Title of lectures and short abstracts of the workshop 2008

Dipl.-Math. Christiane Böhme

Address: Faculty of Mathematics and Computer Science, Prüferstr.9, TU Bergakademie Freiberg, 09596 Freiberg, Germany
email: Christiane.Boehme@math.tu-freiberg.de

Title of the lecture: Energy estimates for Klein-Gordon type models with oscillations

Abstract   The talk will give an overview on the asymptotic behaviour of the energy of Klein-Gordon equations in dependence on mass oscillating in time in the L^2-frame.
The starting point are statements about generalized energy conservation for a scale-invariant model case.
Based on these results we will call mass terms *non-effective* which decrease faster than the special mass. There holds a scattering result, that means, the energy behaves for large times in some sense as the energy of the free wave equation.
On the other hand we will call the mass term *effective* if it is above the critical one. First, we obtain again results of generalized energy conservation if we investigate Klein-Gordon problems with effective mass oscillating in time. By contrast, faster oscillations of the mass term will destroy the non-blow-up effect of the energy. This follows by the application of instability arguments and Floquet's theory.

Prof. Massimo Cicognani

Address: Department of Mathematics, University of Bologna, 40127 Bologna
email: cicognan@dm.unibo.it

date of arrival: September 28
date of departure: October 1

Title of the lecture: The Cauchy problem for an Euler-Bernoulli vibrating beam equation with singular coefficients

Abstract   We consider the global Cauchy problem for an Euler-Bernoulli vibrating beam equation where the external force is a linear function of the displacement and of its derivatives, including the term of shear. We prove the well-posedness in Sobolev spaces under sharp assumptions on the time derivative of the elastic modulus and on the decay of the shear force as the position variable tends to infinity.

Prof. Daniele Del Santo

Address: Department of Mathematics, University of Triest, Via A.Valerio 12/1, 34127 Trieste, Italy
email: delsanto@univ.trieste.it

date of arrival: September 29
date of departure: October 3

Title of the lecture: Uniqueness for the thermic waves system with non Lipschitz coefficients

Abstract   Using the technique developed by Koch and Lasiecka in the case of the thermic waves system with Lipschitz coefficients (Carleman estimates for the energy integral), together with the usual machinery of approximation of non regular coefficients in the phase space (also utilizing the Littlewood-Paley decomposition if the coefficients depend also on the x variables) we prove a uniqueness result in the case of Log-Lipschitz coefficients for the wave equation and Osgood-regular coefficients for the thermic equation (result obtained in collaboration with M. Pivetta)

Mr. Rene Helbig   Presentation of diploma thesis

Address: Faculty of Mathematics and Computer Science, Prüferstr.9, TU Bergakademie Freiberg, 09596 Freiberg, Germany
email: helbig3@student.tu-freiberg.de

Title of the lecture: About optimality of oscillations in wave models

Abstract   Our goal is to study hyperbolic Cauchy problems with time-dependent coefficients. First we study weakly hyperbolic Cauchy problems with propagation speed oscillating in time. With an argument of instability and by the application of Floquet theory we will show, that an arbitrary small loss of regularity really appears. With the same argument of instability we will show for strictly hyperbolic Cauchy problems with unbounded coefficients that an arbitrary slow growth of the energy up to ∞ really appears.

Mr. Torsten Herrmann   Presentation of diploma thesis

Address: Faculty of Mathematics and Computer Science, Prüferstr.9, TU Bergakademie Freiberg, 09596 Freiberg, Germany
email: torsten.herrmann@student.tu-freiberg.de

Title of the lecture: P-evolution operators with characteristics of variable multiplicity

Abstract   The goal of this talk is to derive regularity statements for the solutions of the Cauchy problem for degenerate p-evolution equations with time-dependent coefficients. Degeneracy means that the p-evolution operator has characteristics of variable multiplicity. We discuss conditions which lead to H^s well-posedness (no loss of regularity of the solutions) or H^∞ ill-posedness (infinite loss of regularity of solutions). Some optimality results complete the talk.

Prof. Fumihiko Hirosawa

Address: Department of Mathematical Sciences, Faculty of Science,
Yamaguchi University, Yamaguchi 753-8512, Japan
email: hirosawa@yamaguchi-u.ac.jp

date of arrival: September 28, 15.05 in Dresden
date of departure: October 3, 17.45 from Dresden

Title of the lecture: On the construction of counter examples for hyperbolic Cauchy problems with time depending coefficients

Abstract We introduce some developments of Colombini - De Giorgi's and Tarama's methods for the construction of counter examples for hyperbolic Cauchy problems with time depending coefficients satisfying the stabilization property. These arguments are usually used for periodic initial data or to have some pointwise estimates of the solutions in the phase space. In this talk we introduce some ideas to have some estimates in H^s or the usual Gevrey class in L^2 sense, which ensures the optimality of the assumptions to the coefficients for positive results of the generalized energy conservation law for a wave equation with increasing propagation speed and Gevrey well-posedness for a second order weakly hyperbolic equation with a non-Lipschitz continuous coefficient.

Prof. Albert Milani

Address: Department of Mathematics, University of Wisconsin-Milwaukee,
Milwaukee, WI 53217, USA
email: ajmilani@uwm.edu

date of arrival: September 30
date of departure: October 1

Title of the lecture: Asymptotic behavior of strong solutions to quasi-linear dissipative wave equations in $\mathbb{R}^N$

Abstract We study the asymptotic behavior of strong solutions of the quasi-linear dissipative wave equation

$$u_{tt} + u_t - \sum_{i,j=1}^{n} a_{ij}(Du)\partial_i \partial_j u = f(t,x),$$

with $t \geq 0$ and $x \in \mathbb{R}^N$, corresponding to sufficiently small source term f and initial values u_0 and u_1.

Prof. Rainer Picard

Address: FB Mathematics, TU Dresden, 01069 Dresden, Germany
email: rainer.picard@tu-dresden.de

date of arrival: September 30
date of departure: October 1

Title of the lecture: On a class of linear material laws in classical mathematical physics

Abstract A class of evolutionary problems with linear material laws is considered, which covers a number of diverse initial boundary value problems of classical mathematical physics. The claim that this class of material laws is indeed to a large extent sufficiently comprehensive is exemplified for a number of specific models from classical physics including such cases as the Drude-Lorentz model of electro-dynamics and the Poynting-Thomson model for visco-elastic solids.

Dr. Jens Wirth

Address: Department of Mathematics, Imperial College London SW7 2AZ, UK
email: j.wirth@imperial.ac.uk

date of arrival: September 29
date of departure: October 2

Title of the lecture: Anisotropic thermo-elasticity in two and three space dimensions

Abstract   The equations of thermo-elasticity couple a hyperbolic system (the system of crystal acoustics) to a heat equation. Aim of the talk is to present (sharp and frequency-localised) a priori estimates for solutions in terms of geometric properties of the symbol of the elastic operator. The approach is based on an asymptotic decoupling of the system for small and large frequencies.
Several examples for the two-dimensional situation will be given and the particular situation of cubic media in three space dimensions discussed in some detail.

Conference room: 1108, Prüferstr., in the center of Freiberg

Scientific programme of the workshop:
"Evolution equations"
held at TU Bergakademie Freiberg September 30 - October 1 2008

September 30:

9.30:   M.Cicognani (Bologna)

The Cauchy problem for an Euler-Bernoulli vibrating beam equation with singular coefficients

10.30:   F.Hirosawa (Yamaguchi)

On the construction of counter examples for hyperbolic Cauchy problems with time depending coefficients

11.30:   A.Milani (Milwaukee, Dresden)

Asymptotic behavior of strong solutions to quasi-linear dissipative wave equations in $\mathbb{R}^N$

14.30:   T.Herrmann (Freiberg)   Presentation of diploma thesis

P-evolution operators with characteristics of variable multiplicity

15.30:   R.Helbig (Freiberg)   Presentation of diploma thesis

About optimality of oscillations in wave models

16.30:   Ch.Böhme (Freiberg)

Energy estimates for Klein-Gordon type models with oscillations

18.30: *Conference dinner in the restaurant "Schwanenschlößchen"*

October 1:

9.00   R.Picard (Dresden)
On a class of linear material laws in classical mathematical physics

10.00   J.Wirth (London)
Anisotropic thermo-elasticity in two and three space dimensions

11.00   D.Del Santo (Trieste)
Uniqueness for the thermic waves system with non Lipschitz coefficients