

Material for the Annual Report 2014

Christer O. Kiselman

1. Writings

1.1. Publications (registered in DiVA)

14-1. Kiel rekoni rektojn kaj strekojn inter ĉiuj kurboj kaj aliaj bildoj sur la komputila ekrano? **In:** *Prelegaro, Volume II. Internacia Simpozio “Apliko de Esperanto en la profesia agado”*, pp. 72–92. Formal year of publication 2013; actual year of publication 2014. Karlovo: Akademio Internacia de la Sciencoj. (Text based on a lecture in Sopot on 2010 June 12.)

14-2. Questions inspired by Mikael Passare’s mathematics. *Afrika Matematika* **25**, issue 2 (2014), 271–288.

14-i. Pierre Lelong 1912–2011. *Nordisk Matematisk Tidskrift, Normat* **60**, No. 2, 70–81. Formal year of publication 2012; actual year of publication 2014.

14-ii. Låt oss förbättra samfundets ekonomi! [Let us improve the economy of the Swedish Math Society!] Letter to the Editor of the Society’s *Bulletin. SMS-bulletinen* 2014 February, pp. 12–13.

14-iii. Stärk Normat genom att vidga dess bas! [Strengthen Normat by widening its base!] Letter to the Editor of the Society’s *Bulletin. SMS-bulletinen* 2014 February, p. 13.

1.2. Articles accepted for publication

Euclid’s straight lines. *Nordisk Matematisk Tidskrift, Normat* **62**, No. 4, 145–170. Accepted on 2013 October 09. To appear in 2015; formal year of publication 2014.

Estimates for solutions to discrete convolution equations. Accepted on 2014 November 02 for publication in *Mathematika*.

1.3. Submitted manuscripts

Christer O. Kiselman; Samieinia, Shiva. Convexity of marginal functions in the discrete case (20 pages). Submitted 2014-11-09.

Weak lineal convexity (17 pages). Submitted 2014-11-27.

2. Invited talks

2.1. Invitation to İstanbul

Invited to Sabancı Üniversitesi, İstanbul, 2014-03-12 — 2014-03-17, by Mert Çağlar. Invited lecture at the Istanbul Seminar, Karaköy Center, 2014-03-14: *Lineal convexity*.

2.2. Invitation to Linnaeus University, Växjö Campus

2014-03-18 — 2014-03-19. Invited by Börje Nilsson, who organized a Round Table Meeting on thesis advising. My introduction: *Thoughts on advising*.

2.3. Invitation to the Universal Esperanto Association, Rotterdam

2014-05-10 — 2014-05-11. Invited by Osmo Buller, General Director of the Universal Esperanto Association. Invited talk on 2014-05-11 at the Open Day of the Universal Esperanto Association.

2.4. Symposium for Lars-Olof Sundelöf

A symposium organized by the Royal Society of Sciences. Invited talk: *Matematiskorum*. The text will be published in a proceedings volume honoring Lars-Olof Sundelöf.

2.5. Constructive Approximation of Functions

Conference at Bedlewo Palace, Poland, 2014-06-30 — 2014-07-05. Invited talk: *Weak lineal convexity*.

2.6. Participation in the Universala Kongreso de Esperanto, Buenos Aires

2014-07-25 — 2014-08-02. Invited talk at the Conference on Esperantology 2014-07-31: *Akademio de Esperanto fronte al novaj taskoj*.

2.7. Analysis Day in Memory of Mikael Passare

A one-day conference at Stockholm University 2014-09-24, organized by Pavel Kurasov. Invited lecture: *Discrete convolution operators, the Fourier transformation, and its tropical counterpart: the Fenchel transformation*.

3. PhD thesis advising

3.1. Abtin Daghighi

Abtin Daghighi defended his PhD thesis, entitled *Regularity and Uniqueness-Related Properties of Solutions with Respect to Locally Integrable Structures*, in Sundsvall on 2014-05-21. His main advisor had been Egmont Porten, second advisor Christer Kiselman, and third advisor in the beginning Cornelia Schiebold, later Stefan Borell. The opponent was Jürgen Leiterer.

3.2. Adama Koné (not reported to Squirrel)

I am the principal scientific advisor to Adama Arouna Koné, Université de Bamako I, Mali. His advisors in Bamako are Ouaténi Diallo and Diby Diarra.

4. Committee assignments

4.1. Member, Grading Committee for Vladimir Čurić's PhD thesis

Thesis: *Distance Functions and Their Use in Adaptive Mathematical Morphology*, defended on 2014-05-23. Opponent: Hugues Talbot. The other members of the Grading Committee were Andes Heyden, Reiner Lenz, Alexander Medvedev, and Gabriella Sanniti de Baja.

4.2. The Reference Group of the International Science Programme

The Reference Group for Mathematics met in Seoul 2014-08-11 to discuss research applications from West Africa and South-East Asia.

4.3. Program Committee for the conference Discrete Geometry for Computer Imagery (DGCI 2014)

Member during the period 2014-01-01 — 2014-09-12.

4.4. Committee for evaluation of research at LIRIS, Lyon

LIRIS is the acronym of *Laboratoire d'Informatique en Image et Systèmes d'information*. Appointed as a member of the evaluating committee for the period 2014-09-01 — 2015-01-08 by *l'Agence d'évaluation de la recherche et de l'enseignement supérieur* (AERES), from 2014 November 14 replaced by *Haut Conseil d'évaluation de la recherche et de l'enseignement supérieur* (HCERES).

Presentations in Lyon during three days, 2014-12-17—19. Final report sent 2015-01-08.

5. Participation in conferences without giving a talk

5.1. The ILEI Conference, Montevideo

Participated in the latter part of the conference, 2014-07-23 — 2014-07-25.

5.2. Mathematics in Emerging Nations: Achievements and Opportunities (MENA0)

A one-day conference in Seoul 2014-08-12.

5.3. International Congress of of Mathematicians (ICM)

Participated in ICM 2014 in Seoul for the whole duration 2014-08-13 — 2014-08-21.

5.4. Discrete Geometry for Computer Imagery (DGCI)

Participated in the three-day conference DGCI in Siena, Italy, 2014-09-10 — 2014-09-12.

6. Visits

6.1. Visit to Helsinki

2014-05-31 — 2014-06-01, invited by Kaisu Nevasalmi. Discussions with her and Björn Ivarsson on culture and mathematics.

6.2. Visit to Puerto Montt

2014-07-19 — 2014-07-22, invited by José Antonio Vergara. Discussions on Esperanto.

6.3. Visit to Palestrina

A two-day visit to Palestrina 2014-09-08 — 2014-09-09, invited by Renato Corsetti. Discussions on the future of the Esperanto Academy

6.4. Visit to Feyzin

A one-day visit to Jean-Claude Caraco on 2014-12-20. Discussions on linguistics.

6.5. Visit to Fontainebleau

A two-day visit to Jean Serra and his family 2014-12-20 — 2014-12-21. Discussions on mathematical morphology with one of the founders of this science. Meeting with Rahul Gaurav.

7. Seven research projects reported to Squirrel

7.1. Complex convexity

A bounded open set with boundary of class C^1 which is locally weakly lineally convex is weakly lineally convex, but, as shown by Yuriĭ Zelinskiĭ, this is not true for unbounded domains. We construct explicit examples, Hartogs domains, showing this. Their boundary can have regularity $C^{1,1}$ or C^∞ .

Obstructions to constructing smoothly bounded domains with certain homogeneity properties are presented.

A long-lasting project: 1967-11-01 — 2016-11-11.

Financed by: Université de Nice; Uppsala University; Kingdom of Sweden. Amount 300,000 SEK.

There are several publications in this project. A new manuscript was submitted on 2014-11-27. Some problems remain to be solved.

7.2. Euclid's straight lines

The project is both linguistic and mathematical. We raise two questions on Euclid's *Elements*: How to explain that Propositions 16 and 27 in his first book do not follow, strictly speaking, from his postulates (or are perhaps meaningless)? and: What are the mathematical consequences of the meanings of the term *eutheia*, which we today often prefer to consider as different?

The answer to the first question is that orientability is a tacit assumption. The answer to the second is rather a discussion on efforts to avoid actual infinity, and having to (in some sense or another) construct equivalence classes of segments to achieve uniqueness.

Period: 2007-01-22 — 2015-03-15.

Financed by: Kingdom of Sweden. Amount 100,000 SEK.

An article will appear in *Normat*, volume 62, formal year of publication 2014; actual year of publication 2015.

7.3. Convexity of marginal functions in the discrete case

We define, using difference operators, classes of functions defined on the set of points with integer coordinates which are preserved under the formation of marginal functions.

The duality between classes of functions with certain convexity properties and families of second-order difference operators plays an important role and is explained using notions from mathematical morphology.

Period: 2010-01-11 — 2016-11-11

Partner: Shiva Samieinia, The Royal Institute of Technology (KTH).

Financed by: Stockholm University; The Royal Institute of Technology; Kingdom of Sweden. Amount 70,000 SEK.

A manuscript was submitted on 2014-11-09. Some problems remain to be solved.

7.4. Digital hyperplanes

Project manager: Christer Kiselman. Project abstract: Digital planes in all dimensions are studied. Period: 2010-01-11 — 2016-12-12.

Partner: Adama Koné, Université de Bamako I, Mali.

Financed by: International Science Programme; Kingdom of Sweden. Amount 120,000 SEK.

The general goal is to generalize to any dimension the results of Kiselman's 2011 paper in *Mathematika*.

7.5. Combination of word elements in Esperanto

Project manager: Christer Kiselman.

Project abstract: This is a rather theoretical study of word formation in Esperanto, with an historical survey and questions for the future.

period: 2011-01-11 — 2016-12-12

Financed by: Kingdom of Sweden. Amount 26,000 SEK.

There is a manuscript of 42 pages which is now approaching a final version.

7.6. Discrete convolution equations

Project manager: Christer Kiselman.

Project abstract: We study solvability of convolution equations for functions with discrete support in \mathbf{R}^n , a special case being functions with support in the integer points. The more general case is of interest for several grids in Euclidean space, like the body-centred and face-centered tessellations of three-space, as well as for the non-periodic grids that appear in the study of quasicrystals. The theorem of existence of fundamental solutions by de Boor, Höllig & Riemenschneider is generalized to general discrete supports, using only elementary methods. We also study the asymptotic growth of sequences and arrays using the Fenchel transformation. Estimates using the Fourier transformation will be studied later.

Period: 2012-01-11 — 2016-12-12.

Financed by: Kingdom of Sweden. Amount: 150,000 SEK.

A paper was accepted for publication in *Mathematika* on 2014-11-02.

7.7. Mathematical spaces / Mathematical rooms

Project title: *Matematiska rum*, which could mean ‘Mathematical spaces’ or ‘Mathematical rooms’.

Project manager: Christer Kiselman

Project abstract: A survey of mathematical spaces, mathematical terminology, Euclidean and digital geometry, discretization of space and time, tropical mathematics, mathematical morphology, research policy, evaluation of research.

Period: 2013-10-22 — 2015-03-15.

Partner: Hania Uscka-Wehlou, Flintstensvägen 10, 752 67 Uppsala.

Financed by: Kingdom of Sweden. Amount 45,000 SEK.

Final report submitted 2015-01-15. Publication by the Royal Society of Sciences in a proceedings volume in honor of Lars-Olof Sundelöf is expected.

8. Referee reports (not reported to Squirrel)

8.1. *Journal of Optimization Theory and Applications*

Juan-Enrique Martinez Legaz asks about a manuscript. Report sent on 2014-03-05.

8.2. *Pattern Recognition Letters*

Cris Luengo asks about a manuscript. Report (5 pages) sent on 2014-03-10.

8.3. *Journal of Mathematical Analysis and Applications* (JMAA)

Reports sent on 2014-04-14. Report on a new version sent on 2014-06-22.

8.4. DGCI Sienna, 2014 September 10–12

Jacques-Olivier Lachaud asks for a report on a submitted manuscript. Report sent on 2014-04-10.

Affiliation since 2014 September 15: The author is a guest professor at Uppsala University, Department of Information Technology, Division of Visual Information and Interaction, Computerized Image Analysis and Human-Computer Interaction.

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