Orthogonal Polynomials and Special Functions

SIAM Activity Group on Orthogonal Polynomials and Special Functions

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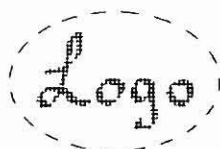
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The News

With this Fall Edition we begin typesetting in the now familiar and ubiquitous LaTeX. Quarterly publication is planned, with regular columns and, occasionally, special articles. Your contributions are sought.

In particular we welcome short expository articles, say from three to five pages. Drawings and photographs may be included but they should fit within the two column layout. It is unlikely that we will print full-fledged book reviews because they should probably appear elsewhere. Instead we seek shorter reviews and commentary.

A column devoted to real life applications is planned, say applications from engineering or physics, or whatever applied area you are involved with. Those of us in the trenches have learned that many applied areas involve special functions in a vital way, so this should provide a source of new problems, or old ones not yet solved.

A few items from the previous edition bear repeating. George Gasper has an updated version of errata, plus new references, for his and Mizan Rahman's book *Basic Hypergeometric Series*, Cambridge, 1990. Please send a stamped, self-addressed envelope to George Gasper at Department of Mathematics, Northwestern University, Evanston IL, 60208 for the update. He will also send it by e-mail (george@math.nwu.edu).

Basic Hypergeometric Series is now being translated into Russian by S.K. Suslov and N.M. Atakishiyev. George has just received an e-mail from Sergei Suslov indicating that they have received the galley proofs and hope to finish the checking soon.

The current list of members appears at the end of this edition, including the new members. Please check your listing carefully for accuracy and omissions. If anything untoward is found, you should inform either SIAM directly (service@siam.org), or Charles Dunkl (cfd5z@virginia.edu). Charles will forward your information to SIAM headquarters where the list is compiled. It is not safe to assume that because your listing appears correctly in *CML* it is also correct here, because SIAM and *CML* have different databases. Finally, if you have recently acquired an e-mail address, please be sure to give that information.

Business Meeting in Los Angeles

At the SIAM 40th Anniversary Meeting in Los Angeles a business meeting of the Activity Group on Orthogonal Polynomials and Special Functions was convened in the Cedar Room of the Century Plaza Hotel on Thursday morning at 10 am July 23, 1992. Charles Dunkl, Chair of the Activity Group, presided. The Program Director, Mourad Ismail, was also present.

It was announced that the Group's Charter had been renewed by the SIAM Council at its meeting on July 19, and that the membership numbered approximately 120 as of June 1, 1992.

In response to a question from Alan Schwartz, the goals of the Group were reviewed by Charles Dunkl—a major

goal being to encourage interaction among the theorists and the applied people who use special functions. The users can provide stimulating new problems while the theorists can promulgate new developments, for example in several variables.

A suggestion from Rahman, that there should be a plenary speaker on the topic of special functions at the annual meetings, will be forwarded to the appropriate organizing committees of SIAM.

Eugene Tomer was introduced as the new Editor of the Group's **Newsletter**. Eugene is an electrical engineer, and also an applied mathematician with a background in dynamical astronomy. He will do desktop publishing on the Macintosh, while SIAM Headquarters will continue to reproduce and distribute the newsletter. The editorial committee will consist of three members: Charles Dunkl, George Gasper, and Eugene Tomer.

There was some discussion about the dissatisfaction felt, especially by the new members, of the considerable delay in getting information on the Group. Thus a new member joining in January would wait several months, because the Newsletter had been previously issued in the Fall while SIAM Headquarters did not send out a membership list until December. And a member paying dues early, in September for example, would not hear anything until the new year.

A plan was therefore established to publish quarterly, with the spring issue appearing about the first of March. This will reduce the delay somewhat and will provide information about our activities and the new members list. But we should continue to press for timely notification of membership in SIAGs by standard means, say an immediate form letter of welcome, accompanied by the complete member list and latest available newsletter.

Electronic communication issues were also addressed. SIAM will soon provide for electronic publication of news items. All members are encouraged to submit an up-to-date e-mail address, if they have not already done so.

It was mentioned that another communication channel is the Approximation Theory Net (AT-Net), which is an independent organization centered at Technion, Israel, and headed by Carl de Boor (Madison) and Allan M. Pinkus (Haifa). Anyone can join this net immediately, receiving items like announcements of meetings and tables of contents of certain journals, such as the Journal of Approximation Theory. To join, send a message to listserv@technion.technion.ac.il with the text consisting of SUB AT-NET (your given name) (your last name).

Probably some Group members have interests which overlap with approximation theory, so they will want to join the AT-Net, but we should still aim to set up our own electronic news net under the auspices of SIAM.

The meeting was adjourned at 11 am.

_____ *SIAM Activity Group* _____
on
Orthogonal Polynomials and Special Functions

CHARLES DUNKL, *Chair*
JET WIMP, *Vice Chair*
MOURAD E.H. ISMAIL, *Program Director*
GEORGE GASPER, *Secretary*

◇

THE PURPOSE *of the Activity Group*
is to promote basic research in orthogonal polynomials and special functions; to further the application of this subject in other parts of mathematics, and in science and industry; and to encourage and support the exchange of information, ideas, and techniques between workers in this field, and other mathematicians and scientists.

The Minisymposium

Here are the topics of the Minisymposium on Special Functions and Their Applications, held Friday, July 24, 1992 at the Century Plaza, and sponsored by our Group. Charles Dunkl and Mourad Ismail were the organizers of the sessions which were well attended.

Morning Session 10:00–12:00 am
"Pages from the Computer Files of R.W. Gosper", by MOURAD E.H. ISMAIL

"A Cubic and a Quintic Summation Formula", by MIZAN RAHMAN

"Orthogonal Polynomials on R^n, Product Formulas, and Hypergroups", by WILLIAM C. CONNETT and ALAN L. SCHWARTZ

"Special Functions on Finite Upper Half Planes", by AUDREY TERRAS

Afternoon Session 1:30–4:00 pm
"Biorthogonality and Continued Fractions", by DAVID MASSON

"Inequalities and Monotonicity properties for Zeros of Hermite Functions", by ÁRPÁD ELBERT and MARTIN E. MULDOON

"Generalized Jacobi Weights, Christoffel Functions, and Jacobi Polynomials", by TAMAS ERDÉLYI, PAUL NEVAI, and ALPHONSE P. MAGNUS

"Weber's Integral Theorem and Singular Solutions for Mixed Boundary Value Problems of Elasticity", by R.P. SRIVASTAV

"Commuting Differential Operators and Special Functions", by ALBERTO GRÜNBAUM

Announcements
Ralph Philip Boas, Jr.
1912–1992

On July 25, 1992, just two weeks before his 80th birthday, Ralph Philip Boas, Jr., died in Seattle. He was Emeritus Henry S. Noyes Professor of Mathematics at Northwestern University.

Ralph Boas was born August 8, 1912, in Walla Walla, Washington. He received his A.B. degree in 1933, and his Ph.D. in 1937 under D.V. Widder, at Harvard University. A two-year National Research Fellowship enabled him to go to Princeton in 1937 to work with Salomon Bochner, and to Cambridge, England in 1938, where he attended lectures by Hardy, Littlewood, and Besicovitch.

During WW II Ralph taught at Duke University, the U.S. Navy Pre-Flight School in Chapel Hill, and also at Harvard University. Then he became a lecturer at M.I.T. in 1948-49, and the Executive Editor of Mathematical Reviews during 1945-50.

Boas became a Professor of Mathematics at Northwestern University in 1950 without having been an Assistant or an Associate Professor. He was an excellent teacher and expositor, and he possessed broad insight and knowledge, not only in his areas of research but about mathematics in general. In 1951-52 he was a Guggenheim Fellow. He wrote almost 200 papers on real and complex analysis. His lucidly written textbooks *Entire Functions* (1954) and *A Primer of Real Functions* (1960) are still being used. Ralph has left a lasting influence on those who knew him and on the mathematical community.

Boas is survived by his wife of 51 years, Mary, Emeritus Professor of Physics at DePaul University; his daughter Anne; and two sons, Ralph, and Harold who will become Full Professor of Mathematics at Texas A&M University as of 1 September.

A memorial service will be held at Northwestern University in the Fall. A more detailed synopsis of Boas's life will appear in a Memorial Issue of the Journal of Mathematical Analysis and Applications.

George Gasper
Northwestern University

Meetings and Conferences

Following the symposia of Bar le Duc in 1984, Segovia in 1986, and Erice in 1990, the 4th International Symposium on Orthogonal Polynomials and Their Applications will be held in Evian, France, October 19 to 23, 1992. The accomodations, as well as the meetings, will be found at the Village-Vacances-Familles (VVF) of Evian, situated on Lac Leman in the French Alps. If you plan to participate, please contact (as soon as possible):

Claude Brezinski, ISOPA4
Laboratoire d'Analyse Numérique

Université des Sciences et Technologies de Lille
59655 Villeneuve d'Ascq Cedex France
e-mail: (labano@frcitl81.bitnet)

The 1994 Congress of Wiskundig Genootschap (Dutch Mathematical Society) will be held in Leiden in April. Richard Askey will give the Stieltjes Lecture. Contact:

Prof. G. Van Dijk
Rijksuniversiteit Leiden
Afdeling Wiskunde en Informatica
P.O. Box 9512
2300 RA Leiden, The Netherlands

From Leuven, Belgium, Walter van Assche informs us that a conference on Rational Approximation will take place in Antwerp sometime in 1993. For information please contact Annie Cuyt (cuyt@ccu.uia.ac.be).

A conference on Applications of Hypergroups and Related Measure Algebras is being planned for the summer of 1993 in Seattle. Contact

Alan L. Schwartz   hypergrp@arch.umsl.edu
Department of Mathematics & C.S.
University of Missouri-St. Louis
St. Louis, MO 63121-4499
(314) 553-6343   Fax: (314) 553-5415

Should you know of any meetings or conferences which might be of interest to the members, please send in the information so it can be posted here.

Abstracts of Contributed Papers

This column is planned for abstracts of upcoming talks or recent papers. The following talk will be given at the December IMACS Conference in Bangalore, India.

"On Computing the Poles and Zeros of a Meromorphic Function by an Extension of the Argument Principle with an Application to Electromagnetic Scattering", by D.V. GIRI and EUGENE TOMER, *Pro* -Tech, 3708 Mt. Diablo Boulevard, Lafayette, CA 94549.

By a constructive method based on an extension of the classical argument principle we compute the poles and zeros of a meromorphic function.

Motivation for this work comes from the computation of the scattering poles of a perfectly conducting object. These are poles of the resolvent of the electric field integral equation, or of the magnetic field integral equation, and they are identified as the exterior natural resonant frequencies of the scatterer. In the case of the sphere, these complex frequencies have been calculated explicitly in terms of special functions, namely Bessel and Hankel functions of order $n + \frac{1}{2}$.

We first give an application of the method to a polynomial of order 20, and to a rational function. Then we compute numerically the natural frequencies of a thin wire antenna, and the input impedance of a biconical antenna.

Problems

Submitted problems may range from elementary to advanced, either solved or unsolved. This gives several possibilities since the proposer need not disclose whether or not the solution is known.

We begin with problem number **1**. The reason for this is that some people use nomenclature like 90–91 to denote problem number 91 in the year 1990, when perhaps they actually mean 91–90; and it is very hard to get excited about problem number E 3384, for example, when you have just worked a long time on E 3348. But we hope to have a famous problem, say number **37**, which will not soon be forgotten.

1. Prove or disprove

$$\prod_{n=1}^{\infty} \frac{\cos{(t/2^n)} - \cos{(\pi 3^n/5)}}{1 - \cos{(\pi 3^n/5)}} = \frac{4\cos(t)}{\sqrt{5} + 5} + \frac{1}{\sqrt{5}}.$$

Submitted by R. William Gosper, August 13, 1992.
2. Is it true that

$$x^2 t^x \, {}_2F_1(x + 1, \, x + 1; \, 2; \, 1 - t)$$

is a convex function of x whenever $-\infty < x < \infty$ and $0 < t < 1$?

Submitted by George Gasper, August 19, 1992.

Solutions

Solutions should appear eventually, whereupon they will be printed together with the original statement of the problem.

Survey of Members

It is becoming clear that the members of the Group represent a fairly wide range of professional interests. We need to have some specific data on this, so a survey seems to be in order. Of course we could send out a questionnaire, but since the Group is pretty small it seems more appropriate that you simply tell us briefly about your professional interests.

In particular we seek answers to the following two questions. *Do you apply the special functions or is your interest theoretical, perhaps both, or neither? Or something else?* Please send your reply and comments to Charles Dunkl by October 15, 1992. We plan to report on the survey in the Winter issue.

Contest for the Logo Design

We considered adopting a logo of some kind, so at the business meeting in Los Angeles it was decided to hold a *Logo Design CONTEST*. The contest will be open to all current members of the group, except for those on the editorial committee of the **Newsletter** since they will be the judges.

The winner will be awarded a *prize*, of course a book on orthogonal functions, namely

Orthogonal Functions by GIOVANNI SANSONE
Dover reprint, 1991.

Please send your entries, along with any comments, to the Editor at the address below by October 15, 1992.

About the Newsletter

The Newsletter is a quarterly publication of the *SIAM Activity Group on Orthogonal Polynomials and Special Functions*. To join the Group, please contact

Society for Industrial and Applied Mathematics

3600 University City Science Center
Philadelphia, PA 19104-2688

(215) 382-9800   service@siam.org

Like all newsletters, this one needs more input from the members it is supposed to serve. For example how about submitting an abstract of your latest paper, or of your upcoming talk; or how you plan to spend the summer, who is visiting from where, and things like that. Send your contributions for the Winter Edition by October 15, 1992 to the Editor (note his new e-mail address)

Eugene Tomer
1691 –11th Avenue
San Francisco, CA 94122
Tel/Fax: (415) 665-9555
etomer@netcom.com   (new e-mail address)

Or, if you prefer, you may send them to the Chair of the Activity Group

Charles Dunkl
Department of Mathematics
University of Virginia
Charlottesville, VA 22903
(804) 924-4939   Fax: (804) 982-3084
cfd5z@virginia.edu

Even if there is no news, let us hear from you anyway. You may be in good company.

Members

Javad Abdollahi-Alibeik
2385-1 Bishop Street
Ann Arbor MI 48105
javad@caen.engin.umich.edu

Andrew A Allers
University of Delaware
Dept of Math Sciences
501 Ewing Hall
Newark DE 19716
(302) 451-2346
allers@brahms.udel.edu

Mohammed A Al-Mohimeed
856 Carriage Road
Pittsburgh PA 15220
maast16@vms.cis.pitt.edu

Felix M Arscott
University of Manitoba
Department of Applied
Mathematics
Winnipeg R3T 2N2
Manitoba, Canada
(204) 474-9789

Richard A Askey
University of Wisconsin
Department of Mathematics
480 Lincoln Drive
Madison WI 53706-1313
askey@math.wisc.edu

Johannes Boersma
Technical University Eindhoven
Department of Mathematics
P O Box 513
5600 MB Eindhoven
Netherlands

R G Buschman
University of Wyoming
Department of Mathematics
Box 3036, University Station
Laramie WY 82071-3036
(307) 766-4321
euler@uwyo.bitnet

Rafael Gonzalez Campos
Universidad Michoacana
Escuela de Fisica y Matematica
Morelia Michoacan 58060
Mexico
451 283 28
campos@unamvm1

Bille C Carlson
Iowa State University
Ames Laboratory
136D Wilhelm Hall
Ames IA 50011
(515) 294-9311
bccarlson@alisuvax.bitnet

Martha A Carter
1705 N Central Drive
Beavercreek OH 45432
(513) 257-3468
mac05@iss1.af.mil

Simon N Chandler-Wilde
University of Bradford
Dept of Civil Engineering
West Yorkshire BD7 1DP
Great Britain
0274 733466 X 8236
sn.chandler-wilde@uk.ac.
bradford

Andrew M Chapman
13 1010 W Clark Street
Urbana IL 61801-2472
(216) 244-8343
chapman@dirac.scs.uiuc.edu

Abdellatif Charafi
Wessex Institute of Technology
Dept of Computational
Mechanic
Ashurst Lodge, Ashurst
Southampton S04 2AA
Great Britain
44-0703-293223
ac@uk.ac.rl.ib

Debao Chen
University of Texas
Department of Mathematics
Austin TX 78712
(512) 471-7711 X192
chen@math.utexas.edu

Serge N Colombo
8 Rue d'Aquitaine
92160 Antony
France

Davis K Cope
North Dakota State University
Mathematical Science Division
P O Box 5075
Fargo ND 58105-5075

Laurence M Dang
Apt 25
2380 Homestead Road
Santa Clara CA 95050
(408) 748-9955

Blaise P DeSesa
3620 Baring Street
Philadelphia PA 19104
(215) 895-1949

Mathijs S Dijkhuizen
Centrum voor Wiskunde Inform
PO Box 4079
1009 AB Amsterdam
Netherlands
(20) 5928020
thijs@cwi.nl

Charles F Dunkl
University of Virginia
Department of Mathematics
Mathematics Astronomy Bldg
Charlottesville VA 22903
cfd5z@virginia.edu

Oliver G Ernst
817 Santa Fe Ave
Stanford CA 94305-1022

John C Fenley
1333 W Greenleaf Ave
Chicago IL 60626-2959

I Fischer
Naval Postgraduate School
Department of Mathematics
Monterey CA 93943
(408) 646-2089

George Gasper Jr
Northwestern University
Department of Mathematics
Evanston IL 60208-2730
(312) 492-5592
george@math.nwu.edu

Jeffrey S Geronimo
Georgia Institute Technology
School of Mathematics
Atlanta GA 30332
(404) 853-9218
geronimo@math.gatech.edu

Rene Girard
15 High Drive
Saint John E2J 4K7
New Brunswick, Canada

Zbigniew Grabowski
University of Connecticut
U-139me
Storrs CT 06269-3139

John Gray
PO Box 489
Dahlgren VA 22448-0489

Hans Joachim Haubold
United Nations
Outer Space Division
Room S-3260B
New York NY 10017
(212) 963-6570
hjh2@pinet.aip.org

Wilhelm Heinrichs
Heinrich-Heine-Universitat
Mathematisches Institut
Universitatsstr 1
D-4000 Dusseldorf 1
Germany
0211 311 2155
wheinric@dd0rud81

Steven L Hodge
3137 Tyre Neck Road
Chesapeake VA 23321

Chang-Ming Huang
#K103
2501 Lake Austin Blvd
Austin TX 78703
cmano43@hermes.chpc.utexas.edu

Yasubiko Ikebe
University Tsukuba
Inst of Information Scienes &
Electronics
Ibaraki 305
Japan
0298-53-5187
ikebe@is.tsukeba.ac.jp

Tetsuo Inoue
Kobe Univ of Mercantile Marine
Dept of Applied Mathematics
Fukae-Minami, Higashinada-ku
Kobe, 658
Japan

Soren S Jensen
11818 Snow Patch Way
Columbia MD 21044-4414
(301) 455-3294
jensen@umbcl.umbc.edu

Robert (Max) W Jones
Hewlett-Packard Company
1000 NE Circle Blvd
Corvallis OR 97330
(503) 750-3899
maxi@cv.hp.com

William B Jones
University of Colorado
Department of Mathematics
Campus Box 426
Boulder CO 80309-0426
(303) 492-6569

Yimin Kang
Clarkson University
Department of Mathematics
Potsdam NY 13676
(315) 268-2399
kangy@sun.mcs.clarkson.edu

Mendel B Kapilevich
Apt 553
40 Wallingford Rd
Brighton MA 02135-4745

Philip C Kenny
618 Benvenue Ave
Los Altos CA 94024
(408) 894-4349

Haidar G Khajah
PO Box 66814
Bayan - 43759
Kuwait

Valery A Kholodnyi
Maharishi International Univ
MIU Box 239
Fairfield IA 52556-0239
(515) 472-1162

Harry A Kiesel
1010 Wellington Road
Jenkintown PA 19046
(215) 947-6844

Members (continued)

Tom H Koornwinder
University of Amsterdam
Dept of Math and Computer Sci
Plantage Muidergracht 24
1018 TV Amsterdam
Netherlands
31-20-525 5297
thk@fwi.uva.nl

Mark D Ladd
4608 Galapagos Drive
Austin TX 78749
(512) 835-3306

Alan G Law
University of Regina
Department of Computer
Science
Regina S4S 0A2
Saskatchewan, Canada
(306) 584-4682

George Ledin Jr
PO Box 2108
Rohnert Park CA 94927-2108
(707) 664-2667
george.ledin.jr@sonoma.edu

Jane A Lenehan
Seskin, Iona Drive
North Circle Road
Limerick
Ireland
353-61-333644
lenehanj@ul.ie

James R Lierzer
MIT
NW16, Room 139
167 Albany Street
Cambridge MA 02139
(617) 253-0835
lierzer@nerus.pfc.mit.edu

Doron S Lubinsky
Witwatersand University
Department of Mathematics
P O Wits 2050
Johannesburg
Republic of South Africa

Edvardo Godoy Malvar
E T S Ingenieros Industrales
Department de Matematica
Appli
Apartado de Correos 62
Vigo
Spain

Francisco Marcellan
C1 San Gerardo 3 - 11 C
28035 Madrid
Spain
34(1)624-9442

David R Masson
University of Toronto
Department of Mathematics
Toronto M5S 1A1
Ontario, Canada
416-978-4868

John T Masterson
Seton Hall University
Department of Mathematics &
Computer Science
South Orange NJ 07079

Peter A McCoy
US Naval Academy
Department of Mathematics
Annapolis MD 21402-5002
(301) 267-2300
pam@math2.sma.usna.navy.mil

Reinhard Mennicken
Universitat Regensburg
NWFI - Mathematik
8400 Regensburg 1
Germany
49 941 943 2992
mennicken@vaxl.rz.uni-
regensburg.dbp.de

Willard Miller Jr
University of Minnesota
Inst for Math & Applications
514 Vincent Hall
Minneapolis MN 55455
(612) 624-6066
miller@ima.umn.edu

Marius S Mitrea
University of South Carolina
Department of Mathematics
Columbia SC 29208
(803) 777-6686
mitrea@milo.math.scarolina.edu

Martin E Muldoon
York University
Dept of Math & Stats
4700 Keele Street
North York M3J 1P3
Ontario, Canada
muldoon@vm1.yorku.ca

James A Mullen
337 S Main Street
Cohasset MA 02025-2028
(617) 383-1993

Edward G Neuman
Southern Illinois University
Department of Mathematics
Carbondale IL 62901
(618) 453-6501
ga3856@siucvmb.bitnet

Paul Nevai
PO Box 3341
Columbus OH 43210-0341
(614) 292-3317
nevai@ohstpy(BITNET)

Adri B Olde Daalhuis
Kruislaan 413
1098 SJ Amsterdam
Netherlands
aod@curing.cwi.nl

Lawrence J Osborne
Lamar University
Dept of Computer Science
P O Box 10056
Beaumont TX 77710-0056
(409) 880-8778
osborne@lub001.lamar.edu

Nuri Ozalp
Univ of Southwestern Louisiana
Box 43708
Lafayette LA 70504
(318) 231-5303

Sotirios Nick Papakostas
Mesologiou 92 Str
Athens 17456
Greece
(30)-1-7784542
spapakos@theseas.ntua.gr

Peter Paule
RISC-Johannes Kepler Univ
Institute for Mathematics
A-4040 Linz
Austria
7236-3231-40
k316230@aearn.bitnet

Robert W Peszek
1A
5910 Franklin Ave
Baltimore MD 21207-5049
(301) 455-2968
rpeszek@titan1.math.umbc.edu

Paul I Peterson
Woodward Governor Co
PO Box 7001
Rockford IL 61125-7001
(815) 877-7441

G Edric Phillips
555-1402 Main Street
New York NY 10044-0151

Michael D Phillips
553 B Connor Road
West Point NY 10996-1235

Louise E Que
PO Box 1545
Kingston RI 02881-0490

Brenda J Quintyne
19402 100th Ave
Hollis NY 11423-3212

Eric Todd Quinto
Tufts University
Department Of Mathematics
Medford MA 02155
(617) 381-3402
equinto@tufts.bitnet

M Mizanur Rahman
Carlton University
Dept of Math & Statistics
Ottawa, Ontario K1S 5B6
Ontario, Canada
613-788-2137
mizan_rahman@carleton.ca

Theodore J Rivlin
IBM Research
PO Box 218
Yorktown Height NY 10598-
0218

William M Robertson
2 April Ln
Lexington MA 02173-8112
wmrobertson@draper.com

Kelly S Robinson
42 Matthew Dr
Fairport NY 14450-9335
(716) 477-4951
krobinsn@kopakr.kodak.com

Ernest E Rothman
Cornell University
Advanced Computing Res Inst
730 Eng & Theory Center Bldg
Ithaca NY 14853-3801
(607) 254-8788
erothman@theory.tc.cornell.edu

Marc Rouff
LGEP/CNRS-ESE
Plateau du Moulon
F-91192 Gif Sur Yvette Cedex
France
33-1-69418040 x1871

Otto George Ruehr
Michigan Technical University
Department of Mathematics
Houghton MI 49931

Jesus Sanchez-Dehesa
Universidad de Granada
Facultad De Ciencias
Departamento de Fisica Nuclear
18071 Granada
Spain
34-58-24-32-15
dehesa@ugr.es

Members (continued)

Venkat V S S Sastry
28 Cockroft Road
Didcot
Oxon OX11 8LH
Great Britain

Alan L Schwartz
University of Missouri
Dept of Mathematical Sciences
8001 Natural Bridge Road
St Louis MO 63121-4401
(314) 553-6343
schwartz@arch.umsl.edu

Sebastiano Seatzu
Universita di Cagliari
Dipartimento di Matematica
Viale Merello, 92
09123 Cagliari
Italy

John E Snyder Jr
9201 Central N W
Albuquerque NM 87121
(505) 277-6161
jsnyder@gauss.unm.edu

Alex Solomonoff
Brown University
Div of Applied Mathematics
Box F
Providence RI 02912
(401) 863-2510
als@cfm.brown.edu

Sam E Speed Jr
86 Godsey Rd
Bristol TN 37620-5738
(615) 652-5954

Dylan B Spratling
21732 Audrey St
Dearborn MI 48124-2909
(313) 277-4976

Herbert R Stahl
Technische Fachhochschule
Berlin/FB2
Luxemburgerstrasse 10
D-1000 Berlin 65
Germany
49 30 802 9552

Joel A Storch
Draper Lab
555 Technology Sq
M S 4C
Cambridge MA 02139-3539
(617) 258-2355
storch@draper.com

Wim F Sweldens
University of South Carolina
Department of Mathematics
Columbia SC 29208
(803) 777-6456
na.sweldens@na-net.ornl.gov

Randall J Swift
University of California
Department of Mathematics
Riverside CA 92521
(714) 787-6478
rswift@ucrmath.ucr.edu

Ian A Taylor
6034 SW Jan Tree Ct
Portland OR 97219-1153

Nico M Temme
C W I
PO Box 4079
1009 AB Amsterdam
Netherlands
31-20-5928020
nicot@cwi.nl

Audrey A Terras
University of California
Mathematics Department C-012
La Jolla CA 92093-0112
(619) 534-2639
aterras@ucsd.edu

Henry C Thacher Jr
924 W Cliff Drive
Santa Cruz CA 95060-6460
(408) 429-8710

William H Thomas II
138 Brownell Circle
Monterey CA 93940-4844
(408) 646-3079
8012p@navpgs

Eugene R Tomer
1691 11th Avenue
San Francisco CA 94122-3626
etomer@netcom.com
(415) 665-9555

Richard J Travers
320 Peabody Drive
Hampton VA 23666
(804) 826-5692

Marietta J Tretter
Texas A & M University
Business Analysis
College Station TX 77843-4217
(409) 845-1383
tretter@tamcba.bitnet

Stephen John Turner
California Inst of Technology
Mail Code 217-50
Pasadena CA 91125
(818) 564-9226
st@caltech.ama.edu

Galliano Valent
LPTHE
Tour 24, 5e etage
2 Place Jussieu
75251 Paris Cedex 05
France
43-543-717
valent@frcpnm

Walter J Van Assche
Katholieke Universiteit
Departement Wiskunde
Celestijnenlaan 200 B
B-3001 Leuven
Belgium
(32) 16-200656
fgaee03@cc1.kuleuven.ac.be

Andrew H Van Tuyl
1000 W Nolcrest Drive
Silver Spring MD 20903-5000

Elinor L Velasquez
University of California
Department of Mathematics
Berkeley CA 94720
(510) 643-5587
velasque@math.berkeley.edu

Hans E Wallin
University of Umea
Department of Mathematics
S-90187 Umea
Sweden
4690-165216
mathw@biovax.umdc.umn.se

Janis E White
Benchmark Environmental Corp
Suite 105
4501 Indian School Road NE
Albuquerque NM 87110
(505) 262-2694

James A Wilson
Iowa State University
Department of Mathematics
Ames IA 50011
(515) 294-8170

Franklin P Witte
6808 S Magnolia Ct
Englewood CO 80112-1037
(303) 971-8708

Jerry D Woods
PO Box 7188
San Diego CA 92167-0188

Frank Wuebbeling
Westfaelische Wilhelms Univ
Inst Fuer Angewandte Math
Einsteinstrasse 62
D 4400 Muenster
Germany
0049 251 83-3795
onm29@dmswwu1a.bitnet

Yajun Yang
334 Hawkeye Court
Iowa City IA 52246
(319) 351-5509
yang@math.uiowa.edu

Ahmed I Zayed
University of Central Florida
Department of Mathematics
Orlando FL 32816

George Zweig
Signition Inc
PO Box 1020
Los Alamos NM 87544-1020
(505) 455-2789
zweig@oracle.lanl.gov