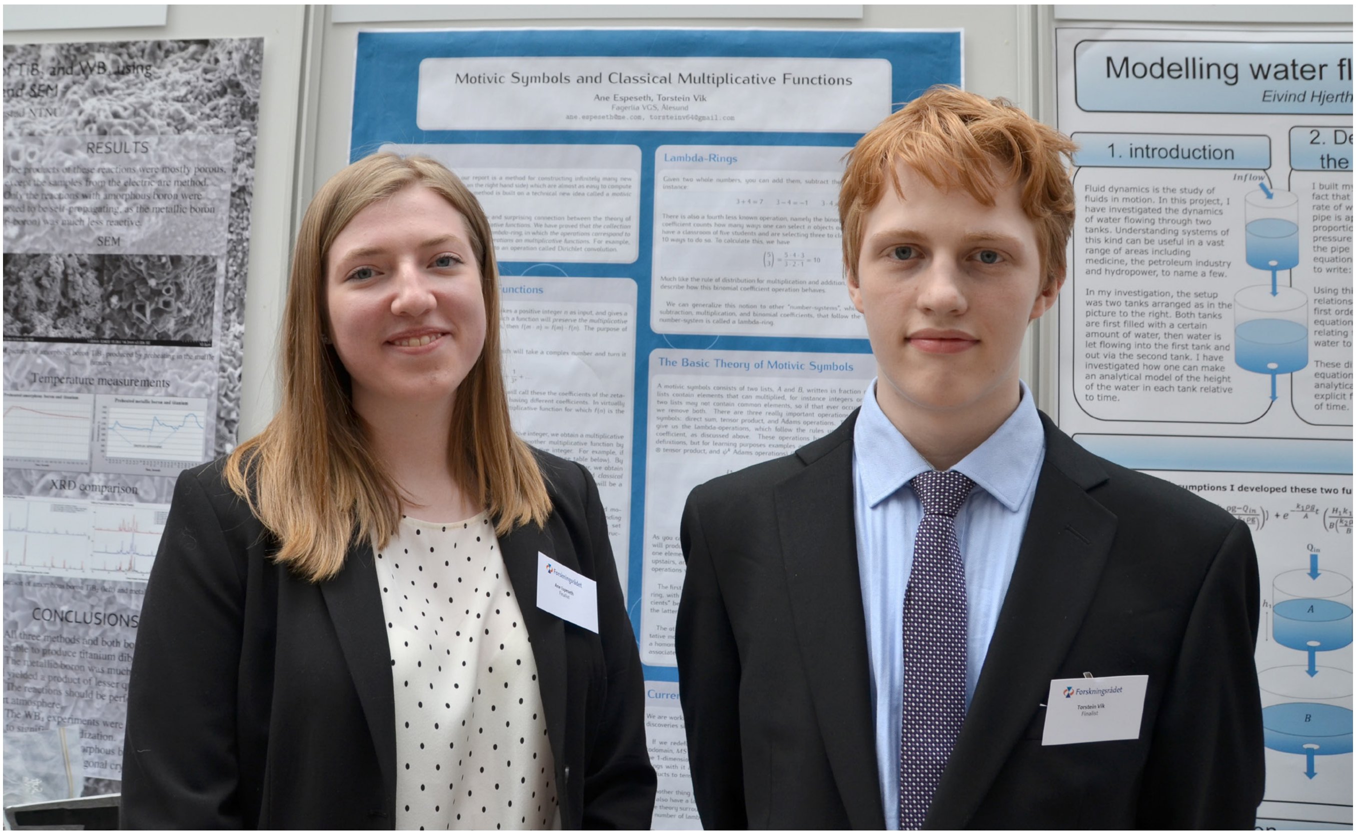
INFOMAT

September 2016



NORSKE SKOLEELEVER TIL TOPPS I PRESTISJETUNG EUROPEISK FORSKERKONKURRANSE

Ane Espeseth og Torstein Vik ved Fagerlia vidaregåande skule i Ålesund vant førsteprisen for sitt matematikkprosjekt under den prestisjefylte European Union Contest for Young Scientists. Tittelen på prosjektet er *Motivic Symbols and Classical Multiplicative Functions*.

INFOMAT kommer ut med 11 nummer i året og gis ut av Norsk Matematisk Forening. Deadline for neste utgave er alltid den 15. i neste måned. Stoff til INFOMAT sendes til

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Foreningen har hjemmeside http://www.matematikkforeningen.no/INFOMAT

Ansvarlig redaktør er Arne B. Sletsjøe, Universitetet i Oslo.

Matematisk kalender

2016:
Oktober:
19.-20. *MatRICs tredje åskonferanse*, Gardermoen
November:
3.-4. *Nasjonalt algebramøte,* UiO*, Oslo*
3.-4. *Geometry and Lie theory. Applications to classical and quantum mechanics*, NTNU, Trondheim
30.-2.desember. *Topology and Applications*, NTNU, Trondheim
2017:
Januar:
27.-29. *Polar Geometry,* DNVA, Oslo

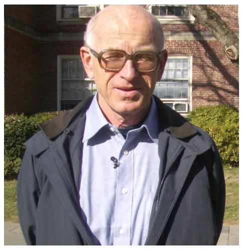
NASJONALT ALGEBRAMØTE, Oslo, 3.-4. november 2016

Årets nasjonale algebramøte finner sted 3.-4. november 2016 i Oslo, se webside: http://www.mn.uio.no/math/forskning/grupper/algebra/arrangementer/nasjonaltmote2016/

GEOMETRY AND LIE THEORY. APPLICATIONS TO CLASSICAL AND QUANTUM MECHANICS, Trondheim, 3.-4. november 2016

Dedicated to Eldar Straume on his 70th birthday.
Speakers:
Alain Chenciner, Paris, Boris Doubrov, Minsk, Claudio Gorodski, São Paulo, Sigbjørn Hervik, Stavanger, Wu–Yi Hsiang, Berkeley, Arnfinn Laudal, Oslo, Valentin Lychagin, Tromsø, Andrew Swann, Aarhus, Dennis The, Vienna, Burkhard Wilking, Münster

TOPOLOGY AND APPLICATIONS,
NTNU, 30. november-2. desember 2016



Dedicated to Nils A. Baas on his 70th birthday.
Speakers:
Marcel Bökstedt (Aarhus), Gunnar Carlsson (Stanford), Ralph Cohen (Stanford,) Herbert Edelsbrunner (Austria), Søren Galatius (Stanford), Kathryn Hess (EPFL), Gerd Laures (Bochum), Arnold Levine (IAS), Ib Madsen, (Copenhagen), Edvard Moser (NTNU), John Rognes (Oslo), Dennis Sullivan, (SUNY), Ulrike Tillmann (Oxford)
https://www.math.ntnu.no/~mariusth/Nils70/

POLAR GEOMETRY,
DNVA, Oslo, 26.-28. januar 2017

A conference celebrating the work of Ragni Piene on the occasion of her 70th birthday.
Time and place: Jan. 26, 2017 11:00 AM - Jan. 28, 2017 03:00 PM, The Norwegian Academy of Science and Letters
Invited speakers:
Paolo Aluffi (Florida) [TBC], Alicia Dickenstein (Buenos Aires), Sandra di Rocco (Stockholm), Lothar Göttsche (Trieste), Steven Kleiman (MIT), Raquel Mallavibarrena (Madrid), Dusa McDuff (Barnard), Elisa Postinghel (Loughborough), Jørgen Vold Rennemo (Oxford), Israel Vainsencher (UFMG), Bernard Teissier (Jussieu), Nelly Villamizar (RICAM)

MATRICs 3. ÅRSKONFERANSE,
Gardermoen, 19.-20. oktober 2016

Tema på MatRICs tredje årskonferanse er “Addressing the challenges faced by teachers and learners of university level mathematics”.

Nye doktorgrader

Linghua Chen, NTNU, forsvarte 29.august 2016 sin avhandling *The Numerical Path Integration Method for Stochastic Differential Equations* for graden Ph.D. Hovedveileder har vært Prof. Arvid Næss og medveileder Prof. Espen Robstad Jakobsen.

Sammendrag:
The thesis investigates the convergence properties of the path-integration method, a scheme which approximates the probability density functions (PDF) of the solution processes to stochastic differential equations (SDE).
In this thesis, the existence of PDFs of the solution to SDEs is proved, the driving noise being Gaussian and non-Gaussian respectively, where the coefficients may have linear growth. Such existence results follow from the well-posedness of the corresponding Kolmogorov forward equations in the space of integrable functions, which is also established in the papers. L1 strong convergence results are then obtained via a semi-group approximation approach. In the third part, a linear strong convergence rate of the path integration method is derived for SDEs driven by Gaussian noise with bounded coefficients.

Karin Marie Jacobsen, NTNU, forsvarte 6.september 2016 sin avhandling *Understanding module categories through triangulated categories using Auslander - Reiten Theory* for graden Ph.D. Hovedveileder har vært Prof. Aslak Bakke Buan.

Sammendrag
Avhandlingen består av tre artikler, og den røde tråden er interaksjonen mellom abelske kategorier og triangulerte kategorier, hvor de to gir informasjon om hverandre. Et klassisk eksempel på en abelsk kategori er samlingen av endelig-genererte moduler over en algebra, og jeg har først og fremst konsentrert meg om veialgebraer.
I den første artikkelen, skrevet med Benedikte Grimeland, ser vi på kvotientfunktorer fra triangulerte kategorier til abelske kategorier. Vi viser at når slike kvotientfunktorer er homologiske, så er de også representerbare, det vil si at de kan skrives på formen Hom(T,-), der T oppfyller noen betingelser som får T til å ligne veldig på et såkalt clustertilteobjekt, definert av Buan et. al i 2006. I noen utvalgte kategorier viser vi at T faktisk må være et clustertilteobjekt, hvis kvotienten skal være særlig interessant.
I den andre artikkelen, også skrevet med Benedikte Grimeland, ser vi på en ekvivalens mellom stabile modulkategorier av selvinjektive algebraer og utvalgte orbit-kategorier. Dette arbeidet fullfører en klassifikasjon startet av Holm og Jørgensen.
I den tredje artikkelen ser jeg på cluster-tiltede algebraer, som er endomorfialgebraer av clustertilteobjekt. Jeg har sett på modulene som har endelig projektiv dimensjon. De har en del fin struktur som gjør dem spennende å studere. Spesielt finnes det en geometrisk modell av modulkategorien der denne strukturen kommer tydelig fram, som jeg har brukt mye.

Bas P. A. Jordans ved Matematisk institutt, UiO forsvarte 23. september 2016 sin avhandling for graden ph.d.: *Random walks on discrete quantum groups and associated categories*. Veiledere har vært Professor Sergiy Neshveyev, UiO og Professor Lars Tuset, HiOA.

Sammendrag
In this thesis we study random walks on discrete quantum groups. We compute some concrete Martin boundaries and investigate convergence to the boundary. In addition we generalise this theory to monoidal categories.
Random walks describe the behaviour of a point moving randomly through a space. A lot of structure of the space can be captured by these random walks. It therefore provides very useful tools to study all kinds of spaces. Originally random walks are mainly applied to lattices, graphs and groups. In the middle of the eighties quantum groups were introduced and in the subsequent years this theory was further developed. Izumi brought the fields of quantum groups and random walks together and defined random walks on discrete quantum groups. One of the main topics we study in this thesis is probabilistic boundaries of random walks on discrete quantum groups. We compute the Martin boundary for classical random walks on the lattice of irreducible representations of deformed Lie groups and we study the full Martin boundary of SUq(N). Convergence to the boundary is an im-

portant theorem in classical random walk theory, but it is a conjecture in the quantum case. Here we give the first quantum example, by establishing convergence to the boundary for random walks on SUq(2).
The representation category of a compact quantum group forms a C*-tensor category. This close relation opens the way for random walks on such C*-tensor categories. We define the Martin boundary and convergence to the boundary for random walks on such categories and we establish compatibility with the quantum case. These C*-tensor categories are important for classifying compact quantum groups. In this thesis we give an intermediate step in this classification process and classify all C*-tensor categories with the same fusion rules as SU(N).

Nyheter

NORSKE UNGDOMMER TIL TOPPS I EUCYS

Ane Espeseth og Torstein Vik fra Ålesund vant førsteprisen for sitt matematikkprosjekt under den prestisjefylte European Union Contest for Young Scientists (EUCYS).
EUCYS er en årlig forskningskonkurranse arrangert av EU. Den har pågått siden 1989 og ble i år arrangert i Brussel. Deltakerne har vunnet sine nasjonale forskningskonkurranser, og Norge sender hvert år førsteprisvinnere til konkurransen.
Espeseth (18) og Vik (17) vant i april klassen for naturvitenskap og teknologi i Konkurransen Unge Forskere med prosjektet *Motivic Symbols and Classical Multiplicative Functions*.
I tillegg til førsteprisen i EUCYS, som er på 7000 euro, vant Espeseth en tur til Stockholm International Youth Science Seminar, hvor hun skal være tilstede under Nobelprisutdelingene i desember. Vik fikk en tur til London International Youth Science Forum 2017, som er en to-ukers intensiv vitenskapsfestival for unge.
Sammendrag:
If we take two integers (also known as whole numbers), we can add them, subtract one from the other, or multiply them. For example:

5 + 3 = 8   5 - 3 = 2   5*3 = 15

In addition to these three operations, we have another one, very useful when computing probabilities, known as a binomial coecient. A binomial coecient will take a positive integer, for instance 5, and another integer, for instance 3, and compute how many dierent ways you can choose 3 things out of 5 things. The answer tells us that if we must choose 3 students out of a group of 5 students, there are 10 possible choices.These four operations are related by certain formulas, called lambda-ring axioms. Any "number system" which has four operations related to each other by these axioms is called a lambda-ring.
The first main discovery in our report is a method for constructing infinitely many new "number systems" like this, which are almost as easy to compute with as the integers. The method is built on a technical new idea called a motivic symbol.
A completely different area of mathematics is the study of prime numbers. A prime number is a positive integer that cannot be factored into two smaller positive integers. For example, 7 is a prime number, but 8 is not, since it can be factored into 2 times 4. Understanding the structure of the prime numbers is one of most dicult challenges in all of mathematics. To help in this endeavour, mathematicians have invented something called multiplicative functions. A typical example is the sigma function, which computes the sum of all factors of a given number.
Many of the most important multiplicative functions can be expressed in terms of the famous Riemann zeta function by a specic kind of formula. Such functions are called classical in our report.
Now we can formulate our second main discovery, which is a new and surprising connection between the theory of lambda-rings and the theory of multiplicative functions. We have proved that the collection of classical multiplicative functions is a lambda-ring, in which the operations correspond to certain well-known number-theoretic operations on multiplicative functions. For example, addition in this lambda-ring corresponds to an operation called Dirichlet convolution.