MATHEMATICS RESEARCH CENTRE

SYMPOSIUM ON SYMPLECTIC GEOMETRY 1997-2000

REPORT

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Contents

Detailed Report

1 Overview

The symposium activities in 1997-98 centered around four main workshops, and included several lecture courses, seminar series, lecture series by visitors, some short meetings and an LMS Spitalfields Day. A closing workshop was held in July 2000 at the end of the three year grant period which gave the opportunity to cover the new developments resulting from Kontsevich's work in deformation theory.

There were three visitors for the whole year (Véronique Chloup-Arnould, Laurent Lazzarini, Joachim Weber) financed by other sources, a number of long term visitors (including Shigeru Mukai, Nagoya, who came for five months from October 1997 to April 1998), and 225 registered particpants for the longer activities as well as many who came to talks from nearby institutions.

In addition to the EPSRC grant of £ 80,000 visitors were also supported by

- EC funds for two TMR fellowships (Laurent Lazzarini, £ 24,344 for 16 months, and Joachim Weber, £ 20,943 for 14 months).
- British Council visiting scientist grant (Véronique Chloup-Arnould, Metz, 12 months).
- British Visitors Fund (LMS).
- LMS funds for the Workshop on Hamiltonian Dynamics organised by Mark Roberts.

- £ 500 from the LMS to organise the Spitalfields Day on 1 April 1998.
- Royal Society Exchange with Georgia for a 1 month visit of Professor Z. Giunashvili (Georgia).
- Japan-UK exchange scheme ``*Infinite Dimensional Geometry and Analysis''* by the *Japan Society for the Promotion of Science Exchange (JSPS)* and the *Royal Society*, handled by Newton Institute and RIMS, Kyoto.
- Travel grant for Joel Horowitz (Brussels) from La Communauté Française de Belgique (3 months).
- Warwick Visitors Fund (MRC at Warwick).

The mathematical topics covered a wide range of subjects centered around symplectic topology and geometry, as well as its many applications and related areas such as Kähler and algebraic geometry or the use of symmetry in mechanics, and several joint activities with these groups were organised (programmes are appended). Over recent years symplectic geometry has been a very active and lively subject with many new developments as well as new links to other subjects in mathematics as well as physics. This was reflected in the various workshops and lecture series at Warwick.

Many visitors came from other British universities, and reciprocally, many of the Symposium visitors, as well as the Symposium organisers, gave seminars and short lecture series at other British universities on symplectic geometry and related fields. A joint seminar between Manchester, Sheffield and Warwick on Bracket Geometries is one of the collaborations to come out of the contacts made in this Symposium year (it has just received funding from the LMS).

A large number of PhD students and post-docs particpated in the workshops and seminars. These are indicated by a [*] in the participant list (Appendix D).

2 The Programme

2.1 Workshops

More details of these workshops including lists of talks are given in Appendix B.

OPENING WORKSHOP
1-12 September 1997(52 participants, 31 lectures)

The main purpose of the first workshop was to provide an introduction to several different topics which would be a focus of the Warwick Symposium 97/98. One of the highlights was a lecture series by Leonid Polterovich (Tel Aviv) about **symplectic rigidity**ranging from symplectic packing problems, via Hofer's geometry, length spectra, and classical mechanics, to Lagrangian knots, and providing many interesting links between these seemingly different topics. Ron Stern (Irvine) gave a lecture series on **symplectic 4-manifolds** with many interesting applications of Seiberg-Witten invariants and surgery along knots. Viterbo gave a series of lectures on applications of **Floer homology**. Victor Ginzburg (Santa Cruz) and Yael Karshon (Jerusalem), gave a series of lectures on **moment maps and symplectic reduction**. Simone Gutt (Brussels/Metz) and Joseph Wolf (Berkeley) gave series of lectures on (deformation resp. direct limit)**quantization**. And there were several additional lectures,

notably one by Ginzburg about his existence theorem for a **compact hypersurface** without closed characteristics, and two by Jean-Claude Sikorav (Toulouse) about an application of the theory of **J-holomorphic curves**.

WORKSHOP ON MOMENT MAPS AND QUANTIZATION
8-18 December 1997(47 participants, 27 lectures)

The main focus of the Workshop was on quantization, with survey lectures by Moshe Flato (Dijon) and Daniel Sternheimer (Dijon), and two series of lectures by Boris Fedosov (Potsdam) on his geometrical approach and Alexander Karabegov (Dubna) on the deformation quantization of Kähler manifolds. Simone Gutt (Brussels/Metz) lectured on equivalence of star products, and the material she presented has been combined with the Quantization seminars of Rawnsley to produce a survey article on Deligne's approach to star products which will appear in the Journal of Geometry and Physics.

A sub-theme was the extension of results from symplectic to Poisson manifolds. Talks on the structure and quantization of Poisson manifolds were given by Santos Asin (Warwick) and Véronique Chloup-Arnould (Warwick/Metz). Johannes Huebschmann (Lille) and Kirill Mackenzie (Sheffield) lectured on geometrical aspects of Poisson manifolds.

Moment maps figured in the lectures on moduli spaces, a noncommutative version in Fedosov's second lecture, and in the lectures of James Montaldi (Nice) and Tatsuru Takakura (Tokyo).

The opening day of the Workshop was concluded with a seminar for a general audience by Dimitri Anosov (Steklov, Moscow) on some geometrical aspects of flows on surfaces.

In addition there were a number of lectures with a strong algebro-geometric content, namely by Hitchin (Oxford) and Pidstrigatch (Warwick) on the geometry of moduli spaces, by Mukai (Nagoya) about theta divisors, by McDuff (Stony Brook) about moduli spaces of stable maps, and by Ono (Hokkaido Univ) about symplectic fillings.

During the workshop Kenji Matsuki (Purdue) began his lecture course about the Mori program. (See Section below.)

WORKSHOP ON SYMPLECTIC TOPOLOGY
23 March - 3 April 1998 (78 participants, 36 lectures).

This workshop included an**LMS Spitalfields Day on Symplectic Topology on 1 April 1998**.

This workshop covered a wide spectrum of topics such as contact geometry (Giroux, Ohta), Legendrian knots (Chekanov, Fraser), Floer homology - both for 3-manifolds and in symplectic geometry (Froyshov, Fukaya, Lazzarini, Ono, Schwarz, Weber), Hofer's geometry of the group of symplectomorphisms (Lalonde, Milinkovich), Seiberg-Witten invariants (Hutchings, Kanda, Lisca, Salamon, Stipsicz), circle actions (Tolman), integrable systems (Uhlenbeck), the topology of the symplectomorphism group (McDuff), Chern-Simons theory

(Tyurin), K3-surfaces (Mukai), invariants of 4-manifolds (Pidstrigatch, Stipsicz), and Donaldson's new theory of symplectic submanifolds and topological Lefschetz fibrations (Auroux).

Notable was a series of three lectures by Kenji Fukaya (Kyoto) about *Categorical Mirror Symmetry*, exploring fascinating links between symplectic and complex geometry. Although highly speculative, his lectures were full of original and inspiring ideas.

Another notable feature of the workshop was the presence of so many young mathematicians who already had made significant contributions to the subject. Among these were Dennis Auroux (IHES), Kim Froyshov (Oslo, now Harvard), Michael Hutchings (Harvard, now Stanford), Yutaka Kanda (Hokkaido Univ), Laurent Lazzarini (Warwick, now ETH Zürich), Matthias Schwarz (Stanford, now Chgicago), Joachim Weber (Warwick, now Stony Brook).

The *Spitalfields Day* consisted of four colloquial style lectures for a general mathematical audience by McDuff, Tolman, Hutchings, and Uhlenbeck. It was very well attended by British mathematicians, and gave an excellent introduction to a number of exciting new developments in symplectic topology and related subjects. The day closed with a social event (party with live blues band).

WORKSHOP ON SYMMETRIC HAMILTONIAN SYSTEMS
16-17 July 1998 (organised by Mark Roberts)(25 participants, 12 lectures).

This 2-day workshop was the third in a series run under the auspices of an LMS Scheme 3 project on ``Bifurcations and Symmetry'' coordinated by David Chillingworth (Southampton). The aim was to bring together mathematicians and physicists working on symmetric Hamiltonian systems from a wide range of points of view. This meeting was held as part of the concluding workshop on Symplectic Geometry (see below) to maximize the potential for interaction between bifurcation theorists and symplectic geometers. Both areas were well represented among the talks, as were applications to specific physical systems.

Talks with a strong geometrical flavour included those by Anthony Bloch (Michigan) on integrable systems, Andrew Lewis (Warwick) on mechanical systems on homogeneous spaces and Sergey Pekarsky (Caltech) on kinematic connections for systems on Kähler manifolds. Symplectic geometry also featured prominently in presentations by Eugene Lerman (Illinois) and Mark Roberts (Warwick), both of whom described recent results on bifurcations of relative equilibria. This was also the theme of talks by Debra Lewis (UCSC) and Andre Vanderbauwhede (Gent). Gianne Derks (Surrey) described her work on the effects of dissipation on the stability of relative equilibria. Applications were represented by talks on systems of point vortices on the sphere (James Montaldi, Nice), on the dynamics of atomic systems (Dmitrii Sadovskii, U. du Littoral), on relative equilibria of rotating fluid masses (Esmeralda Sousa Dias, Lisbon), and on relative equilibria of molecules (Igor Kozin, Warwick).

Funding for the workshop was provided by EPSRC, LMS and the Warwick MRC.

WORKSHOP ON SYMPLECTIC GEOMETRY
13-24 July 1998(101 participants, 37 lectures).

The concluding workshop of the Symposium covered again a wide spectrum of subjects within symplectic topology and its many related areas.

Victor Ginzburg (Santa Cruz) and Yael Karshon (Jerusalem) gave two lectures about their joint work on abstract moment maps. Related to this was Sue Tolman's lecture about cricle reduced spaces. Mark Gross (Warwick) and Jon Wolfson (East Lansing) gave lectures about special Lagrangian fibrations. Yuli Rudyak (Heidelberg) and Misha Farber (Tel Aviv) gave lectures about Ljusternik-Schnirelman theory. Karl Friedrich Siburg (Freiburg), Yiming Long (Tianjin), and Misha Bialy (Tel Aviv) gave interesting lectures about Hamiltonian dynamics and its relation to modern symplectic invariants. There were lectures about Floer homology by Vicente Munoz (Malaga), Yong-Geun Oh (Madison), and Kaoru Ono (Hokkaido Univ), who explained his joint work with Fukaya, Kontsevich, Ohta, and Oh about new obstructions to the construction of Floer homology for Lagrangian intersections. There was a lecture by Andras Stipsicz (budapest) about symplectic Lefschetz fibrations and its Chern numbers.

Zoltan Szabo (Princeton) gave a series of three lectures about his very recent joint work with Peter Ozsvath in which they give a full proof of the symplectic Thom conjecture using the Seiberg-Witten invariants, and building on the previous work by Kronheimer and Mrowka.

Yasha Eliashberg (Stanford) gave two fascinating lectures about his joint work with Hofer and Givental about contact homology. This is a new invariant of contact manifolds which takes the form of a topological quantum field theory.

WORKSHOP ON QUANTISATION
24-28 July 2000(29 participants, 23 lectures).

This additional workshop of the Symposium was organised to cover an area which had developed rapidly after the Symposium year was over, namely the work of Maxim Kontsevich on the Formality Theorem and its consequences for quantisation of Poisson manifolds. It was organised in parallel with a meeting on Geometry and Analysis on Path Spaces, a satellite meeting of the International Congress of Mathematical Physics 2000. There was much interaction between the two meetings, with several sessions in common.

The highlights were talks on formality of the Hochschild complex by Arnal, Jones, A. Voronov; aspects of deformation quantisation by Bordemann, Gutt, Hudson, Maeda, Sternheimer, Waldmann; geometric aspects of quantisation by Hall, Landsman, Merkulov, Sergeev, T. Voronov.

Samples of visitors' comments on the Workshops are included in Appendix E.)

2.2 Lecture courses

The following three MSc courses were part of the Symposium:

- Fall 1997, *Symplectic Topology*, Dietmar Salamon.
- Spring 1998, *Symplectic Geometry*, John Rawnsley.
- Spring 1998, *Mirror Symmetry*, Mark Gross.

Course of 6 lectures on Geometric Invariant Theory by Shigeru Mukai (Nagoya), March-April 1998 (organised by Miles Reid).

Prof. S. Mukai from Nagoya (one of the world's top algebraic geometers) visited for 5 months from Oct 1997 to Mar 1998 and (in addition to many workshop and seminar talks) gave a short lecture course on Introduction to GIT (geometric invariant theory)

Topics were:

- Finite generation of invariant ring
- Example of invariant rings
- Stability and numerical criterion
- Quotient of algebraic variety
- Quotient of toric variety and fiber polytope
- Elementary examples
- Construction of moduli spaces via GIT

Course of 4 lectures on Gauge theory, Symplectic Geometry and Slightly Deformed Algebraic Geometry by Prof. A. Tyurin (Steklov Inst.)

Prof. A. Tyurin from Moscow visited for 2 months during March - June 1998 and gave a short lecture course on his recent research

Topics were:

- Almost Kähler structures and special Lagrangian cycles
- Guruprasad metric on moduli of vector bundles over a curve
- Kähler angles and slightly deformed algebraic geometric cycles
- 3-dimensional complex geometry, globalisation and mirror symmetry

Lectures on A_n-quiver algebras, intersection theory, and Floer homology by Paul Seidel (IAS, Princeton), 16-25 June 1998.

Lectures on Floer homology in Oxford by Dietmar Salamon (Warwick):

- 12.2.98 ``Introduction to Floer homology"
- 13.2.98 ``Fredholm theory"
- 26.2.98 ``Symplectic Floer-Donaldson theory"
- 27.2.98 ``Symplectic isotopy"

Lectures on Mp^c-structures in Oxford by John Rawnsley (Warwick): 21-22, 28-29 May 1998.

2.3 Seminars

Geometry and.... During the year the geometry group (Mark Gross, John Jones, Mario Micallef, Victor Pidstrigatch, John Rawnsley, Miles Reid, Dietmar Salamon) organised a seminar ``Geometry and ...'' (now ``Geometry Plus''), aiming to cover all the areas of cross-fertilisation between the different branches of geometry, physics, algebra, number theory and so on. On almost every Monday of the 3 terms we had two sessions, one aiming at introducing technical topics to graduate students, the second more research oriented.

Floer homology seminar. During the spring and summer terms of 1998 Dietmar Salamon organised a seminar on J-holomorphic curves and quantum cohomology. In the spring term Dietmar Salamon gave a series of lectures on Gromov compactness and stable maps leading up to the construction of the Gromov-Witten invariants and a proof of the general Arnold conjecture along the lines of his joint work with Hofer. In the summer term Mark Gross gave a series of lectures entitled ``Counting curves in the quintic'' in which he explained the work of Yau et al about Givental's proof of the Mirror conjecture.

Quantization seminar. The quantization seminar met weekly from October 1997 and covered Deligne's approach to the classification of star products (Rawnsley, 4 seminars), Mp^c-structures and Fedosov's index theorem (Rawnsley, 3 seminars) and Kontsevich's quantization of Poisson manifolds (Gutt & Rawnsley, 4 seminars). Maeda spoke on quantum diffeomorphisms, Asin on geometrical methods of constructing star products on Poisson manifolds, Terizakis on polarizations with singularities and their effect on geometric quantization, Loi on quantization of Kähler manifolds, Chloup-Arnould on results of Weinstein & Xu, and Cooper on Lagrangian submanifolds in deformation quantization.

Mechanics and Symmetry seminar.

In terms 1 and 2 Mark Roberts organized a seminar programme devoted to geometrical aspects of the theory of symmetric mechanical systems. Andrew Lewis gave a series of talks on Lagrangian reduction. This was followed by a series in which George Patrick (on a year long visit from Saskatchewan) described his work on `drift' dynamics near relative equilibria with nongeneric momenta. Mark Roberts then gave a number of seminars on the Marle-Guillemin-Sternberg normal form for symplectic group actions and its applications to the reduction of symmetric Hamiltonian systems near relative equilibria. Other talks included a survey of properties of coadjoint orbits by John Rawnsley, and a talk on relative equilibria of atomic systems by Dmitrii Sadovskii (U. du Littoral).

Appendices

A Research Overview

A.1 Floer homology

Some of the most interesting new applications of symplectic Floer homology are due to Paul Seidel. In his thesis [127] he used Floer homology to find symplectomorphisms, on a large class of symplectic 4-manifolds, which are smoothly, but not symplectically, isotopic to the identity. The main ingredient in his proof is an exact sequence in symplectic Floer homology, which is reminiscent of Floer's exact sequence for the Floer homology of homology-3-spheres. Seidel uses his exact sequence to compute the Floer homology groups of generalised Dehn twists. Generalised Dehn twists also play a crucial role in his joint work with Kovanov [46] about the symplectic monodromy in A_n singularities. They prove, in particular, that the braid group B_{n+1} embeds into the group of components of the symplectomorphism group of the Milnor fibre. Floer homology is again an essential ingredient to distinguish symplectic isotopy classes. There are interesting relatins to the Burau representation of the braid group. Seidel lectured about this work at Warwick in June.

Fukaya, Kontsevich, Oh, Ohta, and Ono discovered an interesting new obstruction theory for the construction of Floer homology groups for Lagrangian intersections (cf. [30]). This is a major project and the work is still in progress. Ono lectured about these ideas in the March and July workshops.

In [29] Fukaya interprets (noncommutative) mirror symmetry as a duality between symplectic and complex geometry, following Strominger-Yau-Zaslov. The (complex) mirror of a symplectic manifold is interpreted as a moduli space of Lagrangian submanifolds with flat line bundles, up to Hamiltonian isotopy. Floer homology becomes a sheaf over the mirror. Another ingredient of this approach is Floer homology for Lagrangian foliations (rather than submanifolds). The details have been worked out rigorously in the case of the torus. In more general contexts this approach is still speculative but provides a rich source of new ideas. In the March workshop Fukaya gave an inspiring series of lectures about his new approach.

In [73] Schwarz gives a detailed proof for the existence of a natural ring isomorphism between Floer homology and quantum cohomology. This is based on his previous joint work with Piunikhin and Salamon [121].

Some of the most interesting recent work about Yang-Mills Floer homology of 3-manifolds is due to Froyshov. In [28] he uses the dimension of a certain equivariant Floer homology group to establish an integer invariant $Y \varnothing h(Y)$ of homology 3-spheres which respects connected sums:

$$h(Y_1 \# Y_2) = h(Y_1) + h(Y_2).$$

Relations to his previous work about definite intersection forms of smooth 4-manifolds with boundary [106,107] have yet to be established.

Gaio and Salamon worked on pseudo-holomorphic curves in symplectic quotients and their relations to solutions of a certain deformed equation in the ambient symplectic manifold

which couples equivariant maps to connections via the curvature and the moment map (cf. [32] and [31]). Potential applications should include the relation between the Gromov-Witten invariants of symplectic quotients in different chambers, and a geometric proof of the relation between the quantum cohomology of the Grassmannian and the Verlinde algebra.

Salamon and Weber worked on the relation between the Floer homology of the cotangent bundle for a classical Hamiltonian (kinetic plus potential energy) with the cohomology of the loop space (cf [69] and [90]). The technique of proof involves an adiabatic limit in which the perturbed pseudo-holomorphic curves in the cotangent bundle degenerate to solutions of the heat equation, i.e. gradient flow lines of the classical action. This is related to Viterbo's work in [89]. Weber lectured about his results in the March workshop.

In [50] Lazzarini studied pseudo-holomorphic discs with Lagrangian boundary conditions and his results enabled him to prove the Arnold conjecture for strongly negative Lagrangian submanifolds. He lectured about these results in the March workshop.

A codimension zero submanifold U $\wp$ M with corners determines naturally a singular Lagrangian subvariety L_U $\wp$ T^*M. In [42,43] Kasturirangan and Oh constructed Floer homology groups for the Lagrangian pair (L_U,L_0) where L_0 is a Hamiltonian geformation of the zero section, related this to the Conley index, and obtained a refinement of the Arnold conjecture for Lagrangian intersections in cotangent bundles. Oh lectured about these results in the July workshop.

In [88,89] Viterbo constructed a natural push-forward map for Floer homology groups of open manifolds, induced by a certain codimension zero inclusions. Applications include: 1. a proof of the Weinstein conjecture in cotangent bundles of simply connected manifolds, 2. the theorem that subcritical Stein manifolds do not admit exact Lagrangian embeddings, 3. for exact Lagrangian submanifolds L $\wp$ T^*S^n the projection L$\varnothing$ S^n has nonzero degree. Viterbo lectured about these results in the opening workshop. Another application is the theorem that the real part of a Fano variety cannot be hyperbolic. Viterbo lectured about this in the July workshop.

A.2 Seiberg-Witten invariants and smooth 4-manifolds

Recently Ozsvath and Szabo [120] found a proof of the symplectic Thom conjecture, which asserts that symplectic submanifolds (of symplectic 4-manifolds) minimise the genus among all submanifolds representing the same homology class. This had previously been proved by Kronheimer-Mrowka, and independently by Morgan-Szabo-Taubes. The new work of Ozsvath and Szabo is based on a product formula for the Seiberg-Witten invariants in [117]. Szabo gave a series of lectures about this work in the July workshop.

In [104] Fintushel and Stern established a relation between the Seiberg-Witten invariants of a smooth 4-manifold X with that of the manifold $X_{T,K}$ obtained by forming the connected sum, along a suitable torus T $\wp$ X, with the product $M_K \times S^1$, where M_K is obtained by performing 0-surgery on a knot K $\wp$ S^3. The relation has the form

$$SW(X_{T,K}) = SW(X) \cdot \Delta_K(t)$$

where Δ_K is the Alexander polynomial and $t = \exp(2[T])$. As an application they obtain infinitely many diffeomorphism types of symplectic manifolds which are homeomorphic to the K3 surface. Stern gave a series of lectures about this work in the September workshop.

In [77] Stipsicz found interesting applications of the Seiberg-Witten invariants to the geometry of smooth 4-manifolds. He constructed a sequence of new simply connected symplectic 4-manifolds C_n for which the numbers $c_1(C_n)^2/\chi_h(C_n)$ converging to 9. In particular, this gives rise to infinitely many simply connected symplectic 4-manifolds with positive signature. In [78] He establishes the rationality of complex curves in simply connected Kähler surfaces with $b^+ > 1$. In [79] he characterises the minimality of symplectic Lefschetz fibration. At various times Stipsicz gave lectures at the Warwick Symposium about his work.

Stefan Bauer discovered a refinement of the Seiberg-Witten invariants [5] which enabled him to distinguish the diffeomorphism type of certain connected sums of elliptic surfaces which are homeomorphic and whose Seiberg-Witten invariants vanish. He lectured about his work in the March workshop.

In [109,110] Hutchings and Lee establish an interesting link between Reidemeister torsion and circle valued Morse theory. They prove that the topological torsion of a manifold M - with twisted coefficients, determined by a cohomology class $\alpha \in H^1(M,\mathbb Z)$ - is equal to the product of the torsion of the Morse-Novikov complex with a zeta-function, obtained by counting closed orbits. Both the Morse-Novikov complex and the zeta function are determined by the gradient flow of a closed 1-form representing the class α. This result has interesting consequences concerning the relation of the Seiberg-Witten invariants of a 3-manifold with Reidemeister torsion. Hutchings lectured about these results in the March workshop.

Salamon is working on the relation between the Seiberg-Witten monopoles on symplectic Lefschetz fibrations and holomorphic sections of corresponding singular fibrations, in which the fibres have been replaced by symmetric products of a Riemann surface. The 3-dimensional analogue relates the Seiberg-Witten Floer homology of a mapping torus Y_f, associated to a diffeomorphism $f:\Sigma \varnothing \Sigma$ to the symplectic Floer homology of the induced symplectomorphism of the symmetric products of Σ [68]. This is a Seiberg-Witten version of the Atiyah-Floer conjecture. The expected results are closely related to the work of Taubes and Meng-Taubes. Salamon lectured about this work in the March workshop.

In [59] Ohta and Ono proved that symplectic fillings of certain quotients S^3/Γ must have a negative definite intersection form. This work is based on results by Froyshov. Ono lectured about it in the December workshop and Ohta in the March workshop.

In the March workshop Kanda lectured about his extension of Taubes' relation between the Seiberg-Witten and the Gromov invariants to certain noncompact symplectic 4-manifolds.

A.3 Quantization

Many different aspects of quantisation were in development during the period of the Symposium. The recent work of Kontsevich on the Formality of the Hochschild complex and its consequences for deformation quantisation had not been digested during the main activities of the Symposium, but a small continuation workshop including this theme was held during the summer of 2000.

In the Symposium proper one of the main themes was deformation quantisation for symplectic manifolds. This had been revolutionised by Fedosov who bypassed all the difficulties of the traditional approach of constructing star products through gluing together local products. Instead Fedosov uses a geometrical method based on the construction of a flat connection in the Weyl bundle from a (curved) symplectic connection on the manifold.

Deligne's account of the classification of star products using classical deformation theory methods was simplified and extended by Gutt and Rawnsley in work largely done during seminars and workshops of the Symposium.

A.4 Moment maps and symplectic reduction

Ginzburg and Karshon [1] described the work of the Guillemin group on generalised moment maps which provide a simplified approach to symplectic reduction, just retaining the features needed to control topological properties of the reduced spaces and rebuild in some cases the original space from the reduction data.

Tolman [137] described classification results for circle actions in low dimensions, and methods for computing intersection cohomology of reduced spaces.

Geometrical properties of momentum maps were obtained by R. Sjamaar [136], A.R. Gaio and D.A. Salamon [32].

Jones and Rawnsley [111] found a restriction on the signature when a manifold admits a Hamiltonian circle action.

A.5 Topics in symplectic topology

Donaldson proved the existence of symplectic submanifolds and topological Lefschetz fibrations for all symplectic manifolds. In the March workshop Auroux lectured about this new theory and his own related work in [94].

In [96] Biran proved sharp estimates for symplectic packing problems in \mathbb CP^2. He then used Donaldson theory of symplectic Lefschetz pencils study this problem for general symplectic 4-manifolds [7]. His approach is to fill as much as possible of the symplectic manifold by a disc bundle over the symplectic submanifold representing a multiple of the symplectic form. The complement turns out to be a Lagrangian skeleton which carries

information about the underlying symplectic manifold. Biran discussed these remarkable new ideas in his lectures in the July workshop.

Polterovich [125] recently found new interesting links between ergodic theory and symplectic topology. He constructed contractible strictly ergodic Hamiltonian loops on large classes of symplectic manifolds and proved that the asymptotic Hofer norm of every strictly ergodic loop must be zero. He also posed a number of interesting open questions.

In the September workshop Polterovich gave a series of five lectures about symplectic rigidity starting with applications of pseudoholomorphic curves to symplectic packing problems (McDuff-Polterovich [114]), to the Lagrangian knot problem (Eliashberg-Polterovich [100]), and to the deformation problem (persistence of exceptional divisors). He then discussed Hofer's metric on the group of Hamiltonian diffeomeorphisms, his joint work with Bialy about geodesics in this metric, the relation between length spectra in Hofer's metric, invariants of symplectic fibrations, and Gromov's K-area (cf. [122,123,124]), and the relation between Lagrangian knots and classical mechanics (cf. [95,101]).

In [119,126] Oprea and Rudyak proved that every spherical symplectic 2n-manifold has Ljusternik-Schnirelman category 2n+1. Hence they were able to prove the Arnold conjecture for such manifolds in full generality (the minimal number of fixed points of a Hamiltonian symplectomorphism is equal to the minimal number of critical points of a function).

In [47] Lalonde-McDuff-Polterovich proved the flux conjecture for a large class of symplectic manifolds. In [48] They established the topological rigidity of Hamiltonian loops. Namely, if two loops of symplectomorphisms in (M,ω_0) and (M,ω_1) are smoothly isotopic, and one of them is symplectically isotopic to a loop of Hamiltonian symplectomorphisms, then so is the other. In other words, the Hamiltonian condition (zero Flux) is a topological property. Their proof involves the study of symplectic fibrations over the 2-sphere, and is based on the work of Seidel [128]. Lalonde and McDuff lectured about this work in the July workshop.

Le Hong Van studied harmonic almost complex structures on symplectic manifolds.

Schwarz found a continuous section of the action spectrum over the universal cover of the group of Hamiltonian symplectomorphisms [71]. This gives rise to a new bi-invariant metric on the group of Hamiltonian symplectomorphisms. As an application Schwarz proved the existence of infinitely many geometricall distinct periodic orbits for certain Hamiltonian symplectomorphisms. Another application is a proof of the fact that the diameter if the group of Hamiltonian diffeomorphisms of the 2-torus (with respect to the Hofer metric) is infinite [72]. Schwarz lectured about this work in the March workshop.

In [87] Viterbo discovered certain isoperimetric inequalities for the displacement energy. He found many interesting applications concerning obstructions to Lagrangian embeddings,

periodic orbits of billiard problems, and the closure of the symplectomorphism group. Viterbo lectured about these results in the March workshop.

A.6 Topics in contact geometry

One of the most exciting recent developments in this area is the contact homology discovered by Eliashberg, Givental, and Hofer (cf. [21]. This invariant takes the form of a topological quantum field theory, which assigns to every contact manifold a super Poisson algebra (roughly speaking, an algebra of functions on a symplectic (super) vector space generated by the periodic solutions of the Reeb flow). A symplectic manifold with contact boundary gives rise to a Lagrangian subalgebra, and gluing symplectic manifolds along a contact boundary corresponds to symplectic reduction. the correspondiong invariants for closed symplectic manifolds are the Gromov-Witten invariants. Eliashberg gave two lectures about these ideas in the July workshop.

Yuri Chekanov gave lectures about his invariants of Legendrian knots (cf. [15]). These invariants represent a special case of the contact homology by Eliashberg-Givental-Hofer and they can be constructed with combinatorial techniques. They give rise to examples of Legendrian knots which are smoothly isotopic and have the same Bennequin invariant and rotation number, but are not Legendrian isotopic. This should be contrasted with the theorem of Eliashberg and Fraser, which asserts that topologically trivial Legendrian knots are trivial if and only classified by their Bennequin invariant and rotation number (cf. [102] and the March workshop). Lisa Traynor worked on invariants of Legendrian tangles.

During his stay at Warwick Chekanov also worked on the proof of the four-point conjecture by Arnold.

Emmanuel Giroux (in the March workshop) and his former student Vincent Colin worked on contact structures on 3-manifolds. Colin constructed tight contact structures on many 3-manifolds.

A.7 Topics in algebraic geometry

Mark Gross's most recent work on mirror symmetry [34] represents very substantial progress on the Strominger-Yau-Zaslow approach to mirror symmetry via special Lagrangian fibrations. Following his previous joint work with Pelham Wilson, which concentrated on verifying the topological aspects of the SYZ conjectures in one example, Gross has generalised Hitchin's results in the case of trivial connections, developing the crucial metric aspects of the subject by showing how to write down the complex and Kähler structures of the mirror in terms of the geometry of the initial manifold.

A. Tyurin [83] has developed a theory of special Lagrangian geometry and its relations with Bohr-Sommerfeld quantisation.

A.8 Topics in Hamiltonian dynamics

During the year Mark Roberts (Warwick) worked on a number of aspects of the stability and bifurcation theory of relative equilibria of symmetric Hamiltonian systems with two EPSRC research assistants, Andrew Lewis and Igor Kozin, and two long term EPSRC visiting fellows, James Montaldi (Nice) and George Patrick (Saskatchewan). Work with Lewis included the development of Lagrangian and Hamiltonian reduction theories for mechanical systems defined on the tangent bundles of homogeneous spaces. Patrick and Roberts showed that the set of relative equilibria of a generic Hamiltonian system which is invariant under a free action of a compact group is stratified by the symmetry type of the generator-momentum pair. Lewis, Patrick and Roberts also initiated a project which aims to extend aspects of the stability theory of relative equilibria to systems for which the action of the symmetry group has non-compact isotropy subgroups. On the applied side Montaldi and Roberts continued work on the existence and stability of relative equilibria of systems of point vortices on the sphere (a joint project with Chjan Lim (Rensselaer PI)) while work with Kozin centred on the computation and interpretation of bifurcation diagrams for the relative equilibria of tri-atomic molecules.

B List of Lectures

- Tue, 7.10.97, 4:00pm, John Rawnsley (Warwick), ``Mp^c structures and deformation quantisation, I'' (Quantization Seminar).
- Tue, 14.10.97, 4:00pm, John Rawnsley (Warwick), ``Mp^c structures and deformation quantisation, II'' (Quantization Seminar).
- Thu, 16.10.98, 4:30pm in Bath, Piotr Kobak (Cracow/Bath), ``Contact curves in flag varieties'' (COW seminar).
- Mon, 20.10.97, 3pm, Joa Weber (Warwick), ``Morse theory and the Smale-Witten complex I'' (Geometry and...).
- Mon, 20.10.97, 4:30pm, Miles Reid (Warwick), ``Hilbert schemes as resolution of quotient singularities, and the McKay correspondence II'' (Geometry and...).
- Tue, 21.10.97, 4:00pm, John Rawnsley (Warwick), ``Mp^c structures and deformation quantisation, III'' (Quantization Seminar).
- Mon, 27.10.97, 3pm, Joa Weber (Warwick), ``Morse theory and the Smale-Witten complex II'' (Geometry and...).
- Mon, 27.10.97, 4:30pm, Yuri Chekanov (Moscow), ``Invariants of Legendrian knots I'' (Geometry and...).
- Tue, 28.10.97, 4:00pm, Santos Asin Lares (Warwick), ``Fedosov's construction of star products'' (Quantization Seminar).
- Mon, 3.11.97, 3pm, Joa Weber (Warwick), ``Morse theory and the Smale-Witten complex III'' (Geometry and...).
- Mon, 3.11.97, 4:30pm, Yuri Chekanov (Moscow), ``Invariants of Legendrian knots II'' (Geometry and...).
- Tue, 4.11.97, 4:00pm, Andrea Loi (Warwick), ``Rigidity of holomorphic maps into Kähler manifolds'' (Quantization Seminar).
- Tue, 11.11.97, 4:00pm, Véronique Chloup-Arnould (Warwick), ``On a paper of Weinstein-Xu'' (Quantization Seminar).
- Mon, 17.11.97, 4:30pm, John Jones (Warwick), ``Elliptic cohomology I'' (Geometry and...).
- Tue, 18.11.97, 4:00pm, John Rawnsley (Warwick), ``On a paper of Deligne'' (Quantization Seminar).
- Mon, 24.11.97, 4:30pm, Victor Pidstrigatch (Warwick), ``The ADHM construction and invariants of 4-manifolds'' (Geometry and...).

- Tue, 25.11.97, 4:00pm, John Rawnsley (Warwick), ``Quantisation à la Deligne II'' (Quantization Seminar).
- Mon, 1.12.97, 4:30pm, John Jones (Warwick), ``Elliptic cohomology II'' (Geometry and...).
- Thu, 18.12.97, 4:30pm, N.I. Shepherd-Barron (Cambridge), ``Long extremal rays and symplectic terminal singularities'' (COW seminar).
- Tue, 13.1.98, 4:00pm, John Rawnsley (Warwick), ``Quantisation à la Deligne III'' (Quantization Seminar).
- Thu, 15.1.98, 4:00pm, Dietmar Salamon (Warwick), ``Gromov-Witten invariants and the WDVV-equation'' (Floer homology seminar).
- Mon, 19.1.98, 3:00pm, Jose-Luis Cisneros (Warwick), ``Index theorem II'' (Geometry and...).
- Tue, 20.1.98, 4:00pm, George Terizakis (Warwick), ``On an example of a singular polarization'' (Quantization Seminar).
- Thu 22.1.98, 3:00pm, Stefan Endrass (Mainz), ``Contact geometry and even node sets'' (COW Seminar).
- Tue, 27.1.98, 4:00pm, George Terizakis (Warwick), ``On an example of a singular polarization, II'' (Quantization Seminar).
- Thu, 29.1.98, 4:00pm, Dietmar Salamon (Warwick), ``The Deligne-Mumford compactification'' (Floer homology seminar).
- Tue, 3.2.98, 4:00pm, George Terizakis (Warwick), ``On an example of a singular polarization, III'' (Quantization Seminar).
- Thu, 5.2.98, 4:15pm in Oxford, Nigel Hitchin (Oxford), ``The special Kähler geometry of moduli spaces'' (COW Seminar).
- Thu, 5.2.98, 4:00pm, Dietmar Salamon (Warwick), ``Gromov compactness and stable maps'' (Floer homology seminar).
- Tue, 10.2.98, 4:00pm, Paul Cooper (Warwick), ``Lagrangian submanifolds in Fedosov quantization'' (Quantization Seminar).
- Thu, 12.2.98, 5pm, Dietmar Salamon (Warwick), ``Multi-Valued perturbations and rational Gromov-Witten invariants'' (Floer homology seminar).
- Tue, 17.2.98, 4:00pm, Santos Asin Lares (Warwick), ``Projectable star products'' (Quantization Seminar).
- Tue, 17.2.98, 5pm, Jyotshana Prajapat (Tata Institute), ``Alexandrov's Reflection and Symmetry of Solutions of Differential Equations on Manifolds'' (Geometry and...).
- Thu, 19.2.98, 2:15pm in Bath, Balazs Szendroi (Cambridge), ``The Torelli problem for Calabi-Yau threefolds'' (COW Seminar).
- Thu, 19.2.98, 4:15pm in Bath, Mark Gross (Warwick), ``Special Lagrangian fibrations'' (COW Seminar).
- Tue, 24.2.98, 4:00pm, Professor Yoshiaki Maeda (Keio), ``The group of quantum diffeomorphisms'' (Quantization Seminar).
- Thu, 26.2.98, 5pm, Laurent Lazzarini (Warwick), ``J-holomorphic discs and the Arnold conjecture'' (Floer homology seminar).
- Mon, 2.3.98, 3:15pm, Joachim Weber (Warwick), ``Topology of Sp(2,R) and the Conley-Zehnder index'' (Geometry and...).
- Tue, 3.3.98, 4:00pm, John Rawnsley (Warwick), ``Quantisation à la Deligne IV'' (Quantization Seminar).
- Fri, 6.3.98, 12:00noon, Victor Pidstrigach (Warwick), ``Vafa-Witten via compactification'' (COW Seminar).
- Fri, 6.3.98, 2:00pm, Marco Manetti (Pisa), ``Algebraic surfaces, moduli spaces and diffeomorphism type'' (COW Seminar).

- Sat, 7.3.98, 12:00noon, Mark Gross (Warwick), ``Calabi-Yaus and special Lagrangians'' (COW Seminar).
- Sat, 7.3.98, 2:00pm, Dominic Joyce (Oxford), ``The topology of resolutions of Calabi-Yau orbifolds'' (COW Seminar).
- Sat, 7.3.98, 3:30pm, Pelham Wilson (Cambridge), - ``Gromov-Witten invariants and primitive contractions on Calabi-Yaus'' (COW Seminar).
- Mon, 9.3.98, 4:30pm, A. Tyurin (Moscow), ``A slight deformation of algebraic geometry I'' (Geometry and...)
- Wed, 11.3.98, 2:00pm, A. Tyurin (Moscow), ``A slight generalization of algebraic geometry II''.
- Mon, 16.3.98, 4:30pm, S. Mukai (Nagoya), ``Introduction to geometric invariant theory III''.
- Wed, 18.3.98, 3:15pm, S. Mukai (Nagoya), ``Introduction to geometric invariant theory IV''.
- Thu, 23.4.98, 4:00pm, Mark Gross (Warwick), ``Counting curves on the quintic I'' (Floer homology seminar).
- Fri, 1.5.98, 2:00pm John Rawnsley (Warwick), ``Introduction to Kontsevich'' (Quantization Seminar).
- Thu, 7.5.98, 4:00pm, Mark Gross (Warwick), ``Counting curves on the quintic II'' (Floer homology seminar).
- Fri, 8.5.98, 2:00pm Simone Gutt (Brussels/Metz), ``Introduction to Kontsevich II'' (Quantization Seminar).
- Mon, 11.5.98, 3:05pm, Ana Rita Gaio (Warwick), ``Moment Maps and Symplectic Reduction'' (Geometry and...).
- Thu, 14.5.98, 4:00pm, Mark Gross (Warwick), ``Counting curves on the quintic III'' (Floer homology seminar).
- Fri, 15.5.98, 2:00pm Simone Gutt (Brussels/Metz), ``Introduction to Kontsevich III'' (Quantization Seminar).
- Mon, 18.5.98, 3:05pm, Ana Rita Gaio (Warwick), ``Moment Maps and localization'' (Geometry and...).
- Wed, 20.5.98, 2:00pm Simone Gutt (Brussels/Metz), ``Introduction to Kontsevich IV'' (Quantization Seminar).
- Wed, 20.5.98, 4:00pm, Mark Gross (Warwick), ``Counting curves on the quintic IV'' (Floer homology seminar).
- Mon, 25.5.98, 3:05pm, Ana Rita Gaio (Warwick), ``Moment Maps and convexity'' (Geometry and...).
- Wed, 3.6.98, 4:00pm, Mark Gross (Warwick), ``Counting curves on the quintic V'' (Floer homology seminar).
- Mon, 8.6.98, 4:30pm, Mario Micallef (Warwick), ``Minimizing Volume among Lagrangian Submanifolds (à la Schoen and Wolfson) I'' (Geometry and...).
- Mon, 15.6.98, 4:30pm, Mario Micallef (Warwick), ``Minimizing Volume among Lagrangian Submanifolds (à la Schoen and Wolfson) II'' (Geometry and...).
- Tue, 16.6.98, 2:00pm, Andras Stipsicz (Budapest), ``Nuclei in 4-manifolds''.
- Tue, 16.6.98, 4:00pm, Paul Seidel (Princeton), ``A_n quiver algebras, intersection theory, and Floer homology I''.
- Thu, 18.6.98, 2:00pm, Yong-Geun Oh (Madison), Disjunction energy of Lagrangian embeddings''.
- Thu, 18.6.98, 4:00pm, Paul Seidel (Princeton) ``A_n quiver algebras, intersection theory, and Floer homology II''.

- Mon 22.6.98, 3:05pm, Yong-Geun Oh (Madison), ``Geometry of Minimal Langrangian Submanifolds'' (Geometry and...).
- Mon 22.6.98, 4:30pm, Victor Pidstrigatch (Warwick), ``On 4-manifolds and modularity'' (Geometry and...).
- Tue, 23.6.98, 4:00pm, Paul Seidel (Princeton), ``A_n quiver algebras, intersection theory, and Floer homology III''.
- Thu, 25.6.98, 3pm, Yong-Geun Oh (Madison), ``Quantization of the Eilenberg-Steenrod axioms''.
- Thu, 25.6.98, 4:30pm, Paul Seidel (Princeton) ``A_n quiver algebras, intersection theory, and Floer homology IV''.
- Thu, 2.7.98, 11am, Richard Wentworth (Irvine), ``Character varieties and harmonic maps to trees I''.
- Thu, 2.7.98, 2:00pm, Georgios Daskalopoulos (Brown), ``Character varieties and harmonic maps to trees II''.

C List of Publications

C.1 Books worked on during the Symposium

[1]

V. Ginzburg, Y. Karshon, and V. Guillemin, *Cobordisms and Hamiltonian Group Actions* (tentative title), in preparation.

[2]

D. McDuff and D.A. Salamon, *Introduction to Symplectic Topology*, 2nd Edition, Oxford University Press, July 1998.

[3]

D.A. Salamon, *Spin geometry and Seiberg-Witten Invariants*, approx 550 pages, in preparation.

C.2 Papers worked on during the Symposium

[4]

C. Arezzo and M. Micallef, Minimal surfaces in flat tori, Warwick Preprint 34/1998, September 1998.

[5]

S. Bauer, On connected sums of 4-manifolds, in preparation.

[6]

M. Bhupal, Legendrian intersections in the 1-jet bundle, PhD thesis, Warwick, January 1998.

[7]

P. Biran, Symplectic disc bundles and Lagrangian skeletons, in preparation.

[8]

P. Bonneau, Fedosov star-products and 1-differentiable deformations, in preparation.

[9]

F. Bourgeois and M. Cahen, A variational principle for symplectic connections. To appear in J. Geom. Phys.

[10]

M. Braverman, Symplectic cutting of Kähler manifolds, Preprint 1997.

[11]

[12] D. Burns and R. Hind, Uniqueness of Grauert tubes, in preparation.

[13] M. Cahen, Remarks on symplectic connections. Preprint 1998.

[14] M. Cahen, S. Gutt and J. Rawnsley, Symplectic connections with parallel Ricci tensor. To appear in the *Banach Center Publications*.

[15] M. Chaperon, An obstruction for strict convexity of a contact hypersurface near a closed characteristic (working title), in preparation.

[16] Y. Chekanov, Differential algebras of Legendrian links, Preprint 1997.

[17] Y. Chekanov, Proof of the four-point conjecture by Arnold, (working title), in preparation.

[18] Véronique Chloup-Arnould, Star products on the algebra of polynomials on the dual of a semi-simple Lie algebra.

[19] G. Daskalopoulos, S. Dostoglou, and R. Wentworth, Character varieties and harmonic maps to \mathbb R-trees. Preprint 1998.

[20] W. Domitrz, On stability of differential 1-forms and nonlinear-control systems on a manifold with boundary, in preparation.

[21] W. Domitrz, S. Janczko, and Z. Pasternak-Winwarski, On singular symplectic structures, in preparation.

[22] Y. Eliashberg, A. Givental, and H. Hofer, Contact homology (working title), in preparation.

[23] S. Endraß, Minimal even sets of nodes, in preparation.

[24] S. Endraß, Contact of projective surfaces with at most ADE singularities, in preparation.

[25] N. Ercolani, Geometry of the phase diffusion equation, in preparation.

[26] B. Fedosov, Quantization conditions and the index theorem, in preparation.

[27] B. Fedosov, Non-abelian reduction in deformation quantization, in preparation.

[28] B. Fedosov, On the index of elliptic operators on a corner, in preparation.

[29] K. Froyshov, Equivariant aspects of Yang-Mills Floer homology (working title), in preparation.

[30] K. Fukaya, Floer homology of Lagrangian foliations and noncommutative mirror symmetry, Preprint 1998.

K. Fukaya, M. Kontsevich, H. Ohta, K. Ono, and Y.-G. Oh, Anomaly in Lagrangian intersections and Floer homology, in preparation.

[31] A.R. Gaio, PhD thesis, University of Warwick, in preparation.

[32] A.R. Gaio and D.A. Salamon, J-holomorphic curves and moment maps, in preparation.

[33] V. Ginzburg and Y. Karshon, Assignment and abstract moment maps, in preparation.

[34] M. Gross, Special Lagrangian fibrations II: Geometry, Warwick preprint 37/1998, 71 pp.

[35] S. Gutt and J.H. Rawnsley, Equivalence of star products on a symplectic manifold. To appear in J. Geom. Phys.

[36] H. Hofer and D.A. Salamon, Marked Riemann surfaces of genus zero, in preparation.

[37] H. Hofer and D.A. Salamon, Gromov compactness and stable maps, in preparation.

[38] H. Hofer and D.A. Salamon, Rational Gromov-Witten invariants for general symplectic manifolds, in preparation.

[39] H. Hofer and D.A. Salamon, Rational Floer homology and the general Arnold conjecture, in preparation.

[40] A. Karabegov, On the canonical normalization of formal trace density, Lett. Math. Phys. 45 (1998) 217-228.

[41] Y. Karshon, Periodic Hamiltonian flows in 4-dimensional manifolds, Preprint 1998.

[42] R. Kasturirangan and Y.-G. Oh, Floer homology of open subsets and a refinement of the Arnold conjecture, Preprint, 1997.

[43] R. Kasturirangan and Y.-G. Oh, Fary functors, Floer homology, and the Conley index (working title), in preparation.

[44] V. Kharlamov, On the relation real algebraic and symplectic geometries (tenative title), in preparation.

[45] A. Kovalev and M. Singer, Glueing theorems for anti-self-dual metrics, Preprint 1998.

[46] M. Kovanov and P. Seidel, Floer homology, A_n quiver algebras, and the braid group (working title), in preparation.

[47] F. Lalonde, D. McDuff, and L. Polterovich, On the flux conjectures, Preprint DG/9706015, 1997.

[48] F. Lalonde, D. McDuff, and L. Polterovich, Topological rigidity of Hamiltonian loops and quantum cohomology, Preprint DG/9710017, 1997.

[49]
L. Lazzarini, Factorization of closed pseudoholomorphic curves and finiteness of their intersection, submitted to *Trans. A.M.S.*, Preprint, 1997.

[50]
L. Lazzarini, Existence of a somewhere injective pseudo-holomorphic disc, Preprint, 1998.

[51]
H.-V. Le and K. Ono, Topology of symplectomorphism groups and pseudoholomorphic curves, Preprint, November 1997.

[52]
H.-V. Le, Harmonic almost complex structures (working title), in preparation.

[53]
Y. Long, Precise iteration formulae for the Maslov-type index theory for symplectic paths, in preparation.

[54]
K.C.H. Mackenzie, Double Lie Algebroids and duality, in preparation.

[55]
K. Matsuki, Introduction to the Mori program, in preparation.

[56]
K. Matsuki, Uniformity of stably integral points on principally polarized abelian surfaces, in preparation.

[57]
C. Mueller, A two-species superprocess, in preparation.

[58]
C. Mueller, The principal Anderson problem with colored noise, in preparation.

[59]
H. Ohta and K. Ono, Simple singularities and the topology of symplectically filling 4-manifolds, Preprint, Nagoya University, 1997.

[60]
K. Ono, The orientation of moduli spaces of J-holomorphic discs (working title), in preparation.

[61]
R. Paoletti On symplectic invariants of algebraic varieties coming from crepant contractions, Preprint 1997.

[62]
R. Paoletti, Symplectic subvarieties of projective fibrations over symplectic manifolds, Preprint, Fall 1997.

[63]
R. Paoletti, Symplectic submanifolds in special position, Preprint, September 1998.

[64]
D. Park, Product formula for Seiberg-Witten invariants along certain Seifert fibred manifolds, in preparation.

[65]
H. Pederson, Kähler-Weyl geometry and the Einstein-Weyl equations (tentative title), in preparation.

[66]
J. Robbin, D.A. Salamon, and K.F. Siburg, Feynman path integrals, Birkhoff invariants, and the Hofer metric (working title), in preparation.

[67]

D.A. Salamon, *Lectures on Floer homology*, Lecture Notes for the IAS/PCMI Graduate Summer School on Symplectic Geometry and Topology, Warwick preprint 47/97, December 1997.

[68]

D.A. Salamon, Seiberg-Witten equations and symplectic fixed points, in preparation.

[69]

D.A. Salamon and J. Weber, J-holomorphic curves in cotangent bundles and Morse theory of the loop space, in preparation.

[70]

F. Schlenk, On symplectic folding, Preprint 1998.

[71]

M. Schwarz, Continuous sections in the action spectrum for closed symplectically aspherical manifolds. Preprint, March 1998.

[72]

M. Schwarz, A capacity for closed symplectically aspherical manifolds, Preprint 1998.

[73]

M. Schwarz, An explicit isomorphism between Floer homology and quantum cohomology, in preparation.

[74]

J.-C. Sikorav, Spaces of J-holomorphic curves and symplectic surfaces in 4-manifolds, in preparation.

[75]

R. Sjamaar, Projections of coadjoint orbits and the Hilbert-Mumford criterion, in preparation.

[76]

R. Sjamaar, Moment maps and symplectic pairs, in preparation.

[77]

A. Stipsicz, Simply connected symplectic 4-manifolds with positive signature, Warwick preprint 27/1998, June 1998.

[78]

A. Stipsicz, On certain homology classes of Kähler surfaces, Warwick preprint 28/1998, June 1998.

[79]

A. Stipsicz, Chern numbers of certain Lefschetz fibrations, Warwick preprint 30/1998, July 1998.

[80]

T. Takakura, An application of the multiplicity formula, in preparation.

[81]

T. Tokieda, Symplectic reduction in stages and bifurcation of relative equilibria, in preparation.

[82]

T. Tokieda, Extrema and relative equilibria, in preparation.

[83]

A. Tyurin, Special Lagrangian geometry and Slightly deformed Algebraic Geometry (SPLAG and SDAG). Warwick preprint 22/1998, June 1998.

[84]

G. Valli, Minimal Lagrangian submanifolds of Kähler-Einstein manifolds, Preprint 1998.

[85]

[86]
G. Valli, On some minimal Lagrangian discs, Preprint 1998.

[87]
E. Vargas, Polynomial maps with inflection points, Preprint 1998.

[88]
C. Viterbo, Metric and isoperimetric problems in symplectic geometry, Preprint, February 1998.

[89]
C. Viterbo, Functors and computations in Floer homology with applications I, Preprint, February 1998.

[90]
C. Viterbo, Functors and computations in Floer homology with applications II, Preprint, February 1998.

[91]
J. Weber, PhD thesis, TU Berlin, in preparation, to be submitted in the fall of 1998.

[92]
J. Wolf and R. Zierau, Double fibration transforms, Preprint 1998.

[93]
V. Zakalyukin, Singularities of contact with flags loop, Preprint, 1998.

V. Zakalyukin, Vanishing homology of singular Lagrange varieties, Preprint, 1998.

C.3 Other recent papers by participants

[94]
D. Auroux, Asymptotically holomorphic families of symplectic submanifolds, *Geometric and Functional Analysis***7** (1997), 971-995.

[95]
M. Bialy and L. Polterovich, Invariant tori and symplectic topology, *Amer. Math. Soc. Transl.* **171** (1996), 23-33.

[96]
P. Biran, Symplectic packing in dimension 4,, Preprint, October 1996.

[97]
P. Biran, A stability property of symplectic embeddings, Preprint, Dec 1997.

[98]
P. Biran, Constructing new ample divisors out of old ones, Preprint 1998.

[99]
Y. Chekanov, Lagrangian intersections, symplectic energy, and areas of holomorphic curves, Preprint, May 1997 (final version), to appear in Duke Math J.

[100]
Y. Eliashberg and L. Polterovich, New applications of Luttinger's surgery, *Comm. Math. Helv.* **69** (1994), 512-522.

[101]
Y. Eliashberg and L. Polterovich, Local Lagrangian 2-knots are trivial, *Annals of Mathematics* **144** (1996), 61-76.

[102]
Y. Eliashberg and M. Fraser, Classification of topologically trivial Legendrian knots, Preprint, to appear.

[103]
M. Farber and V. Turaev, Poincaré-Reidemeister metric, Euler structures, and torsion, Preprint 1998.

[104]

R. Fintushel and R. Stern, Knots, links, and 4-manifolds, Preprint, 1997.

[105]

R. Fintushel and R. Stern, Surfaces in 4-manifolds, Preprint, July 1997.

[106]

K. Froyshov, On Floer homology and four-manifolds with boundary, PhD thesis, Oxford, 1995.

[107]

K. Froyshov, The Seiberg-Witten equations and four-manifolds with boundary, Preprint, 1996.

[108]

K. Fukaya and K. Ono, Arnold conjecture and Gromov-Witten invariants, Preprint 1996.

[109]

M. Hutchings and Y.-J. Lee, Circle valued Morse theory, Reidemeister torsion, and Seiberg-Witten invariants of 3-manifolds, to appear in *Topology*.

[110]

M. Hutchings and Y.-J. Lee, Circle valued Morse theory and Reidemeister torsion, to appear in *Math. Research Letters*.

[111]

J. Jones and J. Rawnsley, Hamiltonian Circle Actions and the Signature, J. Geom.

Phys. 23 (1997) 301-307 begin_of_the_skype_highlighting   23 (1997) 301-307 FREE end_of_the_skype_highlighting.

[112]

P. Lisca, Symplectic fillings and positive scalar curvature. Preprint 1997.

[113]

C.-G. Liu and Y. Long, Iteration inequalities of the Maslov type index theory with applications, Preprint, November 1997.

[114]

D. McDuff and L. Polterovich, Symplectic packings and algebraic geometry, *Inventiones Mathematicae* **115** (1994), 405-429.

[115]

K.C.H. Mackenzie, Double Lie Algebroids and iterated tangent bundles, Preprint 1998.

[116]

D. Milinkovich and Y.-G. Oh, Floer homology as the stable Morse homology, *J. Korean Math. Soc.* **34** (1997), 1065-1087.

[117]

J. Morgan, T. Mrowka, and Z. Szabo, Product formulas along $\mathbb{T}^3$ for Seiberg-Witten invariants, Preprint, March 1997.

[118]

Y.-G. Oh, Gromov-Floer theory and the disjunction energy of compact Lagrangian submandifolds, *Math. Res. Letters* **4** (1997), 895-905.

[119]

J. Oprea and Yu. Rudyak, On the Ljusternik Schnirelman category of symplectic manifolds and the Arnold conjecture, Preprint 1997.

[120]

P. Ozsvath and Z. Szabo, The symplectic Thom conjecture, Preprint 1998.

[121]

S. Piunikhin, D. Salamon, and M. Schwarz, Symplectic Floer-Donaldson theory and quantum cohomology, in *Contact and Symplectic Geometry*, edited by C.B. Thomas, Publications of the Newton Institute, Cambridge University Press 1996, 171-200.

[122]

L. Polterovich, Gromov's K-area and symplectic rigidity, *Geometric and Functional Analysis* **6** (1996), 726-739.

[123]

L. Polterovich, Symplectic aspects of the first eigenvalue, Preprint DG/9705003, May 1997.

[124]

L. Polterovich, Hamiltonian loops and Arnold's principle, *Amer. Math. Soc. Transl.* **180** (1997), 181-187.

[125]

L. Polterovich, Hamiltonian loops from an ergodic point of view, Preprint, 1998.

[126]

Yu. Rudyak, On strict category weight and the Arnold conjecture, Preprint 1997.

[127]

P. Seidel, Floer homology and the symplectic isotopy problem, PhD thesis, Oxford, Fall 1997.

[128]

P. Seidel, π_1 of symplectic automorphism groups and invertibles in quantum cohomology, Preprint, 1997.

[129]

P. Seidel, Symplectic automorphisms of T^*S^2, Preprint, March 1998.

[130]

P. Seidel, On the group of symplectic automorphhisms of \mathbb CP^m×\mathbb CP^n, Preprint, March 1998.

[131]

P. Seidel, Lagrangian 2-spheres can be symplectically knotted, Preprint, March 1998.

[132]

K.F. Siburg, Aubry-Mather theory and the inverse spectral problem for planar convex domains, Preprint 1998.

[133]

K.F. Siburg, Action minimizing measures and the geometry of the Hamiltonian diffeomeorphism group, to appear in Duke Math J 1998.

[134]

K.F. Siburg, A dynamical systems approach to Birkhoff's theorem, Preprint 1998.

[135]

K.F. Siburg, Bi-invariant metrics for symplectic twist mappings on T^*\mathbb T^n and an application to Aubry Mather theory, CRM Proceedings and Lecture Notes Volume 15, 1998, 137-148.

[136]

L. O'Shea, R. Sjamaar, Moment maps and Riemannian symmetric pairs. Math. Ann. 317 (2000), no. 3, 415-457.

[137]

E. Lerman, S. Tolman, Intersection cohomology of S\sp 1 symplectic quotients and small resolutions. Duke Math. J. 103 (2000), no. 1, 79-99.

D List of participants

Abenda, Simonetta (Bologna, Italy)

Agnihotri, Sharad (Amsterdam, The Netherlands)

Akveld*, Meike (ETH-Zurich, Switzerland)

Altinok*, Selma (Warwick, UK)

Anjos, Silvia (Stony Brook, USA)

Anosov, Dimitri (Steklov-Moscow, Russia)

Arezzo*, Claudio (Warwick, UK)

Arnal, Didier (Metz, France)

Asin*, Santos (Warwick, UK)

Audin, Michèle (Paris, France)

Auroux, Denis (Ecole Polytechnique, France)

Baguis*, Pierre (Brussels, Belgium)

Barrett, John (Nottingham, UK)

Bartocci, Claudio (Genova, Italy)

Bauer, Stefan (Bielefeld, Germany)

Bertelson*, Mélanie (Stanford, USA)

Bhupal*, Mohan (MPI-Bonn, Germany)

Bialy, Misha (Tel Aviv, Israel)

Bieliavsky*, Pierre (Bruxelles, Belgium)

Biran, Paul (Stanford, USA)

Bloch, Anthony (Michigan, USA)

Bloore, Fred, J. (Liverpool, UK)

Bonneau*, Philippe (Bourgogne, France)

Bordemann, Martin (Freiburg, Germany)

Bourgeois, Frédéric (Bruxelles, Belgium)

Braverman, Maxim (Jerusalem, Israel)

Bridges, Thomas J. (Surrey, UK)

Burns, Dan (Michigan, USA)

Burstall, Francis (Bath, UK)

Cahen, Michel (Bruxelles, Belgium)

Caiber, Mirel (Warwick, UK)

Calderon, Francisco (Sevilla, Spain)

Cannas de Silva, Ana (UC Berkeley, USA)

Castano-Bernard[*], Ricardo (Warwick, UK)

Castelvecchi, Davide (Stanford, USA)

Chaperon, Marc (Paris-Jussieu, France)

Chekanov, Yuri (Moscow, Russia)

Chiang, Meng-jung (Urbana-Champaign, USA)

Chillingworth, David (Southampton, UK)

Chloup-Arnould[*], Veronique (Metz, France)

Ciocci, Maria Cristina (Gent, Belgium)

Ciriza, Eleonora (Roma, Italy)

Coelho, Zaq (Porto, Portugal)

Cohen, Ralph (Stanford, USA)

Colin, Vincent (Lyon, France)

Cooper[*], Paul G. (Warwick, UK)

Cruz[*], Ines (Porto, Portugal)

Cushman, Richard (Utrecht, The Netherlands)

Damian, Mihai (Toulouse, France)

Daskalopoulos, Georgios (Brown, USA)

Derks, Gianne (Surrey, UK)

Djordjevic, Goran S. (Nis, Yugoslavia)

Domitrz, Wojciech (Warsaw , Poland)

Dostoglou, Stamatis (Missouri-Columbia, USA)

Eells, James (Warwick, UK)

Eliashberg, Yakov (Stanford, USA)

Farber, Michael (Tel Aviv, Israel)

Fedosov, Boris (Potsdam, Germany)

Fernandes, Emmanuel (Louvain, Belgium)

Fernandes, Rui Loja (Lisbon, Portugal)

Flaschka, Hermann (Arizona, USA)

Flato, Moshe (Bourgogne, France)

Fraser, Maia (Montreal, Canada)

Froyshov, Kim A. (Oslo, NORWAY)

Fukaya, Kenji (Kyoto, Japan)

Furter, Jacques (Brunel, UK)

Gaio[*], Rita (Warwick, UK)

Gammella[*], Angela (Metz, France)

Gekhtman, Michael (Williamsburg, USA)

Ginzburg, Viktor (UC Santa Cruz, USA)

Giroux, Emmanuel (ENS-Lyon, France)

Giunashvili, Zaqro (Academy of Sciences, Georgia)

Gothen, Peter (Porto, Portugal)

Gross, Mark (Warwick, UK)

Gutt, Simone (Bruxelles, Belgium)

Habermann, Katharina (MPI Bonn, Germany)

Halic, Mihai (Institut Fourier, France)

Hall, Brian (Notre Dame, USA)

Hannabuss, Keith C. (Oxford, UK)

He, Xinyu (Warwick, UK)

Herrera[*], Rafael (Oxford, UK)

Hickin, David (Warwick, UK)

Hind, Richard (MPI Bonn, Germany)

Hitchin, Nigel (Oxford, UK)

Horowitz[*], Joel (Bruxelles, Belgium)

Hoyle, Mark (MIT, USA)

Hrabak[*], Sean Paul (KCL, UK)

Hudson, Robin, L. (Nottingham Trent , UK)

Huebschmann, Johannes (Lille, France)

Hutchings[*], Michael (Harvard, USA)

Izadi, Elham (UG Athens, USA)

Jones, John D.S. (Warwick, UK)

Kanda, Yutaka (Hokkaido, Japan)

Karabegov, Alexander (Dubna, Russia)

Karshon, Yael (Hebrew University, Israel)

Kharlamov, V (Strasbourg, France)

Khudaverdyan, H (UMIST, UK)

Kim, Youngsun (Warwick, UK)

Kirwan, Frances (Oxford, UK)

Konno, Hiroshi (Tokyo, Japan)

Konno, Kazuhiro (isa, Italy)

Kovalev, Alexei (Edinburgh, UK)

Lalonde, Francois (Montréal, Canada)

Lamb[*], Jeroen (Warwick, UK)

Landsman, Nicolaas (Cambridge, UK)

Lang, Jens (München, Germany)

Laudenbach, Francois (Ecole Polytechnique, France)

Lazzarini[*], Laurent (Warwick, UK)

LeHong, Van (MPI Bonn, Germany)

Lei, Tan (Warwick, UK)

Lerman, Eugene (Urbana-Champaign, USA)

Lewis[*], Andrew (Warwick, UK)

Lewis, Debra (UC Santa Cruz, USA)

Lisca, Paolo (Pisa, Italy)

Livotto[*], Andrea Giulio (Warwick, UK)

Lizan, Véronique (Toulouse, France)

Loi[*], Andrea (Cagliari, Italy)

Long, Yiming (Nankai, PR CHINA)

McDuff, Dusa (SUNY at Stony Brook, USA)

Mackenzie, Kirill (Sheffield, UK)

Maeda, Yoshiaki (Keio, Japan)

Maeno, Toshiaki (Kyoto, Japan)

Mahassen, Nadim (Swansea, UK)

Marshall, Ian D. (Leeds, UK)

Matsuki, Kenji (Purdue, USA)

Matsushita, Daisuke (Kyoto, Japan)

Markus, Larry (Warwick, UK)

Matessi[*], Diego (Warwick, UK)

Merkulov, Sergei (Glasgow, UK)

Metzler, David (Rice, USA)

Micallef, Mario (Warwick, UK)

Milinkovic, Darko (Wisconsin-Madison, USA)

Missarov, Moukadas (Kazan, Russia)

Mitsumatsu, Yoshihiko (Chuo, Japan)

Miyaoka, Yoichi (MPI Bonn, Germany)

Mohnke, Klaus (Siegen, Germany)

Mohsen, Jean Paul (ENS-Lyon, France)

Montaldi, James (Nice, France)

Mukai, Shigeru (Nagoya, Japan)

Munn[*], Jonathan M. (Warwick, UK)

Munoz, Vicente (Malaga, Spain)

Nakagawa, Yasuhiro (Tohoku, Japan)

Nasir, Sazzad Mahmud (Cambridge, UK)

Norbury[*], Paul (Melbourne, Australia)

Oh, Yong-Geun (Wisconsin, USA)

Ohba, Kiyoshi (Ochanomizu, Japan)

Ohta, Hiroshi (Nagoya, Japan)

Omoda, Yasuhiro (Kyoto, Japan)

Ono, Kaoru (Hokkaido, Japan)

Osipova[*], Daria (Hull, UK)

Pansu, Pierre (Paris-Sud, France)

Paoletti, Roberto (Pavia, Italy)

Park, Doug (Princeton, USA)

Parthasarathy, K.R. (Nottingham Trent, UK)

Patrick, George W. (Saskatchewan, Canada)

Pauly, Christian (Nice, France)

Pekarsky, Sergey (CalTech, USA)

Pidstrigatch, Victor (Warwick, UK)

Pinsonnault, Martin (Montreal, Canada)

Pinto, Alberto (Porto, Portugal)

Polterovich, Leonid (Tel Aviv, Israel)

Prajapat, Jyotshana (TIFR, India)

Prokhorov, Yuri (Lille, France)

Reid, Miles (Warwick, UK)

Robbin, Joel (Wisconsin, USA)

Roberts, Mark (Warwick, UK)

Rogers, Alice (KCL, UK)

Rudyak, Yuli (Siegen, Germany)

Rugh, Hans Henrik (Warwick, UK)

Rumynin[*], Dmitriy (Warwick, UK)

Rybicki, Tomasz (Rzesow, Poland)

Sadovskii, Dmitrii (Littoral, France)

Santa Cruz[*], Sergio (Recife, Brazil)

Schlenk, Felix (ETH Zurich, Switzerland)

Schwarz, Matthias (Stanford, USA)

Seidel, Paul (IAS Princeton, USA)

Sergeev, Armen (Steklov Moscow, Russia)

Sevennec, Bruno (ENS-Lyon, France)

Siburg, Karl Friedrich (Freiburg, Germany)

Sikorav, Jean Claude (Toulouse, France)

Sitta, Angela (Brunel, UK)

Sjamaar, Reyer (Cornell, USA)

Sleewaegen[*], Pierre (Bruxelles, Belgium)

Smith, Ivan (Oxford, UK)

Sousa Dias, Esmeralda (Lisboa, Portugal)

Stavracou[*], Jenny (Brussels, Belgium)

Stern, Ron (UC Irvine, USA)

Sternheimer, Daniel (Bourgogne, France)

Stipsicz, András I. (Budapest, Hungary)

Strien, Sebastian van (Warwick, UK)

Swann, Andrew (Bath, UK)

Swift, S. Timothy (Southampton, UK)

Szabó, Zoltán (Princeton, USA)

Szendröi[*], Balázs (Cambridge, UK)

Takakura, Tatsuru (Chuo, Japan)

Tang, Chun Chung (Cambridge, UK)

Terizakis[*], George (Warwick, UK)

Thomas, Charles B. (Cambridge, UK)

Tokieda, Tadashi (Urbana-Champaign, USA)

Tokunaga, Ken-ichi (Kyoto, Japan)

Tolman, Susan (MIT, USA)

Traynor, Lisa (Bryn Mawr, USA)

Tyurin, Andrei (Steklov Moscow, Russia)

Uhlenbeck, Karen (UT Austin, USA)

Valero[*], Carlos (Oxford, UK)

Valli, Giorgio (Pavia, Italy)

Vanderbauwhede, Andre (Gent, Belgium)

Vassilakis, Theodore (Brown, USA)

Vidussi, Stefano (Pavia, Italy)

Viterbo, Claude (Orsay, France)

Voronov, A. (Michigan State, USA)

Voronov, Theodore (UMIST, UK)

Waldman[*], Stefan (Bruxelles, Belgium)

Wang, Bryan (Adelaide, Australia)

Weber, Joachim (Warwick, UK)

Wentworth, Richard A. (UC Irvine, USA)

Wilson, Pelham (Cambridge, UK)

Wolf, Joseph (UC Berkeley, USA)

Wolfson, Jon (Michigan State, USA)

Wood[*], David (Oxford, UK)

Wurzbacher, Tilmann (Strasbourg, France)

Yoshioka, Akira (Tokyo, Japan)

Zakalyukin, Vladimir M. (Moscow, Russia)

E A selection of comments by visitors

- **Meike Akveld (September):** Wonderful conference; very interesting lectures.
- **Dan Burns (July):** Great place for maths meetings - very high quality science, good facilities, very helpful and friendly staff. I felt that way when I was here 8 years ago, but it's even better now.
- **Marc Chaperon (March):** This has been a most profitable conference. I thank the organisers of this workshop for inviting me.
- **Maria Christina Ciocci (March):** Everything was very well organised!
- **Wojciech Domitrz (March):** I am very grateful for the organisers of the workshop on symplectic topology for inviting me and for their hospitality. It was a very interesting workshop.
- **Emmanuel Fernandes (March):** Wonderful meeting with very good talks and a wonderful place for working and interchanging ideas.
- **Thomas Fangel (January to July):** There's a very inspiring atmosphere at the institute. I've benefitted a lot from my stay.
- **Victor Ginzburg (September):** Very good conference. Outstanding work of organisers. Competent and friendly staff. My thanks to Dietmar and John, and to Peta and Hazel!
- **Simone Gutt (September):** Very good meeting. **Dreadful** food at the cafeteria.
- **Katharina Haberman (March):** The workshop on symplectic topology was very inspiring. I ewnjoyed the great working atmosphere in the mathematics institute.
- **Keith Hannabus (September):** A very useful opportunity to learn about deformation quantization and direct limit quantization, and to meet new people whom I knew only through their papers. It's a pity that the quality of food in the refectory has declined so much, compared with previous visits.
- **Johannes Huebschman (December):** Excellent atmosphere and environment for a contemplative meeting (as is always the case here).
- **Alexander Karabegov (December):** I find the working conditions offered me here excellent.
- **Yael Karshon (September):** The workshop was great! I learned useful stuff, got work done, and enjoyed my visit.
- **Alexei Kovalev (March):** The workshop and Spitalfields Day were very useful source of learning new ideas and developments in Floer theory, Seiberg-Witten theory, symplectic geometry, and other areas.
- **Hiroshi Konno (March):** Everything was very well organised and comfortable. I would like to thank the organisers and staff at Warwick University.
- **Le Hong Van (March):** I have a great opportunity here to participate in the workshop, to listen, and to exchange ideas. The working atmosphere is wonderful.
- **Kirill Mackenzie (December):** This has been a very rich conference in terms of new contacts and developments. Pacing of talks ideal. Facilities and quality of support seem unsurpassed.
- **Kenji Matsuki (December/January):** Thank you very much for the hospitality. It was a mathematically stimulating and educational 2 months stay with Profs. Reid and Mukai. My special thanks to the able and kind staff at the office of Hazel and Peta.
- **Klaus Mohnke (July):** Well organised and very interesting conference. Many thanks to Peta and Hazel for their help!
- **Carl Mueller (July):** The research atmosphere here is excellent.
- **Kaoru Ono (March):** The conference has been well organised. Thank you for the stimulating atmosphere.

- **Doug Park (July):** Attending the symplectic geometry workshop was immensely helpful for my research work. I would like to thank the organisers and staff at the MRC for their hospitality.
- **Henrik Pedersen (January):** The working atmosphere is absolutely perfect: Everything runs smoothly in an international atmosphere with very strong scientists around. The staff and library are 1st class.
- **Yuli Rudyak (July):** The conference was very well organised, the scientific programme was interesting. Also I want to mention the good work of the secretaries: they are very kind.
- **Felix Schlenk (March):** It was a great conference here, with many exciting talks, in a very warm atmosphere, and at a place just perfectly suitable.
- **Karl Friedrich Siburg (July):** Very intensive workshop, very helpful staff.
- **Jean-Claude Sikorav (September):** Excellent organization of the Symposium.
- **Ron Stern (September):** Excellent workshop - good mathematics and excellent entertainment where more good mathematics ensued.
- **Andras Stipsicz (June/July):** Excellent conditions to work; nice library and very good workshop.
- **Georgio Valli (July):** Very good conference, excellent people, friendly environment.
- **Joseph Wolf (September):** Very pleased with scientific quality of conference. Facilities etc excellent. Staff super.

There were many more comments of a similar nature.

F Programmes of Workhops

See front page.