International Mathematical Union

February 18, 2008
IMU AO Circular Letter 3/2008

To: IMU Adhering Organizations
Mathematical Societies

From: Martin Grötschel, IMU Secretary

Nomination of invited plenary and sectional speakers for ICM 2010

The Program Committee for the International Congress of Mathematicians 2010 in Hyderabad, India, August 19-27, 2010 has been set up. According to the PC/OC Guidelines the Program Committee has chosen the core panels for the ICM 2010 sections. At this moment in time the Adhering Organizations of IMU and the mathematical societies the world over are invited to nominate invited plenary and sectional speakers.

Attached to this circular letter please find the list of the ICM 2010 sections. When you make nominations for speakers please specify whether you suggest them as plenary speakers or section speakers. In case of proposals of section speakers please indicate to which sections you would like the persons to be invited.

All communication concerning the scientific program of ICM 2010 is handled by the Chair of the Program Committee. Please direct all your mail with proposals for invited plenary and sectional speakers to Prof. Hendrik W. Lenstra, and please use the special e-mail address for this purpose
hwlicm@math.leidenuniv.nl.

Sincerely

Martin Grötschel

Encl.

Attachment to IMU AO Circular Letter 3/2008 of February 18, 2008

Description and definitions of the ICM 2010 sections, as well as the number of lectures to be given in each section.

Total number of lectures (including panel discussions): 150-176.

1. Logic and foundations (4-5 lectures)

Model theory. Set theory. Recursion theory. Proof theory. Applications.
Connections with sections 2, 3, 14, 15.

2. Algebra (6-7 lectures)

Groups and their representations (except as specified in 5 and 7). Rings, algebras and modules (except as specified in 7). Algebraic K-theory. Category theory. Computational algebra and applications.
Connections with sections 1, 3, 4, 5, 6, 7, 14, 15.

3. Number theory (10-12 lectures)

Analytic and algebraic number theory. Local and global fields and their Galois groups. Zeta and L-functions. Diophantine equations. Arithmetic on algebraic varieties. Diophantine approximation, transcendental number theory and geometry of numbers. Modular and automorphic forms, modular curves and Shimura varieties. Langlands program. p-adic analysis. Number theory and physics. Computational number theory and applications, notably to cryptography.
Connections with sections 1, 2, 4, 7, 12, 14, 15.

4. Algebraic and complex geometry (9-11 lectures)

Algebraic varieties, their cycles, cohomologies and motives (including positive characteristics). Schemes. Commutative algebra. Low dimensional varieties. Singularities and classification. Birational geometry. Moduli spaces. Abelian varieties and p-divisible groups. Derived categories. Transcendental methods, topology of algebraic varieties. Complex differential geometry, Kahler manifolds and Hodge theory. Relations with mathematical physics and representation theory. Real algebraic and analytic sets. Rigid and p-adic analytic spaces. Tropical geometry.
Connections with sections 2, 3, 5, 6, 7, 8, 14, 15.

5. Geometry (10-12 lectures)

Local and global differential geometry. Geometric PDE and geometric flows. Geometric structures on manifolds. Riemannian and metric geometry. Geometric aspects of group theory. Convex geometry. Discrete geometry. Geometric rigidity.
Connections with sections 2, 4, 6, 7, 8, 9, 10, 11, 12.

6. Topology (10-12 lectures)

Algebraic, differential and geometric topology. Floer and gauge theories. Low-dimensional including knot theory and connections with Kleinian groups and Teichmüller theory. Symplectic and contact manifolds. Topological quantum field theories.
Connections with sections 2, 4, 5, 7, 8, 9, 12.

7. Lie theory and generalizations (8-10 lectures)

Algebraic and arithmetic groups. Structure, geometry and representations of Lie groups and Lie algebras. Related geometric and algebraic objects, e.g. symmetric spaces, buildings, vertex operator algebras, quantum groups. Non-commutative harmonic analysis. Geometric methods in representation theory. Discrete subgroups of Lie groups. Lie groups and dynamics, including applications to number theory.
Connections with sections 2, 3, 4, 5, 6, 8, 9, 10, 12, 13, 14.

8. Analysis (7-8 lectures)

Classical analysis. Special functions. Harmonic analysis. Complex analysis in one and several variables, potential theory, geometric function theory (including quasi-conformal mappings), geometric measure theory. Applications.
Connections with sections 5, 6, 7, 9, 10, 11, 12, 16.

9. Functional analysis and applications (5-6 lectures)

Operator algebras. Non-commutative geometry, spectra of random matrices. K-theory of C*-algebras, structure of factors and their automorphism groups, operator-algebraic aspects of quantum field theory, linear and non-linear functional analysis, geometry of Banach spaces, Asymptotic geometric analysis. Connections to ergodic theory.
Connections with sections 5, 6, 7, 8, 10, 11, 12, 13.

10. Dynamical systems and ordinary differential equations (9-11 lectures)

Topological and symbolic dynamics. Geometric and qualitative theory of ODE and smooth dynamical systems, bifurcations and singularities. Hamiltonian systems and dynamical systems of geometric origin. One-dimensional and holomorphic dynamics. Multidimensional actions and rigidity in dynamics. Ergodic theory including applications to combinatorics and combinatorial number theory.
Connections with sections 5, 7, 8, 9, 11, 12, 13, 14, 16, 17.

11. Partial differential equations (9-10 lectures)

Solvability, regularity, stability and other qualitative properties of linear and non-linear equations and systems. Asymptotics. Spectral theory, scattering, inverse problems. Variational methods and calculus of variations. Optimal transportation. Homogenization and multiscale problems. Relations to continuous media and control. Modeling through PDEs.
Connections with sections 5, 8, 9, 10, 12, 16, 17, 18.

12. Mathematical physics (10-12 lectures)

Quantum mechanics. Quantum field theory. General relativity. Statistical mechanics and random media. Integrable systems. Electromagnetism, String theory, condensed matter, fluid dynamics, multifield physics (e.g. fluid/waves, fluid/solids, etc.).
Connections with sections 4, 5, 6, 7, 8, 9, 10, 11, 13.

13. Probability and Statistics (12-13 lectures)

Classical probability theory, limit theorems and large deviations. Combinatorial probability. Random walks. Interacting particle systems. Stochastic networks. Stochastic geometry. Stochastic analysis. Random fields. Random matrices and free probability. Statistical inference. High-dimensional data analysis. Sequential

methods. Spatial statistics. Applications.
Connections with sections 3, 5, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18.

14. Combinatorics (7-8 lectures)

Combinatorial structures. Enumeration: exact and asymptotic. Graph theory. Probabilistic and extremal combinatorics. Designs and finite geometries. Relations with linear algebra, representation theory and commutative algebra. Topological and analytical techniques in combinatorics. Combinatorial geometry. Combinatorial number theory. Polyhedral combinatorics and combinatorial optimization.
Connections with sections 1, 2, 3, 4, 7, 10, 13, 15.

15. Mathematical aspects of computer science (6-7 lectures)

Complexity theory and design and analysis of algorithms. Formal languages. Computational learning. Algorithmic game theory. Cryptography. Coding theory. Semantics and verification of programs. Symbolic computation. Quantum computing. Computational geometry, computer vision.
Connections with sections 1, 2, 3, 4, 13, 14, 16.

16. Numerical analysis and scientific computing (5-6 lectures)

Design of numerical algorithms and analysis of their accuracy, stability and complexity. Approximation theory. Applied and computational aspects of harmonic analysis. Numerical solution of algebraic, functional, differential, and integral equations. Grid generation and adaptivity.
Connections with sections 8, 10, 11, 13, 15, 17, 18.

17. Control theory and optimization (6-7 lectures)

Minimization problems. Controllability, observability, stability. Robotics. Stochastic systems and control. Optimal control. Optimal design, shape design. Linear, non-linear, integer, and stochastic programming. Applications.
Connections with sections 10, 11, 13, 16, 18.

18. Mathematics in science and technology (8-10 lectures)

Mathematics applied to the physical sciences, engineering sciences, life sciences, social and economic sciences, and technology. Bioinformatics. Mathematics in interdisciplinary research. The interplay of mathematical modeling, mathematical analysis and scientific computation, and its impact on the understanding of scientific phenomena and on the solution of real life problems.
Connections with sections 11, 13, 16, 17.

19. Mathematics education and popularization of mathematics
(3 lectures + 3 panel discussions)

All aspects of mathematics education, from elementary school to higher education. Mathematical literacy and popularization of mathematics. Ethnomathematics.

20. History of Mathematics (3 lectures)

Historical studies of all of the mathematical sciences in all periods and cultural settings.