Papers dedicated to Idun Reiten
on the occasion of her
60th birthday

Contents

Preface

To honour Idun Reiten on her sixtieth birthday all her friends and colleagues were invited to submit the papers they intended to dedicate to Idun on this occasion, to be included in an exclusive volume. As a result we received 53 papers by 80 authors/coauthors (at least two more papers did not make the deadline for this preliminary volume[1]). All these papers will appear in different journals, so it is only in this volume that they appear together.[2] When a reprint of all papers become available, these will be collected to an exclusive bounded volume to be presented to Idun.

Idun Reiten celebrates her sixtieth birthday on Tuesday 1st January 2002. She received her PhD at the University of Illinois in 1971 as a student of Robert Fossum (see page ix for her mathematical family tree). In 1982 she was appointed a professor in Trondheim, at what is now called NTNU. She has so far authored/coauthored almost 100 papers in a variety of topics within algebra. The main topics of her work have been the representation theory of artin algebras and more general ring and module theory, including commutative ring theory and the theory of orders. Homological methods have been central in much of her work. There are relations to Schur algebras, Koszul algebras, noncommutative algebraic geometry and triangulated categories. Her work with Maurice Auslander on almost split sequences (later also called Auslander-Reiten sequences) is one of the major milestones. The importance of this concept is illustrated by the fact that it is now given a separate number within the The Mathematics Subject Classification (MSC2000). In 1998 she was an invited speaker at the International Congress of Mathematicians in Berlin.

Idun is a popular and brilliant teacher. She has supervised four students for PhD and 16 students for master degree (some jointly with others). We, her students and colleagues, have learned to appreciate Idun's lectures and mathematical conversations. Both for the clarity in her presentation, and for revealing to us, her underlying joy of doing, discussing and teaching mathematics.

On behalf of all our friends and colleagues, the representation theory group in Trondheim greets Idun on her birthday. We look forward to having her as a teacher, collaborator and friend in the years to come. We also hope and believe that she will continue to challenge us at the blackboard (and for some of us: even at the tennis-court) also in the future. From all of us:

Happy Birthday

[1] Jan Erik Roos, *Modules with strange homological properties and Chebychev polynomials* and a paper by Fred von Oeystayen and a coauthor.

[2] The different papers are listed in the table of contents, and the list of contributors is on page xi. There is a variety of topics included in this volume and no attempt is done to group them in any particular way beyond arranging them in alphabetically order according to the first author of each paper.

Idun's mathematical family quiver

Part 1: Idun as a leaf

$$\begin{tikzcd}
& \text{Joseph Lagrange} \arrow[dl] \arrow[dr] & \\
\text{Simeon Poisson} \arrow[dr] & & \text{Jean-Baptiste Fourier} \arrow[dl] \\
& \text{Gustav Dirichlet} \arrow[dl] & \\
\text{Rudolf Lipschitz} \arrow[dr] & & \text{Julius Plücker} \arrow[dl] \\
& \text{C. Felix Klein} \arrow[d] & \\
& \text{Frank Cole} \arrow[d] & \\
& \text{Eric Bell} \arrow[d] & \\
& \text{Morgan Ward} \arrow[d] & \\
& \text{Robert Dilworth} \arrow[d] & \\
& \text{Jack McLaughlin} \arrow[d] & \\
& \text{Robert Fossum} \arrow[d] & \\
& \text{Idun Reiten} &
\end{tikzcd}$$

Part 2: Idun as a root

$$
\begin{tikzcd}
 & \text{Idun Reiten} \arrow[dl] \arrow[d] \arrow[dr] \arrow[drr] & & \\
\text{Brit Rohnes} & \text{Øyvind Solberg} \arrow[d] & \text{Ingvill M. Holden} & \text{Inger H. Slungård} \\
 & \text{Aslak B. Buan} & &
\end{tikzcd}
$$

List of contributors

Henning Haahr Andersen, Department of Mathematics, University of Aarhus, Building 530, Ny Munkegade, 8000 Aarhus C, Denmark; E-mail address: mathha@imf.au.dk

Lidia Angeleri-Hügel, Mathematisches Institut der Universität, Theresientrasse 39, D-80333 München, Germany; E-mail address: angeleri@rz.mathematik.uni-muenchen.de

Hideto Asashiba, Department of Mathematics, Osaka City University, 3-3-138 Sugimoto, Sumiyoshi-ku, Osaka, 558-8585, Japan; E-mail address: asashiba@sci.osaka-cu.ac.jp

Ibrahim Assem, Département de Mathématiques et d'Informatique, Université de Sherbrooke, Sherbrooke, Québec, Canada, J1K 2R1; E-mail address: ibrahim.assem@dmi.usherb.ca

Luchezar L. Avramov, Department of Mathematics, Purdue University, West Lafayette, Indiana 47907; E-mail address: avramov@math.purdue.edu

Raymundo Bautista, Instituto de Matemáticas, UNAM, Campus Morelia, Mexico; E-mail address: raymundo@matmor.unam.mx

Christine Bessenrodt, Fakultät für Mathematik, Otto-von-Guericke-Universität Magdeburg, D-39016 Magdeburg, Germany; E-mail address: bessen@mathematik.uni-magdeburg.de

Vitalij M. Bondarenko, Institute of Mathematics, Tereshchenkivska 3, 01601 Kiev, Ukraine; E-mail address: vit-bond@imath.kiev.ua

Sheila Brenner, Department of Mathematical Sciences, The University of Liverpool, Liverpool, L69 7ZL, UK; E-mail address: sbrenner@liv.ac.uk

Kenneth A. Brown, Department of Mathematics, University of Glasgow, Glasgow G12 8QW, Scotland; E-mail address: kab@maths.gla.ac.uk

Thomas Brüstle, Fakultät für Mathematik, Universität Bielefeld, P.O.Box 100 131, D-33501 Bielefeld, Germany; E-mail address: bruestle@mathematik.uni-bielefeld.de

Aslak Bakke Buan, Institutt for matematiske fag, NTNU, N-7491 Trondheim, Norway; E-mail address: aslakb@math.ntnu.no

Ragnar O. Buchweitz, Department of Mathematics, University of Toronto, Toronto, Ontario, Canada M5S 3G3; E-mail address: ragnar@math.toronto.edu

Michael C. R. Butler, Department of Mathematical Sciences, The University of Liverpool, Liverpool, L69 7ZL, UK; E-mail address: mcrb@liv.ac.uk

Jon Carlson, Department of Mathematics, University of Georgia, Athens, Georgia, 30602, USA; E-mail address: jfc@math.uga.edu

Flávio U. Coelho, Instituto de Matemática e Estátistica, Universidade de São Paulo, Rua do Matão 1010, 05508-900, São Paulo, SP, Brasil; E-mail address: fucoelho@ime.usp.br

William Crawley-Boevey, Department of Pure Mathematics, University of Leeds, Leeds LS2 9JT, UK; E-mail address: w.crawley-boevey@leeds.ac.uk

Bangming Deng, Department of Mathematics, Beijing Normal University, Beijing 100875, P. R. China; E-mail address: dengbm@bnu.edu.cn

Gabrielle D'Este, Dipartimento di Matematica, Universit di Milano, via Saldini 50, 20133 Milano, Italy; E-mail address: gabriella.deste@mat.unimi.it

Stephen Donkin, School of Mathematical Sciences, Queen Mary, University of London, Mile End Rd., London E1 4NS, England; E-mail address: s.donkin@qmw.ac.uk

Yuri Drozd, Department of Mechanics and Mathematics, Kyiv taras Shevchenko University, Volodimirska 64, 01033 Kiev, Ukraine; E-mail address: unialg@ln.ua

Rolf Farnsteiner, Department of Mathematics, University of Wisconsin, Milwaukee, WI 53201, USA; E-mail address: rolf@uwm.edu

Elsa Fernandez, Facultad de Ingeniería, Universidad Nacional de la Patagonia San Juan Bosco, 9120 Puerto Madryn, Argentina; E-mail address: unonetti@cenpat.edu.ar

Christof Geiss, Instituto de Matemáticas, UNAM, 04510 México DF, MEXICO; E-mail address: christof@math.unam.mx

Ken Goodearl, Department of Mathematics, University of California, Santa Barbara, CA 93106, USA ; E-mail address: goodearl@math.ucsb.edu

Iain Gordon, Department of Mathematics, University of Glasgow, Glasgow G12 8QW, Scotland; E-mail address: ig@maths.gla.ac.uk

Jin-Yun Guo, Department of Mathematics, Hunan Normal University, Changsha 410006, P R China; E-mail address: gjy@sparc2.hunnu.edu.cn

Dieter Happel, Fakultät für Mathematik, Technische Universität Chemnitz, D-09107 Chemnitz, Germany; E-mail address: happel@mathematik.tu-chemnitz.de

Lutz Hille, Mathematisches Seminar der Universität Hamburg, 20146 Hamburg, Germany; E-mail address: hille@math.uni-hamburg.de

François Huard, Division of Natural Sciences and Mathematics, Bishop's University, Lennoxville, Quebec, Canada, J1M 1Z7; E-mail address: fhuard@ubishops.ca

Birge Huisgen-Zimmermann, Department of Mathematics, University of California, Santa Barbara, CA 93106, USA; E-mail address: birge@math.ucsb.edu

Stanisław Kasjan, Faculty of Mathematics and Computer Science, Nicholas Copernicus University, Chopina 12/18, 87-100 Toruń, Poland; E-mail address: skasjan@mat.uni.torun.pl

Bernard Keller, UFR de Mathematiques, URA 748 du CNRS, Case 7012, Universit Paris 7, 2, place Jussieu, 75251 Paris Cedex 05, France; E-mail address: keller@math.jussieu.fr

Otto Kerner, Mathematische Institute, Heinrich-Heine-Universität, D–40225 Düsseldorf, Germany; E-mail address: kerner@math.uni-duesseldorf.de

Ellen Kirkman, Department of Mathematics, P. O. Box 7388, Wake Forest University, Winston-Salem, NC 27109, U.S.A.; E-mail address: kirkman@mthcsc.wfu.edu

Mark Kleiner, Department of Mathematics, Syracuse University, Syracuse, New York 13244, USA; E-mail address: mkleiner@mailbox.syr.edu

Henning Krause, Fakultät für Mathematik, Universität Bielefeld, D-33501 Bielefeld, Germany; E-mail address: henning@mathematik.uni-bielefeld.de

Dirk Kussin, Fachbereich 17 Mathematik, Universität Paderborn, D–33095 Paderborn, Germany; E-mail address: dirk@math.uni-paderborn.de

James Kuzmanovich, Department of Mathematics, P. O. Box 7388, Wake Forest University, Winston-Salem, NC 27109, USA; E-mail address: kuz@wfu.edu

Tom Leangan, J.C.M.B., Kings Buildings, Mayfield Road, Edinburgh EH9 3JZ, Scotland; E-mail address: tom@maths.ed.ac.uk

Lieven Le Bruyn, Universiteit Antwerpen (UIA), B-2610 Antwerp, Belgium; E-mail address: lebruyn@uia.ua.ac.be

Helmut Lenzing, Fachbereich Mathematik-Informatik, Universität-GH Paderborn, D-33095 Paderborn, Germany; E-mail address: helmut@uni-paderborn.de

Libin Li, Department of Mathematics, Yangzhou University, Yangzhou 225002, P R China; E-mail address: lbli324@yahoo.com

Shiping Liu, Département de mathématiques, Université de Sherbrooke, Sherbrooke, Québec, Canada J1K 2R1; E-mail address: shiping@dmi.usherb.ca

Eduardo Do N. Marcos, Departamento de Matemática, Universidade de São Paulo, Caixa Postal 66.281, São Paulo – SP, 05315–970, Brasil; E-mail address: enmarcos@ime.usp.br

Alex Martsinskovsky, Department of Mathematics, Northeastern University, Boston, Massachusetts 02115; E-mail address: alexmart@neu.edu

Hagen Meltzer, Fachbereich 17 Mathematik, Universität Paderborn, D–33095 Paderborn, Germany; E-mail address: meltzer@math.uni-paderborn.de

Héctor A. Merklen, Departamento de Matemática, Universidade de São Paulo, Caixa Postal 66.281, São Paulo – SP, 05315–970, Brasil; E-mail adderss: merklen@ime.usp.br

Sebastian Nowak, Faculty of Mathematics and Informatics, Nicholas Copernicus University, 87-100 Toruń, Poland; E-mail address: sebcio@mat.uni.torun.pl

Frank Okoh, Department of Mathematics, Wayne State University, Detroit, Michigan 48202, USA; E-mail address: okoh@math.wayne.edu

Don S. Passman, Department of Mathematics, University of Wisconsin, Madison, Wisconsin 53706, USA; E-mail address: passman@math.wisc.edu

José A. de la Peña, Instituto de Matemáticas, UNAM, Circuito Exterior, Ciudad Universitaria, México 04510, D. F., México; E-mail address: jap@penelope.matem.unam.mx

Ines Maria Platzeck, Departamento de Matemática, Universidad Nacional del Sur, 8000 Bahía Blanca, Argentina; E-mail address: impiovan@criba.edu.ar

Fred von Oeystayen, Department of Mathematics, Universitaire Instelling Antwerpen, Universiteitsplein 1, B-2610 Wilrijk, Belgium; E-mail address: francin@wins.uia.ac.be

Zygmunt Pogorzaly, Faculty of Mathematics and Computer Science, Nicholas Copernicus University, Chopina 12/18, 87-100 Toru‘n, Poland; E-mail address: zypo@mat.uni.torun.pl

Claus M. Ringel, Fakultät für Mathematik, Universität Bielefeld, POBox 100 131, D-33 501 Bielefeld, Germany; E-mail address: ringel@mathematik.uni-bielefeld.de

Klaus Roggenkamp, Fakultät Mathematik, Universität Stuttgart, Pfaffenwaldring 57, D–70550 Stuttgart, Germany; E-mail address: Roggenkamp@mathematik.uni-stuttgart.de

Gerhard Röhrle, School of Mathematics and Statistics, The University of Birmingham, Birmingham B15 2TT, UK; E-mail address: ger@for.mat.bham.ac.uk

Jan Erik Roos, University of Stockhoolm, Department of Mathemhatics, Box 6701, S-113 85 Stockholm, Schweden; E-mail address: jeroos@matematik.su.se

Wolfgang Rump, Mathematisch-Geographische Fakultät, Katholische Universität Eichstätt, Ostenstrasse 26-28, D-85072 Eichstätt, Germany; E-mail address: wolfgang.rump@ku-eichstaett.de

Corina Sáenz, Departamento de Matemáticas, Facultad de Ciencias, U.N.A.M., Circuito Exterior, Ciudad Universitaria, C.P. 04510, México, D.F. Mexico; E-mail address: ecsv@lya.fciencias.unam.mx

Manuel Saorin, Departamento de Mátematicas, Universidad de Murcia, 30100 Espinardo-MU, Spain; E-mail address: msaorinc@fcu.um.es

Markus Schmidmeier, Department of Mathematical Sciences, Florida Atlantic University, Boca Raton, Florida 33431-0991, USA; E-mail address: mschmidm@fau.edu

Jan Schröer, Department of Pure Mathematics, University of Leeds, Leeds LS2 9JT, UK; E-mail address: jschroer@maths.leeds.ac.uk

Daniel Simon, Faculty of Mathematics and Informatics, Nicholas Copernicus University, 87-100 Toruń, Poland; E-mail address: simson@mat.uni.torun.pl

Andrzej Skowronski, Faculty of Mathematics and Informatics, Nicholas Copernicus University, Chopina 12/18, 87-100 Toruń, Poland; E-mail address: skowron@mat.uni.torun.pl

Sverre O. Smalø, Institutt for mathematiske fag, NTNU, N–7491 Trondheim, Norway; E-mail address: sverresm@math.ntnu.no

Øyvind Solberg, Institutt for matematiske fag, NTNU, N-7491 Trondheim, Norway; E-mail address: oyvinso@math.ntnu.no

Sonia Trepode, Departamento de Matemáticas, Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Mar del Plata, Funes 3350, 76 000 Mar del Plata, Argentina; E-mail address: strepode@mdp.edu.ar

Jan Trlifaj, Katedra algebry MFF UK, Sokolovská 83, 186 75 Prague 8, Czech Republic; E-mail address: trlifaj@karlin.mff.cuni.cz

Luise Unger, FernUniversität Hagen, Fachbereich Mathematik, D 58084 Hagen, Germany; E-mail address: Luise.Unger@FernUni-Hagen.de

Katsuhiro Uno, Department of Mathematics, Osaka University, Toyonaka, Osaka, 560-0043 Japan; E-mail address: uno@math.wani.osaka-u.ac.jp

Michel Van den Bergh, Department WNI, Limburgs Universitair Centrum, 3590 Diepenbeek, Belgium; E-mail address: vdbergh@luc.ac.be

Changchang Xi, Department of Mathematics, Beijing Normal University, 100875 Beijing, P.R.China; E-mail address: xicc@bnu.edu.cn

Jie Xiao, Department of Mathematics, Beijing Normal University, Beijing 100875, P R China; E-mail address: jxiao@math.tsinghua.edu.cn

Kunio Yamagata, Tokyo University of Agriculture and Technology, Naka-cho 2-24-16, Koganei, Tokyo 184-8588, Japan; E-mail address: yamagata@cc.tuat.ac.jp

Dan Zacharia, Department of Mathematics, Syracuse University, Syracuse, New York 13244, USA; E-mail address: zacharia@mailbox.syr.edu

Xiangyong Zeng, Department of Mathematics, Beijing Normal University, 100875, People's Republic of China, E-mail address: xyzeng424@263.net

Pu Zhang, Department of Mathematics, University of Science and Technology of China, Hefei 230026, P R China; E-mail address: pzhang@ustc.edu.cn

Yingbo Zhang, Department of Mathematics, Beijing Normal University, Beijing 100875, P R China; E-mail address: zhangyb@bnu.edu.cn

Alexander Zimmermann, Faculté de Mathématiques et CNRS (LAMFA FRE 2270), Université de Picardie Jules Verne, 33, rue St Leu, 80039 Amiens, FRANCE; E-mail address: alexander.zimmermann@u-picardie.fr

Rita Zuazua, Instituto de Matemáticas, UNAM, Campus Morelia, Mexico; E-mail address: zuazua@matmor.unam.mx