total of 143 ultimately attended (Appendix A). Conferees came from 24 states; a little over 20% of the total represented 13 foreign countries, including two from former East Bloc nations; and nearly 30% of the participants were women. Graduate students, post-doctoral fellows, junior investigators, and senior scientists were all represented. Report contains full program and complete list of attendees.

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1993 Gordon Research Conference on Chronobiology

Final Report

Air Force Office of Scientific Research, Grant F49620-93-1-0247

William J. Schwartz, Chair

The Gordon Research Conference on Chronobiology was held from August 9 - 13, 1993 at Colby-Sawyer College, New London, New Hampshire. There were 169 applications to attend (to my knowledge, the largest number since the Chronobiology conference began in 1978). Of the 150 which could be accommodated and accepted, a total of 143 ultimately attended (Appendix A). Conferees came from 24 states; a little over 20% of the total represented 13 foreign countries, including two from former East Bloc nations; and nearly 30% of the participants were women. Graduate students, post-doctoral fellows, junior investigators, and senior scientists were all represented.

The study of biological timekeeping is now at a particularly fertile stage, encompassing multiple levels of biological organization, recruiting a wide array of disciplines and methodologies, and uniting a host of investigators, from plant geneticists to clinical psychiatrists. This vigor was reflected in the program (Appendix B), which consisted of 24 speakers, 9 discussion leaders, and 4 senior scientists as evening "commentators."

Two sessions on the first day focused on transcriptional and translational mechanisms of circadian rhythmicity, with discussions of putative "clock genes" in cyanobacteria, algae, fungi, fruitflies, and hamsters. The discoveries of prokaryotic circadian rhythmicity, time-dependent phosphorylation of the *per* protein, and rhythmic gene products in *per*⁰ flies - to name only a few examples - clearly pose new challenges to our understanding of circadian oscillators. Two sessions on the second day addressed cellular analyses, including work on photoreceptors in frogs, neurons in molluscs, testis in moths, and immortalized suprachiasmatic nucleus cells from rats. The characterization of a clock-like defecation rhythm in *Caenorhabditis elegans* was exciting, since this model organism, with its powerful genetics and cell biology, may now prove useful in studies of biological rhythmicity. Two sessions on the third day considered clocks as physiological systems, complete with inputs for entrainment and outputs for the overt manifestation of rhythmicity. Remarkable progress included the demonstration that multiple oscillators exist within individual unicells, the role of the intergeniculate leaflet in mediating non-photic entrainment in mammals, and the likelihood that the suprachiasmatic nucleus communicates its timing signal to the rest of the brain by multiple mechanisms. The final three sessions on the last two days were devoted to specific topics. First, new methods for investigating the circadian clock in the suprachiasmatic nucleus were introduced, including infusion of antisense nucleotides, studies of immediate early gene expression, and imaging of intracellular Ca²⁺ concentrations. A session on photoperiodism ranged from cellular studies in *Gonyaulax* to maternal-fetal communication in rodents. The final session on

temperature and timekeeping included instructive presentations using chick pineal cells, social activity of voles, and hibernation in squirrels and bears. These examples demonstrated that the temperature compensation of the circadian pacemaker's free-running period need not imply a temperature insensitivity of the pacemaker's amplitude or of the entire circadian timekeeping system.

Poster sessions were also part of the formal activities of the conference. A total of 55 posters were organized by the Vice-Chair into two sessions (Appendix C), allowing participants a valuable overview as well as detailed information regarding many different research programs.

Throughout the conference, discussion was particularly animated, stimulating, and extensive. The atmosphere was conducive to the cross-fertilization and integration of disciplines, experimental approaches, and model organisms. These features contributed importantly to the success of the conference, as evaluated by the attendees (Appendix D). It is obvious from these comments that the Gordon Research Conference on Chronobiology continues to play a crucial role in the field, and the participants unanimously voted their desire to hold another conference in 1995.

Author		J
Title		
By		
Dist		
Author		
Dist	Author	
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GORDON RESEARCH CONFERENCES

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APP. (A)

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DR NEIL ARONIN UNIV. OF MASS. MEDICL SCHOOL UMMS, DEPT. OF MEDICINE 55 LAKE AVENUE NORTH WORCESTER MA 01655	A 306 508-86-3239 ATTENDEE	
A KEITH BARRETT NORTHWESTERN UNIVERSITY NSF CENTER FOR BIOLOGICAL TIMING 2153 NORTH CAMPUS DRIVE EVANSTON IL 60208	M 8 708-491-8303 ATTENDEE	
DR STEPHANY M BIELLO UNIVERSITY OF TORONTO DEPT. OF ZOOLOGY 25 HARBORD STREET TORONTO, ONTARIO CANADA M5S 1A1	P 200 416-978-8506 ATTENDEE	
DR ERIC L BITTMAN UNIVERSITY OF MASSACHUSETTS AT AMHERST DEPT. OF BIOLOGY MORRILL SCIENCE CENTER AMHERST MA 01003	M 10 413-545-4344 ATTENDEE	
DR GENE D BLOCK DEPT. OF BIOLOGY UNIV. OF VIRGINIA GILMER HALL UNIVERSITY OF VIRGINIA CHARLOTTESVILLE VA 22901	M 12 804-982-5480 SPEAKER	
DR GERARD J BOER NETHERLANDS INSTITUTE FOR BRAIN RESEARCH MEIBERGDREEF 33 AMSTERDAM 1105 AZ THE NETHERLANDS	C 209 312056,65509 ATTENDEE	

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DR DIANE BORRIN X	C 206 ATTENDEE	
DR STUART BRODY BIOLOGY DEPARTMENT UCSD LA JOLLA CA	M 7 619-534-2619 ATTENDEE 92093	
DR MAJA BUCAN UNIVERSITY OF PENNSYLVANIA 111 A CRB, 422 CURIE BLVD. PHILADELPHIA PA	P 207 215-898-0020 ATTENDEE 19104	
DR GREGORY M CAHILL UNIV. OF KANSAS MEDICAL CENTER DEPT. OF ANATOMY & CELL BIOLOGY 3901 RAINBOW BLVD. KANSAS CITY KS	M 15 913-588-2716 SPEAKER 66160-7400	
DR IAIN C CAMPBELL INST. OF PSYCHIATRY DEPT. OF NEUROSCIENCE DECREPIGNY PARK LONDON UK	M 9 71 7035411 ATTENDEE SE5 8AF	

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NAME AND ADDRESS	ROOM # BUS TEL.	GUEST NAMES
DR MONA E CASTEL HEBREW UNIVERSITY CELL & ANIMAL BIOLOGY LIFE SCIENCES JERUSALEM ISRAEL	91904 P 304 02-585945 ATTENDEE	
DR CHRIS C CHABOT PLYMOUTH STATE COLLEGE DEPARTMENT OF NATURAL SCIENCES BOYD HALL PLYMOUTH NH	03264 M 7 603-535-2864 ATTENDEE	
DR KATRIN F CHUA HARVARD MEDICAL SCHOOL PROGRAM IN NEUROSCIENCE DEPARTMENT OF NEUROBIOLOGY, EQRF-360 BOSTON MA	02115 P 209 432-0323 ATTENDEE	
DR GRAHAMI J COLEMAN LA TROBE UNIVERSITY DEPT. OF PSYCHOLOGY BUNDOORA, VIC AUSTRALIA	3083 M 9 6134792947 ATTENDEE	
DR JAMES C COMELLI HARVARD UNIVERSITY DEPT OF CELLULAR & DEVEL. BIO BOX 35 BIO LAB, 16 DIVINITY AVE CAMBRIDGE MA	02138 C 106 617-495-3716 ATTENDEE	
DR GARY G COTE THE UNIVERSITY OF CONNECTICUT DEPT. OF MOLECULAR & CELL BIOLOGY, U-125 75 NORTH EAGLEVILLE ROAD STORRS CT	06269-3125 M 11 203-486-4351 ATTENDEE	

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NAME AND ADDRESS	ROOM # BUS TEL.	GUEST NAMES
DR CHARLES Y CZEISLER BRIGHAM AND WOMEN'S HOSPITAL LAB FOR CIRCADIAN AND SLEEP DISORDERS ENDOCRINE DIVISION, 221 LONGWOOD AVENUE BOSTON MA 02115	M 16 617-732-4933 SPEAKER	
DR SERGE DAAN UNIVERSITY GRONINGEN ZOOLOGICAL LABORATORY P.O. BOX 14 HAREN NETHERLANDS 9750 AA	M 5 31-50-632046 DISC LDR	
DR FRED C DAVIS NORTHWESTERN UNIVERSITY DEPT. OF BIOLOGY 414 MUGAR BLDG BOSTON MA 02115	M 11 617-437-4039 DISC LDR	
DR PATRICIA J DE COURSEY UNIVERSITY OF SOUTH CAROLINA DEPT OF BIOLOGICAL SCIENCES SUMTER AND GREENE STREETS COLUMBIA SC 29208	P 303 803-777-3934 ATTENDEE	
DR HORAUO D DE LA IGLESIA UNIV. OF MASSACHUSETTS, AMHERST BIOLOGY DEPT. MORRILL SCIENCE BUILDING AMHERST MA 01002	M 5 413-545-4344 ATTENDEE	
DR ANTONI DIEZ-NOGUERA UNIVERSITY OF BARCELONA LABORATORY DE FISILOGIA FACULTAT DE FARMACIA, AV JOAN XXIII S/N BARCELONA SPAIN 08028	OFF 3434907869 ATTENDEE	

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NAME AND ADDRESS

ROOM #
BUS TEL.

GUEST NAMES

DR JEANNE F DUFFY
NORTHEASTERN UNIVERSITY
LAB FOR CIRCADIAN MEDICINE-BRIGHAM &
WOMEN'S HOSP, 221 LONGWOOD AVENUE RM 454
BOSTON MA

P 300
617-732-7995
ATTENDEE
02115-5817

DR JAY C DUNLAP
DARTMOUTH MEDICAL SCHOOL
DEPT. OF BIOCHEMISTRY
7200 VAIL, RM 413
HANOVER NH

C 207
603-650-1108
ATTENDEE
03755-3844

DR DAVID J EARNEST
UNIV OF ROCHESTER SCHOOL OF MEDICINE
DEPT OF NEUROBIOLOGY & ANATOMY BOX 603
601 ELMWOOD AVE
ROCHESTER NY

C 212
716-275-6117
SPEAKER
14642

DR TAKASHI EBISAWA
275 BROADWAY, LEFT SIDE
ARLINGTON MA

M 6
617-726-8
ATTENDEE
02174

DR ISAAC EDERY
BRANDEIS UNIVERSITY AND HHMI
DEPT. OF BIOLOGY, 235 BASSINE
BRANDEIS UNIVERSITY
WALTHAM MA
USA

M 17
617-736-3161
ATTENDEE
02254

DR LELAND N EDMUNDS
STATE UNIVERSITY OF NEW YORK/STONY BROOK
DIV. OF BIOLOGICAL SCIENCES
LIFE SCI. BLDG., ROOM 370
STONY BROOK NY

A 304
516-632-8537/8
ATTENDEE
11794

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NAME AND ADDRESS

ROOM #
BUS TEL.

GUEST NAMES

DR JEFFREY A ELLIOTT
UNIVERSITY OF CALIFORNIA SAN DIEGO
DEPARTMENT OF PSYCHIATRY 0667
CIRCADIAN PACEMAKER LAB 9500 GILMAN DR
LA JOLLA CA

M 18
619-534-7191
ATTENDEE
92093-0667

DR MARK G ERLANDER
THE SCRIPPS RESEARCH INSTITUTE
DEPARTMENT OF MOLECULAR BIOLOGY, MB-10
10666 NORTH TORREY PINES ROAD
LA JOLLA CA

M 18
619-554-4314
ATTENDEE
92037

DR ARNOLD ESKIN
UNIVERSITY OF HOUSTON
DEPARTMENT OF BIOCHEMISTRY
HOUSTON TX

C 210
713-743-8381
CHAIRMAN
77204-5934

DR JERRY F FELDMAN
UNIV. OF CALIF. SANTA CRUZ
BIOLOGY DEPARTMENT
SANTA CRUZ CA

C 208
408-459-2604
DISC LDR
95064

DR BRIGITTE FRISCH
BRANDEIS UNIVERSITY
DEPARTMENT OF BIOLOGY
235 BASSINE
WALTHAM MA

P 201
617-736-3172
SPEAKER
02254

DR BEATRIZ FUENTES-PARDO
UNIV. NACIONAL AUTONOMA DE MEXICO
DEPARTAMENTO DE FISILOGIA, FAC. DE MED.
APDO. POSTAL NO. 70-250
MEXICO, D.F.
MEXICO

P 303
525-623-2362
ATTENDEE
04510

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NAME AND ADDRESS	ROOM # BUS TEL.	GUEST NAMES
DR ROBERT L GANNON CIRCADAIN NEUROBIOLOGY RESEARCH GROUP ARMSTRONG LABORATORY (CFTO) 2504 D DR. STE. 1 BROOKS AFB TX 78235	M 14 210-536-3814 ATTENDEE	
DR MENNO P GERKEMA GRONINGEN UNIVERSITY ZOOLOGY LABORATORY P.O. BOX 14, NL 9750 AA HAREN HAREN THE NETHERLANDS	C 304 31-50-632027 SPEAKER NL 9750 AA	
DR MICHAEL E GEUSZ UNIVERSITY OF VIRGINIA DEPARTMENT OF BIOLOGY GILMER HALL CHARLOTTESVILLE VA 22903	M 14 804-982-5481 ATTENDEE	
DR JADWIGA M GIEBULTOWICZ UNIVERSITY OF MARYLAND/USDA 10300 BALTIMORE BLVD BLG 306 RM 322 BARC-EAST USDA/ARS/BA INS. NEUR.HOR. LAB BELTSVILLE MD 20705-2350	P 203 301-504-8038 SPEAKER	
DR MARTHA U GILLETTE UNIVERSITY OF ILLINOIS DEPT. OF CELL & STRUCTURAL BIOLOGY 506 MORRILL HALL, 505 S. GOODWIN AVENUE URBANA IL 61801	P 202 217-244-1355 DISC LDR	
DR VAN D GOOCH UNIVERSITY OF MINNESOTA-MORRIS DIVISION OF SCIENCE & MATH MORRIS MN 56267	M 19 612-589-6372 ATTENDEE	

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DR MICHAEL R GORMAN UNIVERSITY OF CALIFORNIA AT BERKELEY DEPARTMENT OF PSYCHOLOGY BERKELEY CA	M 19 510-642-5888 ATTENDEE 94720	
DR LAUREL L HAAK STANFORD UNIVERSITY DEPT. OF BIOLOGICAL SCIENCES GILBERT HALL BOX 116 STANFORD CA	P 212 415-723-9709 ATTENDEE 94305-5020	
DR GENEVEIVE M HADDAD AIR FORCE OFFICE OF SCIENTIFIC RESEARCH AFORSR/NL BOLLING AFB DC 20332-0001 110 DUNCAN AVENUE SUITE B 115 WASHINGTON DC	P 301 202-767-5021 ATTENDEE 20332-0001	
DR RUDIGER HARDELAND I. ZOOLOGISCHES INSTITUT UNIVERSITAT GOTTINGEN BERLINER STR. 28, D-3400 GOTTINGEN GERMANY	C 305 +551-395414 SPEAKER	
DR PAUL E HARDIN TEXAS A&M UNIVERSITY DEPARTMENT OF BIOLOGY AND CENTER FOR ADVANCED INVERT MOLECULAR SCIENCE COLLEGE STATION TX	C 101 409-845-7756 ATTENDEE 77843-3258	
DR JACOB P HARNEY UNIV. OF KENTUCKY, COLLEGE OF MED. DEPT. OF PHYSIOLOGY M531 MEDICAL CENTER LEXINGTON KY	C 101 410-706-6028 ATTENDEE 40536-0084	

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DR MICHAEL H HASTINGS UNIVERSITY OF CAMBRIDGE DEPARTMENT OF ANATOMY CAMBRIDGE UK	M 10 SEE COMMENTS ATTENDEE CB2 3DY	
DR J. WOODLAND HASTINGS HARVARD UNIVERSITY 16 DIVINITY AVENUE DEPT. OF CELLULAR & DEVELOPMENTAL BIOLOG CAMBRIDGE MA	C 104 617-495-3714 DISC LDR 02138	
DR MICHAELA HAU MAX-PLANCK-INSTITUT FUR VERHALTENSPHYSIOLOGIE VON-DER-TANN-STR 7 ABT. PROF GWINNER 8138 ANDECHS GERMANY	P 306 08152/373-17 ATTENDEE 8138	
DR SABINE HEIGL MAX-PLANCK-INSTITUT FUR VERHALTENSPHYSIOLOGIE VON-DER-TANN-STR 7 ABT. PROF GWINNER 8138 ANDECHS GERMANY	P 306 08152/373-37 ATTENDEE 8138	
DR H. CRIG HELLER C	C 102 ATTENDEE	
DR MARTHA HOTZ VITATERNA NORTHWESTERN UNIVERSITY DEPT OF NEUROBIOLOGY & PHYSIOLOGY 2153 N CAMPUS DRIVE, NSF CTR FOR BIOL. TIMING EVANSTON IL	P 302 708-491-8303 ATTENDEE 60208	

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DR MARK W HURD UNIVERSITY OF TORONTO DEPARTMENT OF PSYCHOLOGY 100 ST GEORGE STREET TORONTO CANADA	M5S 1A1	MC 2 416-978-3433 ATTENDEE
DR HELENA ILLNEROVA ACADEMY OF SCI. OF THE CZECH REPUBLIC INSTITUTE OF PHYSIOLOGY VIDENSKA 1083 PRAGUE 4 CZECH REPUBLIC	14220	P 300 4721151 ATTENDEE
DR NORIO K ISHIDA NATIONAL INSTITUTE OF BIOSCIENCE AND HUMAN TECHNOLOGY 1-13 TSUKUBA SCIENCE CITY305 SCIENCE CITY305 JAPAN	305	C 104 81-298-54-6072 ATTENDEE
DR MASAHITO ISHIUYA NATIONAL INST FOR BASIC BIOLOGY DEPT OF CELL BIOLOGY NISHIGO-RAKA, MYODAIZI-CHO OKAZAKI AICHI JAPAN	444	C 103 ATTENDEE
DR BALZER IVONNE I. ZOOLOGISCHES INSTITUT UNIVERSITY OF GOETTINGEN BERLIN STR 28 GOETTINGEN GERMANY	37073	P 308 ATTENDEE
DR DANIEL S JANIK UNIVERSITY OF TORONTO DEPARTMENT OF ZOOLOGY 25 HARBORD STREET TORONTO CANADA	M5S 1A1	C 106 416-978-8506 SPEAKER

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ROOM #
BUS TEL.

GUEST NAMES

DR AMY E JETTON
UNIVERSITY OF MASSACHUSETTS
DEPT. OF BIOLOGY
MORRILL SCIENCE CENTER
AMHERST MA

01003

P 302
413-545-4344
ATTENDEE

DR MEGAN E JEWETT
HARVARD UNIVERSITY
PIERCE HALL ROOM 318
DIVISION OF APPLIED SCIENCES
CAMBRIDGE MA

02138

C 203
617-495-3789
ATTENDEE

DR CARL H JOHNSON
VANDERBILT UNIVERSITY
DEPARTMENT OF BIOLOGY, BOX 1812-B
NASHVILLE TN

37235

C 310
615-322-2384
ATTENDEE

DR JANET E JOY
NIMH (NIH)
NIMH NEUROSCIENCES CENTER
LABORATORY OF BIOCHEMICAL GENETICS
WASHINGTON DC

20032

C 206
202-373-6037
ATTENDEE

DR SAT BIR S KHALSA
UNIVERSITY OF VIRGINIA
NSF CENTER FOR BIOLOGICAL TIMING
DEPT. OF BIOLOGY, GILMER HALL
CHARLOTTESVILLE VA

22901

C 303
804-982-5481
ATTENDEE

DR THOMAS S KILDUFF
STANFORD UNIVERSITY SCHOOL OF MEDICINE
SLEEP RESEARCH CENTER
DEPT. OF PSYCHIATRY TD-114
STANFORD CA

94305

C 301
415-723-9380
ATTENDEE

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NAME AND ADDRESS	ROOM # BUS TEL.	GUEST NAMES
DR TAKAO KONDO NATIONAL INSTITUTE FOR BASIC BIOLOGY MYODAIJI OKAZAKI JAPAN	444 C 103 81-564-55-7603 SPEAKER	
DR JON M KORNHAUSER NORTHWESTERN UNIVERSITY DEPT. OF NEUROBIOLOGY AND PHYSIOLOGY 2153 SHERIDAN ROAD EVANSTON IL	60208 M 8 708-491-2872 SPEAKER	
DR CONSTANTINOS KOUMENIS UNIVERSITY OF HOUSTON DEPT. OF BIOCHEM. AND BIOPHYSICS SCI. 3201 CULLEN BLVD. HOUSTON TX USA	77004 C 302 713-743-8388 ATTENDEE	
DR DANIEL F KRIPKE UNIVERSITY OF CALIFORNIA, SAN DIEGO 9500 GILMAN DRIVE, 0667 LA JOLLA CA	92093-0667 C 302 619-554-7131 ATTENDEE	
DR JENNIFER J LAROS DARTMOUTH MEDICSL SCHOOL DEPT. OF BIOCHEMISTRY 7200 VAIL ROOM 413 HANOVER NH	03755-3844 C 207 603-650-1154 ATTENDEE	
DR THERESA M LEE UNIVERSITY OF MICHIGAN 3042 NEUROSCIENCE LAB BLDG 1103 E. HURON ST ANN ARBOR MI	48103-1687 P 210 313-936-1495 SPEAKER	

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NAME AND ADDRESS		ROOM # BUS TEL.	GUEST NAMES
DR MICHAEL T LEWIS UNIVERSITY OF CALIFORNIA, SANTA CRUZ SINSHEIMER LABS. DEPT. OF BIOLOGY SANTA CRUZ CA 95064		A 204 408-459-4225 ATTENDEE	
DR DENNIS W LIU UNIVERSITY OF WASHINGTON DEPARTMENT OF GENETICS, SK50 SEATTLE WA 98195		C 306 206-543-3117 SPEAKER	
DR ROBERT LYNCH UNIVERSITY OF COLORADO ENVIRONMENTAL, POPULATION & ORGANISMIC B BOULDER CO 80309-0334		A 110 303-492-7056 ATTENDEE	
DR ROB MC CLUNG DARTMOUTH COLLEGE DEPT. OF BIOLOGICAL SCIENCES GILMAN 6044 HANOVER NH 03755		A 207 503-646-3940 ATTENDEE	
DR MARIJA MEDANIC UNIV. OF INNINOIS, UIUC 524 BURHILL HALL 407. S. GOODWIN AVENUE URBANA IL 61204		C 214 217-244-1842 ATTENDEE	
DR MICHAEL MENAKER UNIVERSITY OF VIRGINIA DEPT. OF BIOLOGY, GILMER HALL CHARLOTTESVILLE VA 22903		A 214 804-982-5767 DISC LDR	

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NAME AND ADDRESS

ROOM #
BUS TEL.

GUEST NAMES

DR MARTHA W MERROW
DARTMOUTH MEDICAL SCHOOL
DEPT. BIOCHEMISTRY
HB 7200
HANOVER NH

C 203
603-650-1120
ATTENDEE

03755-3844

DR ELIZABETH L MEYER
DEPT. OF PSYCHIATRY & BEHAVIORAL SCIENCE
HEALTH SCIENCE CENTER, SUNY
STONY BROOK NEW YORK

P 200
516-444-1614
ATTENDEE

11794

DR STEPHAN H MICHEL
UNIVERSITY OF VIRGINIA
DEPT. OF BIOLOGY
GILMER HALL, R285
CHARLOTTESVILLE VA

C 303
804-982-5481
ATTENDEE

22903

DR ERIC M MINTZ
UNIVERSITY OF CALIFORNIA SANTA CRUZ
DEPARTMENT OF BIOLOGY
SANTA CRUZ CA

A 207
408-459-2745
ATTENDEE

95064

DR MARIA MITTAG
HARVARD UNIVERSITY
DEPT OF CELL & DEVEL. BIOLOGY
16 DIVINITY AVE
CAMBRIDGE MA

P 205
617-495-3716
SPEAKER

02138

DR MARGARET M MOGA
UNIV OF PITTSBURGH
CENTER FOR NEUROSCIENCE
BST W1601
PITTSBURGH PA

P 305
412-648-9873
ATTENDEE

15261

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NAME AND ADDRESS	ROOM # BUS TEL.	GUEST NAMES
DR ROBERT Y MOORE UNIVERSITY OF PITTSBURGH CENTER FOR NEUROSCIENCE BST W1656 PITTSBURGH PA 15217	A 212 412-648-8322 SPEAKER	
DR LARRY MORIN SUNY HEALTH SCIENCE CENTER DEPT. PSYCHIATRY STONY BROOK NY 11794	A 216 516-444-1613 ATTENDEE	
DR MARY E MORRIS HARVARD MEDICAL SCHOOL DEPARTMENT OF NEUROBIOLOGY 220 LONGWOOD AVENUE BOSTON MA 02115	P 209 617-432-0323 ATTENDEE	
DR NICHOLAS MROSOVSKY UNIVERSITY OF TORONTO DEPT. OF ZOOLOGY TORONTO ONTARIO CANADA M5S 1A1	A 216 416-978-8506 ATTENDEE	
DR MARTA B NUNEZ-REGUEIRO UNIVERSITY OF HOUSTON DEPT. OF BIOCHEM. AND BIOPHYSICS SCI. HSC BLDG. #402 HOUSTON TX 77204-5934 USA	C 210 713-743-8382 ATTENDEE	
DR PATRICK J O'CONNOR THE UNIVERSITY OF GEORGIA DEPT OF EXERCISE SCIENCE ATHENS GA 30602-3654	A 213 706-542-4382 ATTENDEE	

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NAME AND ADDRESS

ROOM #
BUS TEL.

GUEST NAMES

DR TERRY L PAGE
VANDERBILT UNIVERSITY
DEPARTMENT OF BIOLOGY, BOX 42B
NASHVILLE TN 37235

C 310
615-322-2256
ATTENDEE

DR GARY E PICKARD
UNIVERSITY OF PENNSYLVANIA
DEPT. OF PSYCHIATRY
422 CURIE BLVD.
PHILADELPHIA PA 19104-6141

A 209
215-898-0787
ATTENDEE

DR COLIN S PITTENDRIGH
NSF CENTER FOR BIOLOGICAL TUNING
2309 FAIRWAY DRIVE
BOZEMAN MT 59715

B 105
406-587-2005
DISC LDR

DR BERNARD P POSSIDENTE
SKIDMORE COLLEGE
BIOLOGY DEPARTMENT
NORTH BROADWAY
SARATOGA SPRINGS NY 12866

OFF
518-584-5000
ATTENDEE

DR JEFFREY L PRICE
ROCKEFELLER UNIVERSITY
1230 YORK AVE.
DR. MICHAEL YOUNG'S LAB
NEW YORK NY 10021

A 213
212-327-8654
ATTENDEE

DR WOLFGANG PUCHALSKI
WESLEYAN UNIVERSITY
DEPARTMENT OF BIOLOGY
MIDDLETOWN CT 06549

A 110
203-347-9411
ATTENDEE

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GUEST NAMES

DR ARCADY A PUTILOV
INSTITUTE OF PHYSIOLOGY S.B. RAMS
2 TIMAKOVA STR
NOVOSIFIRSK
NOVOSIFIRSK RUSSIA
RUSSIA

MC 6
73832358048
ATTENDEE
630117

DR MICHAEL A REA
ARMSTRONG LABORATORY
AL/CFTO
BEOOKS AFB TX

A 209
210-536-2194
ATTENDEE
78235

DR UWE REDLIN
WESLEYAN UNIVERSITY
DEPT. OF BIOLOGY
LAWN AVENUE
MIDDLETOWN CT

A 309
203-347-9411
ATTENDEE
06459-0170

DR JENNY R REDMAN
DEPT. OF PSYCHOLOGY, MONASH UNIVERSITY
WELLINGTON RD, CLAYTON, VICTORIA 3168
VICTORIA
AUSTRALIA

P 308
03-565-3957
ATTENDEE

DR STEPHAN G REEBS
UNIV. OF DE MONCTON
DEPT. DE BIOLOGIE
MONCTON
MONCTON NB
CANADA

A 301
506-858-4384
ATTENDEE

DR LUDGER RENSING
UNIVERSITY OF BREMEN DEPT OF BIOLOGY
PO BOX 3304-40 D-2800 BREMEN
NW 2 LEOBENERSTR
2800 BREMEN 33 GERMANY

A 316
421-218-2126
ATTENDEE

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DR STEVEN M REPERT MASSACHUSETTS GENERAL HOSPITAL JACKSON 1226 BOSTON MA 02114	A 112 617-726-8450 DISC LDR	
DR MICHAEL H ROBERTS CLARKSON UNIVERSITY DEPARTMENT OF BIOLOGY POTSDAM NY 13699-5806	A 314 315-268-4498 ATTENDEE	
DR TILL ROENNEBERG INST. FOR MEDICAL PSYCHOLOGY UNIV. OF MUNICH GOETHESTR 31 MUNICH GERMANY 8000	A 107 49-89-5996650 SPEAKER	
DR MICHAEL ROSBASH HOWARD HUGHES MEDICAL INST. BRANDEIS UNIVERSITY DEPT. OF BIOLOGY WALTHAM MA 02254	A 112 617-736-3160 DISC LDR	
DR ALAN M ROSENWASSER UNIVERSITY OF MAINE DEPARTMENT OF PSYCHOLOGY, LITTLE HALL ORONO MA 04469-5742	A 204 207-581-1954 ATTENDEE	
DR FRANCOIS ROUYER BRANDEIS UNIVERSITY- DEPT. OF BIOLOGY 415 SOUTH ST. WALTHAM MA 02254 USA	M 17 617-736-3161 ATTENDEE	

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GUEST NAMES

DR NORMAN F RUBY
STANFORD UNIVERSITY
DEPT. OF BIOLOGICAL SCIENCES
GILBERT HALL
STANFORD CA

C 102
415-725-0924
ATTENDEE

94305-5020

DR PETER RUOFF
ROGALAND UNIVERSITY CENTER
P.O. BOX 2557
CHEMISTRY DEPARTMENT
STAVANGER
NORWAY

A 202
47-4-87-4777
ATTENDEE

4004

DR KATHLEEN D RYAN
UNIVERSITY OF PITTSBURGH, SCHOOL OF MED.
DEPT. OBSTETRICS, GYNECOLOGY & REPROD.
MAGEE-WOMENS HOSPITAL; FORBES AT HALKET
PITTSBURGH PA

P 204
412-641-4053
ATTENDEE

15213

DR KATHRYN SCARBOUGH
NORTHWESTERN UNIVERSITY
DEPT. NEUROBIOLOGY & PHYSIOLOGY
2153 SHERIDAN ROAD
EVANSTON IL

C 201
308-467-3245
ATTENDEE

60208-3520

DR WILLIAM J SCHWARTZ
UNIV. OF MASS. MEDICAL SCHOOL
DEPT. NEUROLOGY
55 LAKE AVE. NORTH
WORCESTER MA

MSUITE
508-856-4147
CHAIRMAN

01655

DR AMITA SEHGAL
UNIVERSITY OF PENNSYLVANIA
233 STEMMLER HALL, DEPT OF NEUROSCIENCE
36TH AND HAMILTON WALK
PHILADELPHIA PA

C 204
215-573-2985
ATTENDEE

19041

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NAME AND ADDRESS	ROOM # BUS TEL.	GUEST NAMES
DR DONALD SHAW THE UNIVERSITY OF CONNECTICUT DEPT. OF PHYSIOLOGY/NEUROBIOLOGY U-154 3107 HORSEBARN HILL RD. BLDG. 4. RM. 19 STORRS CT	06269-4154	SEE COMMENTS ATTENDEE
DR KAZUHIRO SHIMIMURA GILMER HALL DEPT. OF BIOLOGY CHARLOTTESVILLE VA	22901	A 206 804-982-5768 ATTENDEE
DR DORIT SHWEIKI HEBREW UNIVERSITY MOLECULAR BIOLOGY DEPARTMENT HADASSAH MEDICAL SCHOOL JERUSALEM ISRAEL	91010	C 204 972-2428496 ATTENDEE
DR RAE SILVER BARNARD COLLEGE-COLUMBIA UNIVERSITY 3009 BROADWAY PSYCHOLOGY DEPT. NEW YORK NY	10027	P 206 212-854-3930 ATTENDEE
DR KATHLEEN K SIWICKI SWARTHMORE COLLEGE BIOLOGY DEPT. 500 COLLEGE AVE. SWARTHMORE PA	19081	P 207 215-898-0021 ATTENDEE
DR JOAN G SPEH UNIVERSITY OF PITTSBURGH CENTER FOR NEUROSCIENCE, W1656 PSYCH. BIOMEDICAL SCIENCE TOWER PITTSBURGH PA	15261	C 202 412-648-8322 ATTENDEE

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BUS TEL.

GUEST NAMES

DR JOSEPH S TAKAHASHI
NORTHWESTERN UNIVERSITY
NEUROBIOLOGY & PHYSIOLOGY
2153 NORTH CAMPUS DRIVE
EVANSTON IL 60208

A 303
708-491-4598
ATTENDEE

DR JUNICHI TAKEUCHI
UNIVERSITY OF MASSACHUSETTS
MEDICAL SCHOOL, DEPT OF NEUROLOGY
55 LAKE AVENUE NORTH
WORCESTER MA 01655

A 206
508-856-4147
ATTENDEE

DR BARBARA A TATE
MIRIAM HOSPITAL & BROWN UNIVERSITY
DEPT. OF PSYCHIATRY
164 SUMMIT AVENUE
PROVIDENCE RI 02906

BE 201
401-331-8500
ATTENDEE

DR WALTER R TAYLOR
HARVARD UNIVERSITY BIOLOGICAL LABS
16 DIVINITY AVENUE
CAMBRIDGE MA 02138

A 203
617-495-3716
ATTENDEE

DR FRED W TUREK
NORTHWESTERN UNIVERSITY
2153 N. CAMPUS DRIVE
DEPARTMENT OF NEUROBIOLOGY
EVANSTON IL 60208

A 105
708-491-2865
DISC LDR

DR RUSSELL N VAN GELDER
DEPARTMENT OF BIOCHEMISTRY, STANFORD U
DEPT. OF BIOCHEM. BECKMAN CENTER B400
STANFORD UNIVERSITY SCHOOL OF MEDICINE
STANFORD CA 94305

M 2
415-723-7596
SPEAKER

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NAME AND ADDRESS	ROOM # BUS TEL.	GUEST NAMES
DR OLIVIER A VAN REETH CERB. UNIVERSITY OF BRUSSELS HOP. ERASLE 808 ROUTE DE LENNIK BRUSSELS BELGIUM	1070	A 211 32-2-556427 ATTENDEE
DR ANTHONY N VANDENPOL STANFORD UNIV. DEPT. BIOLOGY YALE UNIV. SECT. NEUROSURGERY 333 CEDAR ST NEW HAVEN CT	06510	A 208 203-785-5823 ATTENDEE
DR NARAYANAN VISWANATHAN NORTHEASTERN UNIVERSITY 414 MUGAR BLDG. DEPT. OF BIOLOGY BOSTON MA	02115	A 210 617-437-2557 ATTENDEE
DR GARY T WASSMER VANDERBILY UNIVERSITY BOX 1812, STATION B, DEPT. OF BIOLOGY 390 24TH. AVE. S. NASHVILLE TN	37235	A 205 607-322-2256 ATTENDEE
DR EDWARD T WEBER UNIVERSITY OF ILLINOIS DEPARTMENT OF PHYSIOLOGY 524 BURRILL HALL, 406 SOUTH GOODWIN AVE URBANA IL	61801	C 214 217-244-1842 ATTENDEE
DR THOMAS WEHR NATIONAL INST. OF MENTAL HEALTH NIMH 10, 4S-239 9000 ROCKVILLE PIKE BETHESDA MD	20892	A 312 301-496-2141 ATTENDEE

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NAME AND ADDRESS	ROOM # BUS TEL.	GUEST NAMES
DR CHARLES J WEITZ HARVARD MEDICAL SCHOOL DEPT. OF NEUROBIOLOGY, EGRF-360 220 LONGWOOD AVENUE BOSTON MA 02115	A 310 617-432-0322 ATTENDEE	
DR DAVID K WELSH HARVARD MEDICAL SCHOOL PROGRAM IN NEUROSCIENCE 220 LONGWOOD AVENUE BOSTON MA 02115	A 202 617-735-7349 ATTENDEE	
DR MALCOLM B WILKINS GLASGOW UNIV BOTANYD EPT GLASGOW UK 012 8QQ	B 216 ATTENDEE	
DR PHYLLIS M WISE UNIVERSITY OF KENTICKY SCHOOL OF MEDICINE DEPARTMENT OF PHYSIOLOGY LEXINGTON KY 40536	C 201 606-233-5254 SPEAKER	
DR JOHN C WOOLUM CALIFORNIA STATE UNIVERSITY PHYSICS DEPT. CSULA 5151 STATE UNIVERSITY DR. LOS ANGELES CA 90032	A 307 213-343-2116 ATTENDEE	
DR MICHAEL W YOUNG ROCKEFELLER UNIVERSITY HOWARD HUGHES MEDICAL INSTITUTE 1230 YOUR AVENUE NEW YORK NY 10021	A 305 212-327-8645 ATTENDEE	

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NAME AND ADDRESS		ROOM # BUS TEL.	GUEST NAMES
DR MARTIN ZATZ N.I.M.H. 36/2A-17, LCB, NIMH. BETHESDA MD	20892	A 108 301-496-5590 SPEAKER	
DR YAN ZHANG NORTHWESTERN UNIVERSITY NBP HOGAN HALL 2153 SHERIDAN RD. EVANSTON IL	60208-3520	A 301 708-491-5687 ATTENDEE	
DR WILLIAM F ZIMMERMAN AMHERST COLLEGE BIOLOGY DEPARTMENT AMHERST COLLEGE AMHERST MA	01002	A 302 413-542-2073 ATTENDEE	
DR PIOTR ZLOMANCZUK WESLEYAN UNIVERSITY DEPARTMENT OF BIOLOGY WESLEYAN UNIVERSIT LAWN AVE MIDDLETOWN CT	06459-0170	A 309 203-347-9411 ATTENDEE	
DR IRVING ZUCKER UNIVERSITY OF CALIFORNIA PSYCHOLOGY DEPT BERKELEY CA	94720	510-642-7136 DISC LDR	

GORDON RESEARCH CONFERENCES

Gordon Research Conference on Chronobiology

August 9 - 13, 1993

Colby-Sawyer College (S), New London, N.H.

William J. Schwartz, Chair

Serge Daan, Vice-Chair

Monday Morning - 9:00 a.m. to 12:15 p.m.

Michael Rosbash (Brandeis Univ.), Discussion Leader
Transcriptional and Translational Mechanisms I

Takao Kondo (National Institute for Basic Biology, Myodaiji, Japan)
Prokaryotic circadian rhythms of gene expression reported by bacterial luciferase

Maria Mittag (Harvard Univ.)
Circadian control of gene expression in the bioluminescence system of the marine dinoflagellate *Gonyaulax polyedra*

Jon Kornhauser (Northwestern Univ.)
Light-activated signal transduction pathways in the suprachiasmatic nucleus

Monday Evening - 7:30 p.m. to 10:00 p.m.

Michael Young (Rockefeller Univ.), Discussion Leader
Transcriptional and Translational Mechanisms II

Jay Dunlap (Dartmouth Medical School)
Neurospora - the molecular identity of a clock gear and hand

Brigitte Frisch (Brandeis Univ.)
Elements of the *period* gene's cyclical expression in the *Drosophila* brain

Russell van Gelder (Stanford Univ.)
Circadian control of gene transcription in *Drosophila melanogaster*

Monday Commentary : Jerry Feldman (Univ. Calif., Santa Cruz)

Tuesday Morning - 9:00 a.m. to 12:15 p.m.

Arnold Eskin (Univ. Houston), Discussion Leader
Clocks in Culture

Gregory Cahill (Univ. Kansas Medical Center)
A circadian oscillator in vertebrate retinal photoreceptors

Gene Block (Univ. Virginia)
Cellular analysis of circadian rhythms in isolated neurons

David Earnest (Univ. Rochester Medical Center)
Establishment, characterization, and subcloning of immortalized cell lines derived from the rat suprachiasmatic nucleus

Tuesday Evening - 7:30 p.m. to 10:00 p.m.

J. Woodland Hastings (Harvard Univ.), Discussion Leader
Unfamiliar Clocks

Jaga Giebultowicz (U.S. Dept. Agriculture)
Circadian pacemaker in insect testis controls release and maturation of sperm

Dennis Liu (Univ. Washington)
Mutations affecting periodic behavior in *C. elegans*

Tuesday Commentary : Michael Menaker (Univ. Virginia)

Wednesday Morning - 9:00 a.m. to 12:15 p.m.

Serge Daan (Groningen Univ. Netherlands), Discussion Leader
Clocks *In Situ* - Input Mechanisms

Till Roenneberg (Univ. Munich)
Living with two clocks

Daniel Janik (Univ. Toronto)
Mechanisms of non-photoc phase shifting

Charles Czeisler (Brigham and Women's Hospital)
Mechanisms of entrainment of the human circadian pacemaker

Wednesday Evening - 7:30 p.m. to 10:00 p.m.

Fred Turek (Northwestern Univ.), Discussion Leader
Clocks *In Situ* - Output Mechanisms

Rae Silver (Barnard College)

What do suprachiasmatic nucleus grafts really do?

G. Robert Lynch (Univ. Colorado)

The suprachiasmatic nucleus *in vitro*, melatonin, and seasonal behavior
in the Djungarian hamster

Wednesday Commentary : Colin S. Pittendrigh (Stanford Univ.)

Thursday Morning - 9:00 a.m. to 12:15 p.m.

Martha Gillette (Univ. Illinois), Discussion Leader
Suprachiasmatic Nucleus - New Tools

Phyllis Wise (Univ. Kentucky College of Medicine)

Use of antisense nucleotides to study the circadian clock

Michael Hastings (Univ. Cambridge, U.K.)

Functional domains of the suprachiasmatic nucleus

Anthony van den Pol (Yale Univ. School of Medicine)

Digital imaging of cellular behavior in the suprachiasmatic nucleus

Thursday Evening - 7:30 p.m. to 10:00 p.m.

Steven Reppert (Massachusetts Gen. Hosp.), Discussion Leader
Photoperiodic Mechanisms

Rüdiger Hardeland (Univ. Göttingen, Germany)

Photoperiodism at the cellular level: rhythms and effects of
indoleamines in *Gonyaulax polyedra*

Theresa Lee (Univ. Michigan)

Communication of photorefractoriness from mother to pups

Thursday Commentary : Robert Y. Moore (Univ. Pittsburgh)

Friday Morning - 9:00 a.m. to 12:00 p.m.

Irving Zucker (Univ. Calif., Berkeley), Discussion Leader
Temperature and Timekeeping

H. Craig Heller (Stanford Univ.)

Circadian rhythmicity in hibernating ground squirrels

Menno Gerkema (Univ. Groningen, Netherlands)

Synchronization of ultradian activity rhythms in common voles: the role of environmental temperature

Martin Zatz (Natl. Inst. Mental Health)

Thermal effects on melatonin rhythms in chick pineal cells

App. (D)

CHRONOBIOLOGY - COLBY SAWYER COLLEGE (S)
CONFERE COMMENT

SCIENCE:

1. Excellent scientifically and socially.
2. The conference was excellent, timely, and covered new developments.
3. A good conference with most papers at the cutting edge. As a plant biologist, I must say that it was a pity that there was only one talk on higher plants but this does reflect the fact that there are rather few people studying higher plant rhythm all this time.
4. Chronobiology conference excludes clinical research. Some lectures were too long or poor.
5. More papers on human rhythms and medical implications needed.
6. There seems to be a split between those involved in molecular techniques and those involved from a more biological/behavioral point of view. Maybe that will change with time.
7. It seems that several of the talks represented projects that are possibly promising and interesting, but have been presented in a far from convincing and complete format for the past (at least) 1.5 years. It seems that some quality control may be possible, or some way to communicate displeasure with presenters for their own quality control.

DISCUSSION:

8. Discussion/session leaders need to insure that all hear the questions and comments from the audience by a brief recap or restatement.

MANAGEMENT:

9. Poster sessions could be held in the evening after 6:30 p.m. and the evening talks in the afternoon.
10. Great conference. Good balance of topics (light on human). Easy to talk to people. Speakers were excellent. Poster were excellent. Dividing the posters into 4 sessions and leaving them up for two days was helpful. Hold the next chronobiology conference in Newport, R.I. on the beach!
11. I've been to all of the Gordon Conferences on chronobiology (one of 2 people) and thought that this had the best organization of all of them!
12. Some speakers were not well selected. Please speak at a moderate speed. Some speakers spoke too fast and non-natives could not catch up. Questions should be made using a microphone. We need several microphones among audiences.
13. Interdisciplinary mix was good. In a future meeting, I would like to see a sleep/rhythm mix. It would be good to try some poster discussion sessions allowing presenters 1 or 2 slides.
14. Mix it up. Why one whole day of molecular then nothing the rest of the conference?

CHRONOBIOLOGY - COLBY SAWYER COLLEGE (S)
CONFEREES COMMENTS

15. The meeting was unusually current and interactive. The chair promoted a relaxed pace combined with presentations of new, highly visible research findings. The combination was invigorating! Great job.
16. Goals, themes, objectives? I've never heard anyone actually state these. I'm not sure I'd want to. Poster sessions would be improved if even posters were one day, and odd posters the next instead of 1-13 and 14-26. This would take advantage of the entire room and reduce crowding.
17. As usual, a wonderful conference. This year's organizers were outstanding in putting together a high quality meeting.
18. There should have been more presentations per day or a shorter conference.
19. Lets go to Italy!
20. The morning session would be better if there were 2 speakers, then coffee, and then the final speaker, for attention span reasons. Overall, I like the structure of 3 morning speakers and 2 evening speakers and then a summary.
21. An excellent meeting! Probably the best "rhythms" meeting I've attended. The chair has put together an outstanding program, highlighting excellent work from many different labs, including many relative newcomers to the field. The speakers have been uniformly impressive, presenting new approaches and exciting new results.
22. Small group/subtopic meeting might be schedule on one evening.
23. I would have liked to receive abstracts of the posters.

ATMOSPHERE:

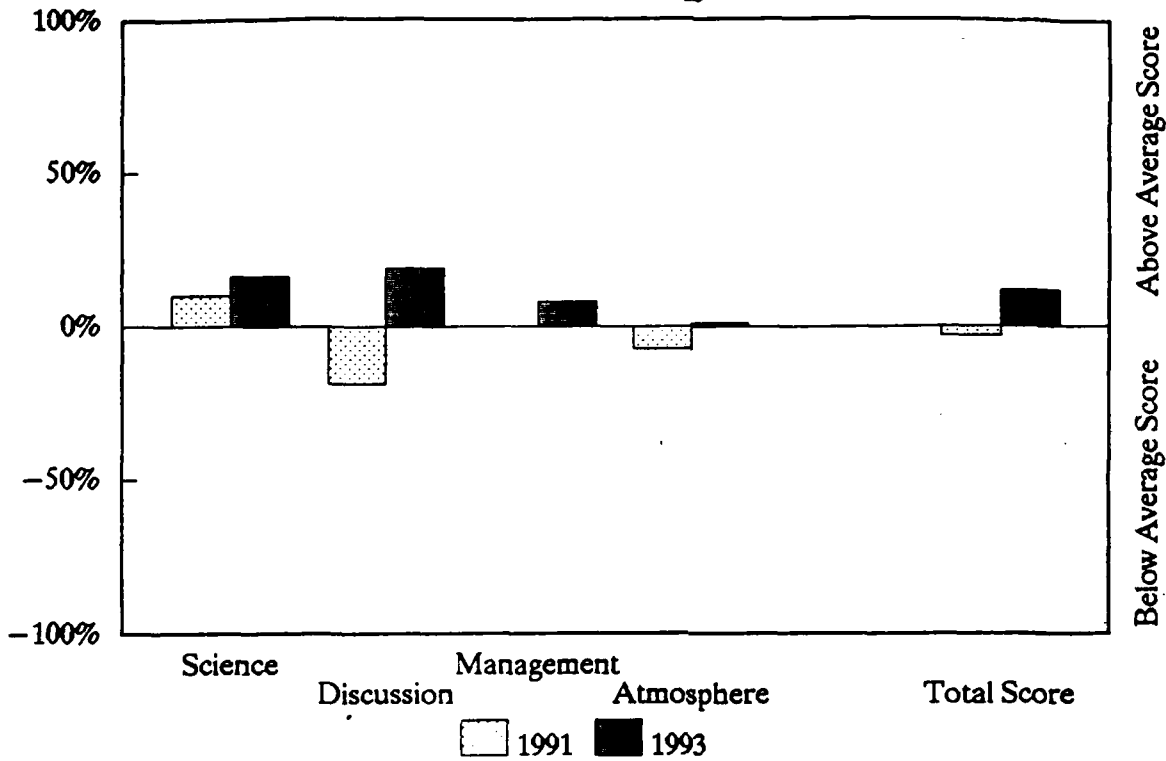
24. Great conference.
25. Excellent - The best chronobiology conference to date and all have been good.
26. Excellent.
27. Fantastic conference - the best of the several excellent chronobiology Gordon Conferences I have attended over the last 8 years, and more stimulating than G.C.s I have attended on other subjects.
28. This continues to be stimulating and very important to the field in spite of proliferation of related meetings (e.g. neuroscience, soc. study of biological rhythms).
29. This conference continues to attract the best scientists in the field and in increasing numbers. The meeting has played an important role in the development of the field, especially the interactions between U.S. and European workers.
30. The best Gordon Conference overall that I have attended (I've done 4).
31. Excellent conference! Very informative.

CHRONOBIOLOGY - COLBY SAWYER COLLEGE (S)
CONFERE COMMENT

32. In general, I am very happy to be here and I wish to attend this type of G.R.C. again and again.
33. The best conference that I have ever been to.

1993 Overall Conference Comparison

Chronobiology



CONFERENCE SCORES: Chronobiology

Conference Scores:	1993	1991	Average Conference Scores
Science:	25.45	24.13	21.93
Discussion:	20.27	13.85	17.08
Management:	15.74	14.56	14.56
Atmosphere:	15.83	14.48	15.61
Total Score:	77.29	67.02	69.19

Gordon Research Conferences

App. (C)

GORDON CONFERENCE CHRONOBIOLOGY 1993

POSTER EXHIBITS

EXHIBIT A:

Posters up: Monday morning
Posters down: Wednesday morning

Monday 16:30-18:00:

Poster session A1, authors of posters A1-A13 present at their posters.

Tuesday 16:30-18:00:

Poster session A2, authors of posters A14-A26 present at their posters.

EXHIBIT B:

Posters up: Wednesday morning
Posters down: Friday morning

Wednesday 16:30-18:00:

Poster session B1, authors of posters B1-B13 present at their posters.

Thursday 16:30-18:00:

Poster session B2, authors of posters B14-B26 present at their posters.

GORDON CONFERENCE CHRONOBIOLOGY 1993

POSTERS

EXHIBIT A. (August 9-10)

- A-1 Michael T. Lewis, Jerry F. Feldman (University of California, Santa Cruz):
Comparative phylogenetic analysis of the *frq* (frequency) clock locus from several fungi reveals conserved and non-conserved regions.
- A-2 David K. Welsh, Diomedes E. Logothetis, Steven M. Reppert (Laboratory of Developmental Chronobiology, Massachusetts General Hospital; Dept. of Cardiology, Children's Hospital, Program in Neuroscience, Harvard Medical School, Boston):
Synaptic and nonsynaptic communication among cells cultured from rat suprachiasmatic nucleus.
- A-3 James Comolli, Walter Taylor, J.W.Hastings (Biological Laboratories, Harvard University, Cambridge, MA):
Inhibitor of protein phosphorylation lengthens *tau* and blocks light phase shifts in *Gonyaulax polyedra*.
- A-4 Marija Medanic, Martha U. Gillette (Department of Cell and Structural Biology, University of Illinois, Urbana, IL):
The mammalian circadian pacemaker shows bimodal sensitivity to regulation by neuropeptide-Y.
- A-5 S. Michel, K.Manivannan, J.J.Zaritzky, G.D.Block (Department of Biology, University of Virginia, Charlottesville, VA):
Whole cell currents in cultured circadian pacemaker neurons of *Bulla*.
- A-6 M. M. Moga, R. Y. Moore (Depts. of Psychiatry, Neurology, Behavioral Science and the Center for Neuroscience, University of Pittsburgh):
The paraventricular thalamic nucleus as a component of the circadian timing system in the rat.
- A-7 Bernard Possidente (Skidmore College, Saratoga Springs, NY):
Olfactory bulb role in a mouse circadian system.
- A-8 Wolfgang Puchalski, G. Robert Lynch (Dept. Biology, Wesleyan University, Middletown, Ct.):
Photoperiodic time measurement in Djungarian hamsters evaluated from T-cycle studies.
- A-9 Arcady A. Putilov (Biological Rhythms Research Lab. Institute of Physiology, Siberian Branch, Russ. Acad. of Med. Sciences, Novosibirsk, Russia):
A somnostat model can predict time course of slow wave activity during multiple sleep latency test.
- A-10 Martin Ralph, Diego Golombek, Gerry Honrado, Mark W. Hurd (Department of Psychology, University of Toronto):
Transgenic mice and circadian clocks: *Fos*-less and *NGF Receptor*-less, but not *Timeless*.

- A-11 O. van Reeth, Y. Zhang, M. Lesourd, F. W. Turek (Dept. Neurobiology & Physiology, Northwestern University, Evanston; Centre des Rythmes Biologiques, University of Brussels; Servier Company, Paris):
Chronic treatment with sulbutiamine can reverse some age-related changes in hamster's circadian rhythms.
- A-12 Alan Rosenwasser (Department of Psychology, University of Maine): Do presynaptic alpha-2 noradrenergic autoreceptors mediate circadian phase-shifting by clonidine ?
- A-13 Alan Rosenwasser (Department of Psychology, University of Maine):
Photic and non-photic phase-shifting associated with routine cage-maintenance.
- A-14 Martha W. Merrow, Jay C. Dunlap (Department of Biochemistry, Dartmouth Medical School, Hanover, NH):
Functional and molecular characterization of a homolog of *N. crassa* *frq*.
- A-15 François Rouyer (Dept. of Biology, Brandeis University, Waltham, MA)
Cloning of a circadianly regulated gene expressed in the head of *Drosophila melanogaster*.
- A-16 Norman F. Ruby, H.C. Heller (Dept. of Biological Sciences, Stanford University, Stanford, CA):
Low temperature shortens the period of circadian neuronal rhythms in the suprachiasmatic nucleus (SCN) of golden-mantled ground squirrels *in vitro*.
- A-17 Peter Ruoff (Rogaland University Center, Stavanger, Norway):
Temperature compensation in any reaction kinetic model of circadian oscillations.
- A-18 Kazuhiro Shimomura, Michael Menaker (Dept. of Biology, University of Virginia, Charlottesville VA 22901)
Effects of the *tau* Mutation on Circadian Phase Shifting by Light.
- A-19 Kathleen K. Siwicki, M.G. Folwell, W. Bug, P. Jacobs, K. Shinkai, Z. Verney, M. Bucan (Biology Department, Swarthmore College, Swarthmore, PA 19091)
Cellular rhythms in the PER antigen in *Drosophila* and *Manduca*.
- A-20 Junichi Takeuchi, William Shannon, Neil Anonin, William J. Schwartz (Department of Neurology, University of Massachusetts):
Compositional changes of AP-1 DNA-binding proteins are regulated by light in a mammalian circadian clock.
- A-21 Barbara Tate (Dept. of Psychiatry, Miriam Hospital, Providence, RI):
Circadian abnormalities induced by the Alzheimer beta-amyloid protein.
- A-22 N. Viswanathan, Fred C. Davis (Dept. of Biology, Northeastern University, Boston, Ma.):
Activation of dopaminergic system mediates maternal entrainment in hamsters.

- A-23 G. T. Wassmer, T. L. Page (Dept. of Biology, Vanderbilt University, Nashville, Tn.):
Photoperiodic regulation of a putative storage protein in the cockroach *Parcoblatta pennsylvanica*.
- A-24 E.T.Weber, M.U.Gillette (Department of Physiology, University of Illinois, Urbana, Ill.):
Identification of protein kinase G as an SCN substrate for phosphorylation during the circadian cycle.
- A-25 C. R. McClung, Z. R. Liu, E. A. Pease, M. L. Pilgrim, H. H. Zhong ():
Circadian and light regulated gene expression in *Arabidopsis*.
- A-26 Daniel F. Kripke (University of California, San Diego, La Jolla):
Human light exposure and its correlates.

EXHIBIT B (August 11-12)

- B-1 P. Badhakchani, N. W. S. Chong, C. Coen, K. Marsden, J. F. Powell, I. C. Campbell (Institute of Psychiatry and King's College, London, U.K.):
Circadian studies of rat SCN: temporal differences in mRNA expression.
- B-2 N. W. S. Chong, P. Badhakchani, C. Coen, K. Marsden, J. F. Powell, D. Sugden, I. C. Campbell (Institute of Psychiatry and King's College, London, U.K.):
Differential expression of an mRNA in chick pineal over 24 hours.
- B-3 Ivonne Balzer (Zoological Institute, University of Göttingen, Germany):
Circadian rhythmicity of encystment and excystment in *Gonyaulax polyedra*.
- B-4 Stephany M. Biello, N. Mrosovsky (Depts. of Zoology and Physiology, Univ. of Toronto, Ont. Canada M5S 1A1)
Antiserum to neuropeptide-Y attenuates phase shifts in response to induced wheel running.
- B-5 Pamela J. Carter, Malcolm B. Wilkins, Hugh G. Nimmo, Charles A. Fewson (Dept. of Botany and Biochemistry, Glasgow University, Glasgow G12 8QQ, U.K.):
Temperature regulation of phospho-enol-pyruvate carboxylase activity in relation to the circadian rhythm of CO₂ exchange in *Bryophyllum* leaves and the temperature compensation of the period.
- B-6 Patricia J. DeCoursey, C. Sandlin, S. Pius, C. Herrin (University of South Carolina, Dept. of Biological Sciences, Columbia SC):
Relationship of Circadian Temperature Cycles and Activity Rhythms in Rodents.
- B-7 A. Diez-Noguera, A. Campuzano, J. Vilaplana, T. Cambras (Laboratori de Fisiologia, Facultat de Farmacia, Universitat de Barcelona):
Effects of period length of light/dark cycles in the circadian rhythms of motor activity and in the growth rate of young Wistar rats.

- B-8 Takashi Ebisawa, Yukiko Sasaki, Takeo Deguchi (Lab. of Developmental Chronobiology, Massachusetts Gen Hospital, Boston, USA):
Complementary DNA's for Two Arylamine N-Acetyltransferases with Identical 5'-Noncoding Region from Rat Pineal Gland.
- B-9 Isaac Edery (Dept. of Biology, Brandeis University, Waltham, MA)
Temporal Phosphorylation of the Drosophila Period Protein.
- B-10 Jeffrey A. Elliott, Colin S. Pittendrigh (Dept. Psychiatry, U.C. San Diego):
Phase relationship of evening and morning oscillators regulates amplitude of hamster PRC to light.
- B-11 Beatriz Fuentes-Pardo, M. Lara-Aparicio, S. López de Medrano (Departamento de Fisiología, Facultad de Medicina, Instituto de Matemáticas Universidad nacional Autónoma de México, México 04510, MÉXICO)
Mathematical simulation of the action of external stimuli on the circadian rhythm of electroretinogram of crayfish.
- B-12 Menno P. Gerkema, Eddy A. van der Zee, Louis E. Feitsma (Zoology Laboratory and Department of Animal Physiology, Groningen University):
The number of arginine-vasopressin immunoreactive cells in the SCN correlates with the degree of expression of circadian rhythmicity in common voles, *Microtus arvalis*.
- B-13 M.E.Geusz, S.Michel, G.D.Block (Department of Biology, University of Virginia, Charlottesville, VA):
Intracellular calcium responses of circadian pacemaker neurons measured with fura-2.
- B-14 R. Keith Barrett, Joseph S. Jakahashi ((NSF Center for Biological Timing, Dept. of Neurobiology and Physiology, Northwestern University, Evanston IL 60208)
Temperature compensation of the chick pineal circadian clock.
- B-15 Mona Castel (Department of Cell and Animal Biology, Hebrew University of Jerusalem):
Organotypic culture of the suprachiasmatic nucleus, particularly the GABA-ergic innervation.
- B-16 Van D. Gooch, J. C. Thoen (Division of Science & Math, Univ. Minnesota, Morris Mn):
Time lapse video of circadian conidiation in *Neurospora*.
- B-17 P.Hardin (Department of Biology, Texas A & M University, College Station, Texas):
Circadian cycling of *period* mRNA is correlated with nuclear localization of *period* protein.
- B-18 J. P. Harney, K. Scarborough, K. Rosewell, P. M. Wise (Department of Physiology, University of Kentucky College of Medicine, Lexington, KY; Department of Neurobiology and Physiology, Northwestern University, Evanston, IL):
Effect of intracranial infusion of VIP antisense oligonucleotides into the suprachiasmatic nuclei (SCN) on the LH surge in the rat.

- B-19 **Michaela Hau** (Max Planck Institut für Verhaltensphysiologie, Andechs, Germany):
Entrainment of house sparrow circadian rhythms to feeding cycles with different food access times.
- B-20 **Sabine Heigl** (Max Planck Institut f. Verhaltensphysiologie, Abt. Gwinner, Andechs, Germany)
Periodic food availability entrains circadian rhythms in pinealectomized house sparrows.
- B-21 **Martha Hotz Vitaterna, Phil L. Lowrey, David McDonald, William F. Dove, Lawrence H. Pinto, Fred W. Turek, Joseph S. Takahashi** (NSF Center for Biological Timing, Department of Neurobiology and Physiology, Northwestern University, Evanston, IL; McArdle Laboratory for Cancer Research, University of Wisconsin Medical School, Madison, WI):
Identification of a circadian clock mutant in the mouse.
- B-22 **Norio Ishida, Miwa Matsui, Youji Mitsui** (National Institute of Bioscience and Human Technology, AIST, MITI, Tsukuba Science City 305, Japan):
Circadian and light regulation of pp2.5 mRNA in the Suprachiasmatic Nucleus of rat brain.
- B-23 **Janet E. Joy** (NIMH Neuroscience Center at Saint Elizabeths, Washington, D.C.):
Proteins associated with the maturation of the circadian clock in the reproductive tract of the male Gypsy moth.
- B-24 **S.B.S.Kalsa, D.Whitmore, B.Bogart, G.D.Block** (Department of Biology, University of Virginia, Charlottesville, VA):
Evidence for direct involvement of transcription in the timing mechanism of a circadian pacemaker.
- B-25 **Hak Yong Kim, Gary G. Coté, Richard C. Crain** (Dept. of Molecular and Cell Biology, Univ. of Connecticut, Storrs, CT):
Circadian rhythmic regulation of light-responsive potassium channels in protoplasts from *Samanea saman* pulvini.

A-27 MOUSE MUTANT WITH ALTERED CIRCADIAN RHYTHM: PRELIMINARY BEHAVIORAL AND GENETIC ANALYSIS

Gary E. Pickard^{1,2,5}, Patricia J. Sollars^{1,5}, Eugene M. Rinchik⁶, Allan I. Pack^{3,5} and Maja Bucan^{1,4,5}

Departments of Psychiatry¹, Neuroscience², Medicine³ and Genetics⁴, Center for Sleep and Respiratory Neurobiology⁵, University of Pennsylvania School of Medicine, Philadelphia, PA and Division of Biology⁶, Oak Ridge National Laboratory, Oak Ridge, TN.

A-28 THE USE OF DIFFERENTIAL DISPLAY IN THE ANALYSIS OF GENE EXPRESSION IN SCN

Patrick Nolan¹, Patricia J. Sollars^{1,4}, Kathy Siwicki⁵, Gary E. Pickard^{1,2,4} and Maja Bucan^{1,3,4}

Departments of Psychiatry¹, Neuroscience², and Genetics³, Center for Sleep and Respiratory Neurobiology⁴, University of Pennsylvania School of Medicine, Philadelphia, PA and Department of Biology⁵, Swarthmore College, Swarthmore, PA.

B-26 Michael Roberts - "Nitric Oxide Synthase in the eye of Bulla:"

B-27 Piotr Zlomanczuk "Melatonin sensitivity in SCN neurons in Djungarian hamsters exposed to constant light"