PERIODICA POLYTECHNICA SER. MECH. ENG. VOL. 36, NOS. 3-4, PP. 171-179 (1992)

SCIENTIFIC ACTIVITIES OF THE STAFF OF THE DEPARTMENT OF GEOMETRY 1977 TO 1992

Á. G. HORVÁTH

Department of Geometry
Faculty of Mechanical Engineering
Technical University of Budapest

Received: November 16, 1992

The field of interest of this Department's staff covers primarily various chapters of geometry, involving both classic and recent trends. There are four main scopes such as axiomatic geometry and theory of construction; discrete and combinatorial geometry; differential geometry; and computer graphics.

Research in the first scope is hallmarked by Gyula Strommer, who essentially endeavoured at a possibly elementary analysis of the construction of Gaussian regular polygons (STROMMER [4]–[13]). The construction of regular settimdecagon by a ruler and a gauge merits special interest. Problems of construction theory according to Bolyai's hyperbolic and non-Euclidean geometries (STROMMER [1], [2], [3], [7]) induced an axiomatic approach to special questions of foundantions of geometry.

Results in the second scope are variegated, although three essential trends are manifest, such as /hyperbolic and Euclidean/ problems related to space tiling, investigations of the density of sphere packings, and lattice geometry related to geometric number theory. Imre Vermes pointed out an interesting property of asymptotic or regular $\{p, 4\}$ mosaics (VERMES [1], [10]). Proving existence of the densest hypercycle packings in the hyperbolic plane (VERMES [2], [5]), the problem of the sparsest hypercycle covering is also solved (VERMES [8], [4], [6], [7]). An interesting problem is that of the density of congruent circles accommodable in the given hypercycle domain, assessed in (VERMES [8]).

Results by Emil Molnár in hyperbolic geometry are obtained from a method developed by him. Fundamental idea of this method and of the related theory is that: space tiling by polyhedra according to some combinatorially given group of transformations may be realized in some homogeneous space of constant curvature or other, depending on free parameters. A d-dimensional calculation procedure relying on projective metrics has been developed (MOLNÁR [1], [2], [8]), with concrete, computerized applications.

These results, utilized in MOLNÁR [6], [7], [9], [14], are essentially interesting from hyperbolic geometry aspects. Overall frames of this theory have been developed in (MOLNÁR [8]), combined later with the method of D-symbols, and leading, — thanks to the cooperation of colleagues from Bielefeld, — to efficient computer algorithms. The obtained complete classifications are described in MOLNÁR [3], [6], [7], [12], [14], [15], while crystallographic applications motivated (MOLNÁR [11], [12]). MOLNÁR's papers written with co-authors from Belgrade (MOLNÁR [4], [5], [13]) conclude long-studied difficult classification problems by applications of discrete groups in the hyperbolic plane. Because of the high number of cases, in general, this topic cannot be handled without computer. To solve the arising problems, István Prok has developed a program to produce all the space groups for a polyhedron given with a fitting flag structure so that the polyhedron will be the fundamental domain of the corresponding space groups (PROK [1]). By this method all the crystal groups of cubic fundamental domain in the Euclidean space were determined (PROK [2], [3]). In a paper by István Prok and Emil MOLNÁR (PROK [4]) all the solid-transitive simplex tilings of the three-dimensional simply connected spaces are classified.

Emil Molnár, Ákos G. Horváth and Jenő Szirmai investigated problems of densest sphere packings in three-dimensional Euclidean space. Ákos G. Horváth demonstrated that the densest double-latticelike congruent sphere packings cannot be denser than the densest lattice-like ones (G. HORVÁTH [7]). In the joint paper with by E. Molnár the same is verified for all packings generated by the ten Euclidean space groups without fixed points (G.HORVÁTH [11], [12]). Jenő Szirmai is concerned with similar problems (SZIRMAI [1], [2]) for other discrete space groups /F23, F432, P432/.

Lattice geometry is the chapter of n-dimensional discrete geometry related to geometric number theory, a scope concerned with primarily by Ákos G. Horváth at this Department. Joining the Moscow school of this topic, problems of different lattice bases /or for primitive systems/ are studied in G. HORVÁTH [1], [2], [3], [6], [10], while those for minimum vectors in lattices in [4], [15]. Sections by a hyperplane of the Dirichlet cell system of particular point sets are investigated in G. HORVÁTH [8], while G. HORVÁTH [9] and [14], indicating lattices with many minimum vectors lead to the theory of finite-dimensional vector spaces over finite fields, that is, the coding theory. The finite geometries above have earlier been investigated by István Reiman. He studied certain relations between finite geometries and graph theory. He succeeded in solving extremal graph problems by means of finite geometries.

At this Department, the convex geometry has been studied by Károly Böröczky, jr., examining the concept of 'rectangular convex' figures [1]. In discrete geometry, a densest configuration of finite spheres is described in BÖRÖCZKY, jr. [2], then some extremal properties of simplices are justified BÖRÖCZKY, jr. [3], [5]. We mention an interesting paper of VERMES [9], pointing to the relation between 'elementary' and 'differential' geometry by synthetic treatment of plane curves in hyperbolic geometry.

Investigations in differential geometry are of internationally comprehensive scopes, relied on a wide cooperation in the frames of a seminary headed by János Szenthe, and of the OTKA competition. One of its important events was the summer course 'Loop spaces' in June 1989, organized by János Szenthe, László Verhóczki and this Department. Leading professors were outstanding mathematicians such as M. F. Atiyah, R. Bott and G. B. Segal.

Differential geometry of curves in an n-dimensional Euclidean space was investigated by Gábor MOLNÁR–SÁSKA in [2] followed by investigations on isometry groups of Riemannian manifolds (MOLNÁR–SÁSKA [4], [5]). After having studied certain special group actions, János Szenthe generalized the concept of the Weyl group (SZENTHE [4]–[10]). In subsequent works of SZENTHE [11]–[19], certain comparison theorems of Riemannian geometry are extended and applied for isometric group actions. Then group actions on symplectic manifolds are investigated, applied in reducing mechanical systems. László Verhóczki has been concerned with special isometries, reflections of Riemannian geometries, then with submanifolds left fixed by isometries (VERHÓCZKI [1], [3]). He studied isoparametric submanifolds in symmetric spaces, and planar mappings between manifolds endowed with affin connection (VERHÓCZKI [4], [2], [5]).

Research in the theory of computer aided geometric design was initiated by Márta Szilvási–Nagy. Data systems were developed for geometric algorithms and spatial models, polyhedral data structures and intersection algorithms were developed with estimating the number of steps (SZILVÁSI [4]–[9]). Polyhedron algorithms rounding off edges and vertices by spline patches were given and mixed-type data stucture was constructed from discrete and analytic models (SZILVÁSI [11], [12], [15]). Pál Ledneczki developed various spline curve and surface fitting methods (LEDNECZKI [2], [3], [4]), systemized motion transformations and mappings for the sake of updating the subjects from the aspects of computer methodology. The computer is likely to become the main tool also for research in geometry.

At last, let us have a look at the products of scientific activities in the past fifteen years. The Department staff has published 120 papers, 12 books, defended four Dr. Univ. Theses, one Ph. D. and one Candidate's Thesis, delivered 57 /unpublished/ scientific lectures.

The papers and books written by the staff of the Department in the past fifteen years are listed in the following bibliography. In the cases of those papers which have been accepted but not published until now only the titles of the journals are presented.

References

Károly Böröczky jr.

1. Rectangular Convexity of Convex Domains of Constant width. *Geometriae Dedicata* Vol. 34 (1990), pp. 13–18.
2. On the Smallest Limited Snake of Unit Disks (in common with T. Bisztriczky, H. Harborth and L. Piepmeyer). *Geometriae Dedicata* Vol. 40 (1991), pp. 319–324.
3. About Mean width of the Simplices. *Per. Pol. Mech. Eng.*
4. Inexhaustible Homogeneous Structures (in common with N. Sauer and X. Zhu). *Discrete Mathematics.*
5. Some Extremal Properties of the Regular Simplex. *Proceedings of the Conference on Intuitive Geometry, Szeged,* 1991.
6. Intrinsic Volumes and Finite Ball-Packing. Ph. D. thesis, Calgary, 1992.

Dr. Ákos G. Horváth:

1. Az n-dimenziós rácsok Minkowski és Hermite bázisairól. *Mat. Lapok* 33 (1982–1986), 93–98.
2. On the Connection of Bases of n-Lattices, Reduced by Minkowski and Reduced by Hermite. *'First conference of program designers' Budapest, ELU* (1985) 67–72.
3. On the Basis Reduction Problem. *'Second conference of program designers' Budapest, ELU* (1986) 117–122.
4. On the Nearest Latticepoint Problem. *'Geometrie und Anwend.' 7. Tagung der Fachsektion Geometrie.* Holzhau (1989), 55–56.
5. On a Polynomial Algorithm for Selecting a Lattice-Basis Containing a Given Primitive System. *Studia Sci. Math. Hung.* Vol. 24 (1989), pp. 325–329.
6. Algebraic Characterization of Primitive Systems. *Studia Sci. Math. Hung.* Vol. 24 (1989), pp. 331–337.
7. On Double-Latticelike Spherepacking. *Ann. Univ. Sci. Budapest* Vol. 33 (1990), pp. 53–60.
8. On a Question of K. Bezdek and T. Ódor. *Per. Math. Hung.* Vol. 24 (1992), pp. 189–192.
9. Codes and Lattices. *Per. Pol. Mech. Eng.*
10. Some Remarks Connected with G. Csóka's paper 'On an Extremal Property of Minkowskireduced Forms'. *Studia Sci. Math. Hung.*
11. Egy nehezen kezelhető geometriai szélsőérték problémáról. *Mat. Lapok.*
12. Densest Ball Packing by Orbits of the 10 Fixed Point Free Euclidean Space Groups (in common with E. Molnár). *Studia Sci. Math. Hung.*
13. On the Coordinates of Minimum Vectors in N-Lattices. *Studia Sci. Math. Hung.*
14. On the Number of the Minima of N-lattices. *Conference on Intuitive Geometry, Szeged* (1991).
15. On the Nearest Latticepoint Problem. *Ann. Univ. Sci. Budapest.*
16. Konstruktiv módszerek a rácsgeometriában. Doktori értekezés 1987.

Dr. Pál Ledneczki:

1. Two dimensional Spline Interpolation (in common with M. Szilvási Nagy and G. Molnár-Sáska). *Per. Pol. Mech. Eng.* Vol. 25 (1981), pp. 263–276.
2. Selections from Teaching Computational Geometry. *'Geometrie und Anwend.' 7. Tagung der Fachsektion Geometrie.* Holzhau (1988), pp. 79–80.
3. B-splines in Constructive Geometry. *Konstruktive Geometrie Symposium Vortragssammlung, Debrecen* (1990), pp. 63–70.
4. Conic sections, an Introduction to the Rational Splines. *Per. Pol. Mech. Eng.*
5. A spline-interpoláció néhány ábrázoló geometriai alkalmazása. Doktori értekezés, 1982.
6. Geometriai transzformációk. Budapest 1992.

Dr. Emil Molnár:

1. Adott tükrözéscsoportokhoz tartozó extremális gömbkitöltések a hiperbolikus térben (in common with Brezovich László). *Mat. Lapok* Vol. 34 (1991), pp. 61–91.
2. Projective Metrics and Hyperbolic Volume. *Ann. Univ. Sci. Budapest* Vol. 32 (1990), pp. 127–157.
3. Eine Klasse von hyperbolischen Raumgruppen. *Beiträge zur Algebra und Geometrie* 30 (1990), pp. 79–100.
4. Fundamental Domains for Planar Discontinuous Groups and Uniform Tilings (in common with Z. Lucic). *Geometriae Dedicata* Vol. 40 (1991), pp. 125–143.
5. Combinatorial Classification of Fundamental Domains of Finite Area for Planar Discontinuous Isometry Groups (in common with Z. Lucic). *Archiv Math.* Vol 54 (1990), pp. 511–520.
6. Bipyramidal Non-compact Hyperbolic Space Forms with Finite Volume (in common with M. Sarac). *Ann. Univ. Sci. Budapest* Vol. 33 (1990), pp. 75–103.
7. Tetrahedreon Manifolds and Space Forms. *Note di Matematica* Vol. 10 (1990), pp. 335–346.
8. Polyhedron Complexes with Simply Transitive Group Actions and Their Realizations. *Acta Math. Hung.* Vol. 59 (1992), pp. 175–216.
9. On Isometries of Space Forms. *Coll. Math. Soc. J. Bolyai* 56, *Differential Geometry.* Budapest (1992), pp. 509–534.
10. Some Old and New Aspects on the Crystallographic Groups. *Per. Pol. Mech. Eng.*
11. Densest Ball Packings by Orbits of the 10 Fixed Point Free Euclidean Space Groups (in common with Á. G. Horváth.) *Studia Sci. Math. Hung.*
12. Symmetry Breaking of the Cube Tiling and the Spatial Chess Board by D-symbols. *Univ. Bielefeld, Combinatorics and its applications 1990/91 SFB-NR 91/100; ZiF-Nr. 91/30, Beiträge zur Algebra und Geometrie.*
13. The Classification of Face-Transitive Periodic 3D-Tilings (in common with A. W. M. Dress and D. Huson). *Universität Bielefeld, Combinatorics and its applications 1990/91, ZiF-Nr 91/38, Acta Crystallographica.*
14. The 14 Infinite Series of Isotoxal Tilings in the Planes of Constant Curvature (in common with Z. Lucic and M. Stojanovic). *J. Combinatorial Theory (Series B).*
15. Klassifikation der hyperbolischen Dodekaederpflasterungen von maximalen flächentransitiven Bewegungsgruppen. *Math. Pannonica* 4/1 (1993) S. 113–136.
16. Classification of Solid Transitive Simplex Tilings in Simply Connected 3-spaces. Part 1. (in common with I. Prok). *Coll. Math. Soc. J. Bolyai* **63** *Intuitive Geometry, Szeged* (1991).
17. Diszkrét csoportok és térformák poliédermodelljei. Akadémiai doktori értekezés, 1990.

Dr. Gábor Molnár–Sáska:

1. Generalization of a Theorem by P. Hartman and A. Wintner. *Per. Pol. Mech. Engrg.* Vol. 21 (1977), pp. 153–158.
2. On Some Questions Concerning the Differential Geometry of Curves in n-dimensional Euclidean Space. *Publ. Math. Debrecen* Vol. 30 (1983), pp. 57–73.
3. Two Dimensional Spline Interpolation (in common with M. Szilvási Nagy and P. Ledneczki). *Per. Pol. Mech. Eng.* Vol. 25 (1981), pp. 263–276.
4. The Focal Locus of a Submanifold in a Riemannian Manifold (in common with J. Szenthe). *Ann. Univ. Sci. Budapest* Vol. 30 (1987), pp. 101–114.
5. On Some Symplectic Actions of Compact Lie Groups (where all the orbits are equivariantly isomorphic and diffeomorphic to a fixed orbit of the coadjoint action). *Per. Pol. Mech. Eng.*
6. Az n-dimenziós euklideszi tér reguláris görbéiről. Doktori értekezés, 1980.

Dr. Márta Szilvási–Nagy:

1. A quarter szimmetrikus konnexió görbületéről. *Mat. Lapok* Vol. 28 (1980).
2. On the Curvature Tensor of the Quarter-Symmetric Linear Connection. *Colloq. Math. Soc. János Bolyai* 31, *Differential Geometry.* Budapest (1982), pp. 719–723.
3. Two dimensional Spline Interpolation (in common with P. Ledneczki and G. Molnár–Sáska). *Per. Pol. Mech. Eng.* Vol. 25 (1981), pp. 263–276.
4. An Algorithm for Determining the Intersection of Two Simple Polyhedra. *Computer Graphics Forum* Vol. 3 (1984), pp. 219–225.
5. A Solution for the Intersection of Two Convex Polyhedra. *Per. Pol. Mech. Eng.* Vol. 30 (1986), pp. 273–275.
6. The Base of Graphic Systems. The intersection, union and difference of two convex polyhedra. *'First conference of program designers', Budapest, ELU* (1985) pp. 47–54.
7. Ein graphisches System in BASIC für Personalcomputer Commodore 64. *'Geometrie und Anwend." 6. Tagung der Fachsektion Geometrie.* Tabarz (1986), pp. 119–120.
8. Datenstrukturen zur Polyederbeschreibung und Schnittoperationen für Polyeder. *TU Dresden Studientexte Computergeometrie* 92 (1986), pp. 115–118.
9. Two Algorithms for Decomposing a Polyhedron into Convex Parts. *Computer Graphics Forum* Vol. 5 (1986), pp. 197–202.
10. CAD-Anwendungen auch in Verpackungskonstruktion, über Erfahrungen mit einem CAD-Unterrichtsmodell am Institut für Technologie und Planung Druck. *HDK Berlin, Verpackungs-Rundschau* 2 (1988), S. 142–144.
11. Shape Manipulation on Polyhedral Models. *microCAD'90 Nemzetközi Számitástechnikai Találkozó Miskolc (NOVITAS Egyetemi Egyesület)* I/94–96.
12. Numerische Beschreibung von Polyedermodellen mit Verrundungen. *TU Dresden, Studientexte Computergeometrie* 109 (1990), pp. 184–189.
13. CAD-school. *microCAD'91, A számitástechnika Müszaki alkalmazásai Konferencia, Miskolc* V/43–48.
14. A Tested Model of Teaching CAD for Beginners. *SEFI Proceedings of the 6th European Seminar on mathematics in Engineering Education, Budapest-Balatonfüred 1991, Hungary, SEFI Mathematics Working Group* TUB 186–189.
15. Flexible Rounding Operation for Polyhedra. *Computer-aided Design* Vol. 23 (1991), pp. 629–633.
16. Proposals for Teaching Geometry that Lead Out of the Crisis. *COMPUGRAPHICS 91, First International Conference on Computational Graphics and Visualization Techniques.* Sesimbra (1991), pp. 472–476.

17. Parabolic Blending Surfaces along Polyhedron Edges. *Per. Pol. Mech. Eng.*
18. The Right Place of CAD-Courses in Engineer Education. *Per. Pol. Mech. Eng.*
19. Geometriai algoritmusok poliéderekre. Kandidátusi értekezés, 1988.
20. Geometriai feladatok (in common with István Reiman). Tankönyvkiadó, 1982.
21. CAD-Iskola. Typotex Kft Elektronikus Kiadó, 1991.

István Prok:

1. A Polyhedron Algorithm for Finding Space Groups (in common with E. Molnár). *Proceedings of Third Int. Conf. on Engineering Graphics and Descriptive Geometry, Vienna,* Vol. 2 (1988), pp. 37–44.
2. Euclidean Crystallographic Groups with Cubic Fundamental Domains. *Konstruktive Geometrie Vortragssammlung. Debrecen,* (1990) pp. 133–142.
3. Data Structures and Procedures for a Polyhedron Algorithm. *Per. Pol. Mech. Eng.*
4. Classification of Solid Transitive Simplex Tilings in Simply Connected 3-spaces. part 1. (in common with E. Molnár). *Coll. Math. Soc. J. Bolyai* **63** *Intuitive Geometry, Szeged* (1991).
5. The Euclidean Space Has 298 Fundamental Tilings with Marked Cubes by 130 Space Groups. *Coll. Math. Soc. J. Bolyai* **63** *Intuitive Geometry, Szeged* (1991).
6. Kocka alaptartományú euklideszi kristálycsoportok. *Alkalmazott Mat. Lapok.*

Dr. István Reiman:

1. Einige Beziehungen zwischen der endlichen projektiven Ebenen und der Graphentheorie. *Per. Pol. Mech. Eng.* 21 (1977), pp. 129–135.
2. Eine Tetraeder-Dreieck Zuordnung in der Elementargeometrie. *Per. Pol. Mech. Eng.*
3. *A geometria és határterületei.* Budapest, 1986, 419 old.
4. *Ábrázoló geometria.* Budapest, 1986, 226 old.
5. *Fejezetek az elemi geometriából.* Budapest, 1987, 206 old.
6. *Matematikai versenyek, 3. kötet.* Budapest, 1989, 340 old. 7. *Matematika.* Budapest, 1992, 608 old.

Dr. Gyula Strommer:

1. Zu den Steinerschen Konstruktionen. *Per. Pol. Mech. Eng.* 21 (1977), S. 83–102 .
2. A Bolyai geometria szerkesztéselméletéről. *Mat. Lapok* 27 (1976–1979), 65–67.
3. Szabályos sokszögek abszolút szerkesztése. *Mat. Lapok* 27 (1976–1979), 161–163 .
4. Geodetische und Pseudogeodetische auf Regelflächen im Flaggenraum (in common with H. Sachs). *Archiv Math.* 33 (1980), S. 478–484.
5. Über das Verhalten einer krummen Fläche in der Nähe eines parabolischen Punktes. *Studia Sci. Math. Hung.* 22 (1987) S. 103–105.
6. Szabályos ötszög szerkesztése vonalzóval és hosszátvivővel. *Középisk. Mat. Lapok* 32 (1989), 245–249.
7. Ein neuer elementarer Bewies der Kreisaxiome der hyperbolischen Geometrie. *Acta Sci. Math. Szeged* Vol.54 (1990), pp. 269–271.
8. Kürschák József (1844–1933). *Mat. Lapok* 34 (1991), 239–245.
9. Szabályos tizenhétszög szerkesztése. *Középisk. Mat. Lapok* 41 (1991), 441–449.
10. Konstruktion des regulären Siebzehnecks mit Lineal und Streckenübertrager. *Acta Math. Hung.* Vol. 58 (1992), pp. 217–226.
11. Berichtigung zu meiner Arbeit: Konstruktion des regulären Siebzehnecks mit Lineal und Streckenübertrager. *Acta Math. Hung.* 60 (1992), S. 269–270.
12. Konstruktion des regulären Siebzehnecks mit Lineal und Streckenübertrager. *Per. Pol. Mech. Eng.*
13. Zur Konstruktion des regulären Siebzehnecks. *Studia. Sci. Math. Hung.*

14. *Geometria* , Tankönyvkiadó, Budapest, 1988. 738 old.
15. D. Hilbert-S. Cohn Vossen, *Szemléletes geometria* (Translation) Budapest, Gondolat Kiadó, 1982.

Dr. János Szenthe:

1. On reductive structures and their applications. *Per. Pol. Mech. Engrg.* 21 (1977), 111–118.
2. A homogén terek elméletének kérdéseiről. *Doktori értekezés tézisei.* Budapest 1977.
3. Henri Poincaré matematikai munkásságáról és hatásáról (in common with M. Bognár). *Mat. Lapok* 28 (1977–80), 269–286.
4. On Maximal Invariant Neighborhoods of Orbits. *Coll. Math. Soc. J. Bolyai* 23, *Topology.* Budapest (1980), 127–138.
5. Sur les sous-groupes d'isotropie des actions isométriques sur variétés riemanniannet á courbure positive. *Studia Sci. Math. Hung.* 15 (1980), 89–92.
6. On the Orbit Structure of Orthogonal Actions with Isotropy Subgroups of Maximal Rank. *Acta Sci. Math. Szeged* 43 (1981), 353–367.
7. On the Cut Locus of a Principal Orbit in a Riemannian Manifold of Non-positive Sectional Curvature. *Ann. Univ. Sci. Budapest* Vol. 24 (1981), pp. 227–240.
8. Sur les voisinages invariants maximums des orbites d'actions orthogonales. *Publ. Math. Debrecen* 29 (1982), 43–55.
9. Isometric Actions with Isotropy Subgroups of Maximal Rank on Riemannian Manifolds. *Coll. Math. Soc. J. Bolyai* 31, *Differential Geometry.* Budapest (1982), pp. 705–718.
10. On Dynamical Group Actions. *GAMM-Tagung. Budapest* (1982).
11. A Generalization of the Weyl Group. *Acta Math. Hung.* Vol. 41 (1983), pp. 347–357.
12. On Symplectic Actions of Compact Lie Group with Isotropy Subgroups of Maximal Rank. *Acta Sci. Math.* Vol. 45 (1983), pp. 381-388.
13. Geometriai transzformációk és azok alkalmazásai. *A Budapesti Műszaki Egyetem bicentenáriumi ünnepsége keretében a Gépészmérnöki Karon rendezett tudományos ülésszak előadásai.* Budapest (1983), 85–90.
14. On the Comparison of Isometric Actions. *Ann. Glob. Analysis and Geometry* 1 (1983), pp. 23–36.
15. A szeletfogalom a transzformációcsoportok elméletében. *Mat. Lapok* 31 (1978–83), 39–66.
16. Orthogonally Transversal Submanifolds and the Generalizations of the Weyl Group. *Per. Math. Hung.* Vol. 15 (1984), pp. 281–299.
17. A Reduction in Case of Compact Hamiltonian Actions. *Acta Sci. Math.* Vol. 49 (1985), pp. 107–117.
18. Some Isometric Actions with Orthogonal Transversal Submanifolds on Riemannian Symmetric Spaces. *Studia Sci. Math. Hung.* Vol. 21 (1986), pp. 175–179.
19. The Focal Locus of a Submanifold in a Riemannian Manifold (in common with G. Molnár–Sáska). *Ann. Univ. Sci. Budapest* Vol. 30 (1987), pp. 101–114.

Jenő Szirmai:

1. Optimale Kugelpackungen für die Raumgruppen F23, F432 und P432. *Per. Pol. Mech. Eng.*
2. Néhány tércsoport optimális gömbkitöltése. *Alkalmazott Mat. Lapok.*

Dr. László Verhóczki:

1. Involutive Isometries of Reimannian Manifolds. *'Geometrie und Anwend.', 7. Tagung der Fachsektion Geometrie.* Holzhau (1988), 127–128.

2. E_1-planar Maps of Torsion Free Affine-Connected Spaces (in Common with S. Bácsó). *Publ. Math. Debrecen* 37 (1990), pp. 131–136, (in Russian).
3. Reflections of Riemannian Manifolds. *Publ. Math. Debrecen* Vol. 38 (1991), pp. 19–31.
4. Isoparametric Submanifolds of General Reimannian Manifolds. *Coll. Math. Soc. J. Bolyai* 56, *Differential geometry.* Budapest (1992), pp. 691–705.
5. Quasiplanar Maps in Three-dimensional Manifolds. *Per. Pol. Mech. Eng.*
6. Riemann sokaságok tükrözései. Doktori értekezés, 1988.

Dr. Imre Vermes:

1. Über die nicht-total asymptotischen Mosaike der hyperbolischen Ebene. *Per. Pol. Mech. Engrg.* 21 (1977), 137–143.
2. Ausfüllungen der hyperbolischen Ebene durch kongruente Hyperzykelbereiche. *Per. Math. Hung.* 10 (1979), 217–229.
3. Über reguläre Überdeckungen der Bolyai-Lobatschewskischen Ebene durch kongruente Hyperzykelbereiche. *Per. Pol. Mech. Eng.* 25 (1981), 249–261.
4. A hiperbolikus sík szabályos lefedései egybevágó hiperciklus-tartományokkal. *Mat. Lapok* 32 (1984), 97–105.
5. Über eine geometrische Ungleichung bezüglich der Dichte der regulären Ausfüllungen der hyperbolischen Ebene durch kongruente Hyperzykelbereiche. *Studia Sci. Math. Hung.* 21 (1986), 29–33.
6. Bemerkungen zum Problem der dünnsten Überdeckungen der hyperbolischen Ebene durch kongruente Hyperzykelbereiche. *Studia Sci. Math. Hung.* 23 (1988), 1–6.
7. Egy lefedési konstrukció a hiperbolikus síkon. *Mat. Lapok* 32 (1985), 259–262.
8. Kreisunterdeckungen auf einem Hyperzykelbereich in der hyperbolischen Ebene. *Studia Sci. Math. Hung.* 26 (1991), 111–114.
9. Über eine Überdeckungskonstruktion in der Bolyai-Lobatschewskischen Ebene. *Per. Pol. Mech. Engrg.*
10. Über die synthetische Behandlung der Krümmung und des Schmiegzykels der ebenen Kurven in der Bolyai-Lobatschewskyschen Geometrie. *Studia Sci. Math. Hung.*
11. Eine Extremaleigenschaft des regulären Mosaiks $\{p, 4\}$ in der hyperbolischen Ebene und ihre Verallgemeinerung für die Mosaike $\{p, 2k\}$. *Studia Sci. Math. Hung.*
12. Geometria-útmutató és példatár (bővitett kiadás), Tankönyvkiadó, 1990.

Address:

Á. G. Horváth
Department of Geometry
Faculty of Mechanical Engineering
Technical University of Budapest
H–1521 Budapest, Hungary