



BRÅKET



*Information om seminarier och högre undervisning
i matematiska ämnen i Stockholmsområdet*

NR 22

FREDAGEN DEN 5 JUNI 2009

BRÅKET

Veckobladet från
Institutionen för matematik
vid Kungl Tekniska Högskolan
och Matematiska institutionen
vid Stockholms universitet

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Red. för Bråket
Institutionen för matematik
KTH
100 44 Stockholm

Sista manustid för nästa nummer:
Torsdagen den 11 juni kl. 13.00.

Topics in Algebra

En konferens med denna titel
skall äga rum vid SU den 12–16
juni. Se sidorna 7–8.

Nästa nummer av Bråket,
som utkommer den 12 juni, blir
det sista före sommaruppehållet.
Numret därefter utkommer fre-
dagen den 14 augusti.

Money, jobs: Se sidorna 8–9.

SEMINARIER

Ti 06–09 kl. 14.00–15.00. Institut Mittag-Leffler
Seminar. Andrew Barbour, Universitat Zurich:
Quasi-stationary distributions. Institut Mittag-
Leffler, Auravagen 17, Djursholm. Se sidan 3.

On 06–10 kl. 10.00. Licentiatseminarium i numerisk
analys. Sara Zahedi presenterar sin licentiatav-
handling: *Numerical Modeling of Fluid Interface
Phenomena*. Opponent: Professor Martin Berg-
gren, Umea universitet. Sal D42, KTH, Lind-
stedtsvagen 5, 1 tr. Se sidan 3.

Fortsattning pa nasta sida.

Disputation i matematik

Lisa Nilsson skall disputerar pa avhandlingen *Amoebas, Dis-
criminants, and Hypergeometric Functions* fredagen den 5 juni
kl. 13.00 i sal 14, hus 5, Matematiska institutionen, SU, Kraft-
riket. Se Braket nr 21 sidorna 12–13.

Disputation i matematik

Erik Lindgren skall disputerar pa avhandlingen *Regularity
properties of two-phase free boundary problems* fredagen den
5 juni kl. 14.00 i sal F3, KTH, Lindstedtsvagen 26, b.v. Se
Braket nr 21 sidan 13.

Europeiska forsknings- och utvecklingsprogram — En presentation

Denna skall aga rum vid KTH onsdagen den 10 juni. Se
Braket nr 21 sidan 14.

Disputation i optimeringslara och systemteori

Yohei Kuroiwa skall disputerar pa avhandlingen *A Parameter-
ization of Positive Real Residue Interpolants with McMillan
Degree Constraint* fredagen den 12 juni kl. 10.00 i sal D1,
KTH, Lindstedtsvagen 17, 3 tr. Se Braket nr 21 sidan 15.

Seminarier (fortsättning)

- On 06–10 kl. 10.00–11.00. Presentation av examensarbete i matematik** (15 högskolepoäng, grundnivå). **Maxim Chapovalov**: *Explicit growth functions of the Coxeter groups of Lannér and quasi-Lannér type*.Handledare: **Dimitry Leites**. Sal 21, hus 5, Matematiska institutionen, SU, Kräftriket. Se sidan 4.
- On 06–10 kl. 10.15–11.15. Kombinatorikseminarium.** **Andrzej Rucinski**, Adam Mickiewicz University, Poznan, Poland: *Dirac-type problems for hypergraphs*. Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 5.
- On 06–10 kl. 14.15. Licentiatseminarium i numerisk analys.** **Murtazo Nazarov** presenterar sin licentiatavhandling: *An adaptive finite element method for the compressible Euler equations*. Opponent: **Professor Mats Larsson**, Institutionen för matematik och matematisk statistik, Umeå universitet. Sal D42, KTH, Lindstedtsvägen 5, 1 tr. Se sidan 5.
- On 06–10 kl. 18.00–19.00. Offentlig föreläsning på Kungl. Vetenskapsakademien.** **Professor Bo Sundqvist**: *Arvid G. Högbom, landhöjningen och hembygden*. Beijersalen, Kungl. Vetenskapsakademien, Lilla Frescativägen 4A, Stockholm. Se Bråket nr 21 sidan 9.
- To 06–11 kl. 13.15. Licentiatseminarium i numerisk analys.** **Henrik Holst** presenterar sin licentiatavhandling: *Multi-scale methods for wave propagation in heterogeneous media*. Opponent: **Professor Nils E. M. Svanstedt**, Matematiska vetenskaper, Chalmers tekniska högskola, Göteborg. Sal D31, KTH, Lindstedtsvägen 17, b.v. Se sidan 4.
- Fr 06–12 kl. 10.00–11.00. Öppen föreläsning om risk i försäkringsbranschen.** **Karel van Hulle**, Head of Insurance and Pensions, Internal Market and Services, European Commission: *Solvency II: a new and modern solvency regime for the insurance industry*. Sal E2, KTH, Lindstedtsvägen 3, b.v. Se Bråket nr 21 sidan 14.
- Fr 06–12 kl. 13.15. Licentiatseminarium i numerisk analys.** **Jelena Popovic** presenterar sin licentiatavhandling: *A Fast Method for Solving the Helmholtz Equation Based on Wave Splitting*. Opponent: **Docent Elisabeth Larsson**, Institutionen för informationsteknologi, Uppsala universitet. Sal D41, KTH, Lindstedtsvägen 17, 1 tr. Se sidan 6.
- Fr 06–12 kl. 14.00. Seminar in Fluid Mechanics. (Observera dagen, tiden och lokalen!)** **Kunihiko Taira**, Princeton University: *Simulation and control of flows around low-aspect-ratio wings*. Sal E53, KTH, Osquars Backe 14, 2 tr. Se Bråket nr 21 sidan 16.
- Må 06–15 kl. 15.15–16.00. Seminarium i finansiell matematik.** **Jonas Larsson** presenterar sitt examensarbete: *Risk analysis of structured products*. Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 6.
- On 06–17 kl. 10.00–11.00. Presentation av examensarbete i matematik** (30 högskolepoäng, avancerad nivå). **Madeleine Leander**: *On the bunkbed conjecture*.Handledare: **Svante Linusson**. Sal 21, hus 5, Matematiska institutionen, SU, Kräftriket. Se sidan 8.

Fortsättning på nästa sida.

Seminarier (fortsättning)

On 06–17 kl. 13.15. Algebra and Geometry Seminar. René Birkner, Berlin: *Title to be announced.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

INSTITUT MITTAG-LEFFLER SEMINAR

Andrew Barbour:
Quasi-stationary distributions

Abstract: . . . and their relationship to a problem in population biology. Or, why the biologists had it right all along.

Tid och plats: Tisdagen den 9 juni kl. 14.00–15.00 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

LICENTIATSEMINARIUM I NUMERISK ANALYS

Sara Zahedi

presenterar sin licentiatavhandling:

Numerical Modeling of Fluid Interface Phenomena

Opponent: **Professor Martin Berggren**, Institutionen för datavenskap, Umeå universitet.

Abstract: This thesis concerns numerical techniques for two phase flow simulations; the two phases are immiscible and incompressible fluids. The governing equations are the incompressible Navier-Stokes equations coupled with an evolution equation for interfaces. Strategies for accurate simulations are suggested. In particular, accurate approximations of the surface tension force, and a new model for simulations of contact line dynamics are proposed.

In the popular level set methods, the interface that separates two immiscible fluids is implicitly defined as a level set of a function; in the standard level set method the zero level set of a signed distance function is used. The surface tension force acting on the interface can be modeled using the delta function with support on the interface. Approximations to such delta functions can be obtained by extending a regularized one-dimensional delta function to higher dimensions using a distance function. However, precaution is needed since it has been shown that this approach can lead to inconsistent approximations. In this thesis we show consistency of this approach for a certain class of one-dimensional delta function approximations.

We also propose a new model for simulating contact line dynamics. We consider capillary dominated flows and assume that contact line movement is driven by the deviation of the contact angle from its static value. This idea is in this thesis adapted to the conservative level set method. By providing a diffusive mechanism for contact line movement, the need to allow fluid slip at the boundary is eliminated. Numerical experiments in two space dimensions show that we are able to capture contact line dynamics qualitatively correct.

Tid och plats: Onsdagen den 10 juni kl. 10.00 i sal D42, KTH, Lindstedtsvägen 5, 1 tr.

PRESENTATION AV EXAMENSARBETE I MATEMATIK

**Maxim Chapovalov:
Explicit growth functions of the Coxeter groups
of Lannér and quasi-Lannér type**

Handledare: **Dimitry Leites.**

Abstract: In 1950, in *Medd. Lunds Univ. Mat. Sem.*, Lannér classified Coxeter groups whose Coxeter diagram without one vertex is a disjoint union of Coxeter diagrams of spherical type. In the 1980s, Vinberg and Shwartzman classified Coxeter groups of *quasi-Lannér* type whose Coxeter diagram without one vertex is a disjoint union of Coxeter diagrams of spherical or Euclidean type.

Solomon proved (1966) that the growth function of any Coxeter group is a rational function. The growth functions of Coxeter groups of spherical or Euclidean type are known. Here we give the explicit expressions of the growth functions of (quasi-)Lannér groups. For the Lannér groups with 4 and 5 generators, these series are known thanks to Worthington (1988) but, for 3 of 5 cases of the Lannér groups with 5 generators, his results are wrong. For quasi-Lannér groups, our results are new as well as corrected answers for Lannér groups.

We offer the virgin form of the growth function as a reliable tool for verification of results; it also helps to get an explicit expression of the zeros of the growth function.

The non-real poles of the growth functions of quasi-Lannér groups lie in a narrow annulus, as in the famous Eneström theorem, although the coefficients of the denominators of the growth functions do not satisfy the conditions of Eneström's theorem.

Tid och plats: Onsdagen den 10 juni kl. 10.00–11.00 i sal 21, hus 5, Matematiska institutionen, SU, Kräftriket.

LICENTIATSEMINARIUM I NUMERISK ANALYS

Henrik Holst

presenterar sin licentiatavhandling:

Multi-scale methods for wave propagation in heterogeneous media

Opponent: **Professor Nils E. M. Svanstedt**, Matematiska vetenskaper, Chalmers tekniska högskola, Göteborg.

Abstract: Multi-scale wave propagation problems are computationally costly to solve by traditional techniques, because the smallest scales must be represented over a domain determined by the largest scales of the problem. We have developed new numerical methods for multi-scale wave propagation in the framework of heterogeneous multi-scale methods. The numerical methods couple simulations on macro and micro scales with data exchange between models of different scales. With the new method we are able to consider a general class of problems including some problems where a homogenized equation is unknown. We show that the complexity of the new method is significantly lower than that of traditional techniques. Numerical results are presented from problems in one, two and three dimensions and for finite and long time. We also analyse the method, in one and several dimensions and for finite time, using Fourier analysis.

Tid och plats: Torsdagen den 11 juni kl. 13.15 i sal D31, KTH, Lindstedtsvägen 17, b.v.

KOMBINATORIKSEMINARIUM

Andrzej Rucinski:

Dirac-type problems for hypergraphs

Abstract: We present various generalizations to hypergraphs of the celebrated Dirac theorem from 1952 guaranteeing a Hamilton cycle in every graph with minimum degree at least $n/2$.

A (tight) Hamilton cycle in a k -uniform hypergraph is a cyclic ordering of all vertices in which every k consecutive vertices form an edge of the hypergraph.

In particular, we present new results by Rodl, Rucinski, and Szemerédi on the relation between the minimum $(k - 1)$ -wise co-degree of a k -uniform hypergraph and the presence of a Hamilton cycle.

Tid och plats: Onsdagen den 10 juni kl. 10.15–11.15 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

LICENTIATSEMINARIUM I NUMERISK ANALYS

Murtazo Nazarov

presenterar sin licentiatavhandling:

An adaptive finite element method for the compressible Euler equations

Opponent: **Professor Mats Larsson**, Institutionen för matematik och matematisk statistik, Umeå universitet.

Abstract: This work develops a stabilized finite element method for the compressible Euler equations and proves an a posteriori error estimate for the approximated solution. The equations are approximated by the cG(1)cG(1) finite element method with continuous piecewise linear functions in space and time. cG(1)cG(1) gives a second order accuracy in space, and corresponds to a Crank-Nicholson type of discretization in time, resulting in second order accuracy in space, without a stabilization term.

The method is stabilized by componentwise weighted least squares stabilization of the convection terms, and residual based shock capturing. This choice of stabilization gives a symmetric stabilization matrix in the discrete system. The method is successfully implemented for a number of benchmark problems in 1D, 2D and 3D. We observe that cG(1)cG(1) with the above choice of stabilization is robust and converges to an accurate solution with residual based adaptive mesh refinement.

We then extend the General Galerkin framework from incompressible to compressible flow, with duality based a posteriori error estimation of some quantity of interest. The quantities of interest can be stresses, strains, drag and lift forces, surface forces or a mean value of some quantity. In this work we prove a duality based a posteriori error estimate for the compressible equations, as an extension of the earlier work for incompressible flow (J. HOFFMAN, C. JOHNSON, *Computational Turbulent Incompressible Flow*, Springer-Verlag, 2007).

The implementation and analysis are validated in computational tests both with respect to the stabilization and the duality based adaptation.

Tid och plats: Onsdagen den 10 juni kl. 14.15 i sal D42, KTH, Lindstedtsvägen 5, 1 tr.

LICENTIATSEMINARIUM I NUMERISK ANALYS

Jelena Popovic

presenterar sin licentiatavhandling:

**A Fast Method for Solving the Helmholtz Equation
Based on Wave Splitting**

Opponent: **Docent Elisabeth Larsson**, Institutionen för informationsteknologi, Uppsala universitet.

Abstract: In this thesis, we propose and analyse a fast method for computing the solution of the Helmholtz equation in a bounded domain with a variable wave speed function. The method is based on wave splitting. The Helmholtz equation is first split into one-way wave equations which are then solved iteratively for a given tolerance. The source functions depend on the wave speed function and on the solutions of the one-way wave equations from the previous iteration. The solution of the Helmholtz equation is then approximated by the sum of the one-way solutions at every iteration. To improve the computational cost, the source functions are thresholded and in the domain where they are equal to zero, the one-way wave equations are solved with GO with a computational cost independent of the frequency. Elsewhere the equations are fully resolved with a Runge-Kutta method. We have been able to show rigorously in one dimension that the algorithm is convergent and that for fixed accuracy, the computational cost is just $O(\omega^{1/p})$ for a p -th order Runge-Kutta method. This has been confirmed by numerical experiments.

Tid och plats: Fredagen den 12 juni kl. 13.15 i sal D41, KTH, Lindstedtsvägen 17, 1 tr.

SEMINARIUM I FINANSIELL MATEMATIK

Jonas Larsson

presenterar sitt examensarbete:

Risk analysis of structured products

Abstract: During the last decade investors' interest in structured products, especially Equity-Linked Notes (ELN), has increased dramatically. An ELN is a debt instrument which differs from a typical fixed-income security in that the final payout is based partly on the return of an underlying equity, in this case the Swedish equity index OMXS30. The ELN is specified as a portfolio of a bond and a call option on the index. This thesis investigates the risks with investing in an ELN on the Swedish market, and also compares the ELN to investing in portfolios of different combinations of the bond and the index. The risks are measured using Value-at-Risk and Expected Shortfall with three different approaches; historical simulation, analytical solution, and Monte Carlo simulation. The ELN is found to have a risk profile that varies significantly with changing market conditions. Though, the major set-backs of the ELN seem to be the risk of losing the interest rate and the high upfront fee charged, and the difficulty to easily adjust the portfolio composition.

Tid och plats: Måndagen den 15 juni kl. 15.15 – 16.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

TOPICS IN ALGEBRA

International Conference in Honour of Ralf Fröberg's 65th Birthday, Stockholm University, June 12–16, 2009

The theme of the conference is algebra. All the talks will be given in room 14 (Gradängsalen), building 5, Department of Mathematics, SU, Kräftriket. Complete information about the conference can be found on the web site: <http://www2.math.su.se/froberg65/>. The scientific programme of the conference can also be read below (social activities are omitted):

Friday, June 12

- 9.00 – 9.50 **J.-E. Roos:** *On some applications of the homological theory of graded skew-commutative rings.*
- 10.00 – 10.50 **V. Barucci:** *One-dimensional Arf rings and Arf semigroups.*
- 11.00 – 11.30 Coffee.
- 11.30 – 12.20 **J. Herzog:** *Stanley decompositions.*
- 12.30 – 14.00 Lunch.
- 14.00 – 14.35 **A. Björner:** *A q -FKG inequality and series weighted by Young tableaux.*
- 14.40 – 15.15 **E. Wulcan:** *Sparse effective Nullstellensätze via residue currents.*
- 15.15 – 15.45 Coffee.
- 15.45 – 16.20 **J. Snellman:** *Walks with prescribed degree sequences.*

Saturday, June 13

- 9.00 – 9.50 **Ngo Viet Trung:** *On the Cohen-Macaulayness of symbolic powers of Stanley-Reisner ideals.*
- 10.00 – 10.50 **M. Boij:** *Decompositions of Betti diagrams.*
- 11.00 – 11.30 Coffee.
- 11.30 – 12.20 **V. Welker:** *Buchsbaum* simplicial complexes.*
- 12.30 – 14.00 Lunch.
- 14.00 – 14.35 **F. Hreinsdóttir:** *Title to be announced.*
- 14.40 – 15.15 **G. Björck:** *Bi-unimodular sequences and cyclic n -roots.*
- 15.15 – 15.45 Coffee.
- 15.45 – 16.20 **A. Torstensson:** *Coset diagrams as a tool in the study of finitely presented groups.*
- 16.25 – 17.00 **M. D'Anna:** *Analytically unramified one-dimensional semilocal rings and their value semigroups.*

Monday, June 15

- 9.00 – 9.35 **J. Backelin:** *How completely independence stable triangle free graphs from Ramsey theory yield Gorenstein rings.*
- 9.40 – 10.30 **A. Geramita:** *Title to be announced.*
- 10.40 – 11.10 Coffee.
- 11.10 – 12.00 **L. Avramov:** *Poincaré series of graded modules.*
- 12.00 – 13.30 Lunch.
- 13.30 – 14.20 **A. Iarrobino:** *Commuting nilpotent matrices and Artinian algebras.*
- 14.30 – 15.05 **S. Lundqvist:** *Title to be announced.*
- 15.05 – 15.35 Coffee.
- 15.35 – 16.10 **M. Passare:** *Amoebas, residues, and discriminants.*
- 16.15 – 16.50 **C. Löfwall:** *Infinite filiform Lie algebras.*

(Continued on the next page.)

Tuesday, June 16

- 9.00 – 9.35 **V. Micale:** *On the Buchsbaumness of the associated graded of a semigroup ring.*
 9.40 – 10.30 **S. Di Rocco:** *Toric fibrations and Cayley polytopes ring of a semigroup ring.*
 10.40 – 11.10 Coffee.
 11.10 – 12.00 **W. Bruns:** *Normaliz: algorithms for rational cones and affine monoids.*
 12.00 – 13.30 Lunch.
 13.30 – 14.05 **S. Zarzuela:** *Apery and Micro-invariants of a one-dimensional Cohen-Macaulay ring and invariants of its tangent cone.*
 14.10 – 14.45 **C. Gottlieb:** *Joint work with Ralf.*
 14.45 – 15.15 Coffee.
 15.15 – 15.50 **E. Emtander:** *A well-behaved class of numerical semigroups.*
 15.55 – 16.30 **E. Sköldbberg:** *Title to be announced.*

PRESENTATION AV EXAMENSARBETE I MATEMATIK

Madeleine Leander:
On the bunkbed conjecture

Handledare: **Svante Linusson.**

Abstract: We will study a problem on percolation on product graphs $\tilde{G} = G \times K_2$, where G is a finite graph and K_2 is the graph consisting of two vertices, $\{0, 1\}$, and one edge connecting them. On \tilde{G} consider the percolation model with p , the probability that an edge e exists, for all $e \in \tilde{G}$. All edges in \tilde{G} will exist independently of each other. We write $u \leftrightarrow v$ for the event ‘there is a path from u to v ’. The bunkbed conjecture states that for any bunkbed graph $\tilde{G} = G \times K_2$, corresponding to a finite graph G the following holds,

$$P(u_0 \leftrightarrow v_0) \geq P(u_0 \leftrightarrow v_1),$$

for all $u, v \in V(G)$ and any probability p . We prove the bunkbed conjecture for some small classes of graphs.

Tid och plats: Onsdagen den 17 juni kl. 10.00 – 11.00 i sal 21, hus 5, Matematiska institutionen, SU, Kräftriket.

MONEY, JOBS

Columnist: Johannes Lundqvist, Department of Mathematics, Stockholm University.
 E-mail: johannes@math.su.se.

Info = information. This will be given and repeated until obsolete. Rely on other sources as well.

BBKTH = Bulletin Board at the Department of Mathematics, KTH.

BBSU = Bulletin Board at the Department of Mathematics, SU.

The following information, with links, is also available at <http://www2.math.su.se/~johannes/mj.html>.

Unless stated otherwise, a given date is the last date (e.g. for applications), and the year is 2009. A number without an explanation is a telephone number.

Standard information channels

1. A channel to information from Vetenskapsrådet: <http://www.vr.se/naturteknik/index.asp>.
2. A channel to information from the European Mathematical Society: <http://www.emis.de>.
3. A channel to information from the American Mathematical Society: <http://www.ams.org>.
4. KTH site for information on funds: <http://www.kth.se/aktuellt/stipendier>.
5. Stockholm University site for information on funds: <http://www2.su.se/forskning/stipendier/databas.php3>.

(Continued on the next page.)

6. Umeå site for information on funds: http://www.umu.se/umu/aktuellt/stipendier_fond_anslag.html.
7. Job announcement site: <http://www.maths.lth.se/nordic/Euro-Math-Job.html>. This is run by the European Mathematical Society.
8. Stiftelsen för internationalisering av högre utbildning och forskning (STINT) site for information on funds: <http://www.stint.se>.
9. Nordisk Forskerutdanningsakademi (NorFA) site for information on funds: <http://www.norfa.no>.
10. Svenska institutet (SI) site for information on funds: <http://www.si.se>.

Old information

Money to apply for

11. Stiftelsen P. E. Lindahls fond utlyser två stipendier om vardera 100 000 kr för studier inom de naturvetenskapliga ämnena. Tidigare har prioritering givits till nydisputerade forskare samt till seniora forskare som är i behov av bidrag till fortsatt utbildning, exempelvis i form av resa till eller vistelse vid annat universitet. Sista ansökningsdag är den 31 augusti. Web-info: http://www.kva.se/KVA_Root/swe/awards/scholarships/detail_scholarships.asp?grantsId=15.

Jobs to apply for

12. Linköpings universitet söker en doktorand i matematik. Sista ansökningsdag är den 12 juni. Web-info: <http://www.liu.se/jobbdb/show.html?2977>.
 13. Örebro universitet söker en universitetslektor i matematik med inriktning mot tillämpad matematik. Sista ansökningsdag är den 17 augusti. Web-info: <http://www.oru.se/templates/oruextAdViewer.aspx?id=2303&adPageID=58674>.
 14. Norges teknisk-naturvitenskapelige universitet (NTNU) i Trondheim söker en "førsteamanuensis" (associate professor) i algebra. Sista ansökningsdag är den 9 juni. Web-info: <http://www.math.ntnu.no/~oyvinso/algebra-position-2009.pdf>.
 15. Linköpings universitet söker en universitetslektor i tillämpad matematik. Sista ansökningsdag är den 24 juni. Web-info: <http://www.liu.se/jobbdb/show.html?2962>.
 16. Linköpings universitet söker en universitetslektor i matematikdidaktik. Sista ansökningsdag är den 12 juni. Web-info: <http://www.liu.se/jobbdb/show.html?2954>.
 17. Lunds universitet söker en biträdande universitetslektor (associate senior lecturer) i matematisk statistik med inriktning mot statistiska metoder och modeller inom biologi och medicin. Sista ansökningsdag är den 31 juli. Web-info: <http://www3.lu.se/info/lediga/admin/document/PA2009-1148.pdf>.
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