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PROFESSOR WOLFGANG W. BRECKNER AT HIS 60TH ANNIVERSARY

ŞTEFAN COBZAŞ

Professor Wolfgang Werner Breckner was born in Sibiu, Romania, on October 6, 1942. After finishing the high school in 1960, he went to Cluj-Napoca and enrolled the Faculty of Mathematics and Mechanics of the Babeş-Bolyai University. During the studies he was one of the best students, so that in 1965, after graduating, he was retained at this faculty as an assistant at the Chair of Mathematical Analysis, headed by Professor Tiberiu Popoviciu, member of the Romanian Academy. In 1971 he obtained the Ph.D. degree with the thesis "Characterization theorems for the solutions of certain optimization problems", elaborated under the guidance of Tiberiu Popoviciu. In 1972 he was promoted Lecturer and in 1990 Associate Professor. Since 1993 he is full Professor at the Chair of Analysis and Optimization of the Faculty of Mathematics and Computer Science at present, and since 1992 he is the head of this chair.

He married in 1965 Maria Erzsébet Corvin. They have two daughters Brigitte Erika (born in 1970) and Hannelore Inge (born 1971). They graduated both the Faculty of Mathematics and Computer Science of the Babeş-Bolyai University, earned Ph.D.'s in Germany, and now are affiliated as lecturers with our faculty.

The managerial and professional skills of Professor Breckner determined his election in 1997 as a vice-rector of the Babeş-Bolyai University. Since then, he acted in this position.

As a recognition of the value of his research he was invited to spend several research stages at some universities in Germany: in 1991 at the Gerhard Mercator University Duisburg, in 1994 and 1998 at the Technical University Munich, and in 1995 and 2001 at the Martin Luther University Halle.

He was member of the Organizing Committees of several symposia and colloquia held in Cluj-Napoca and member of the Editorial Board of their proceedings as well. Among these I do mention the International Conference on Approximation and Optimization (ICAOR), a satellite conference of the European Congress of Mathematics, Budapest, 1996.

Over the years he taught courses and conducted seminars on mathematical analysis, functional analysis, optimization, operations research, convex analysis. All these were, and still are, characterized by the clarity of the exposure, and by the novelty and richness of the included topics, as can be seen also from the five textbooks he published at the University.

The research activity of Professor Breckner, as reflected by over than 60 published papers, covers three main directions: functional analysis, applications of functional analysis to best approximation and optimization, and applications of functional analysis to convex analysis. In all of these areas he obtained significant results as: very general principles of condensation of singularities for families of nonlinear functions, extensions of the uniform boundedness principle of Banach and Steinhaus, Hahn-Banach theorems for modules, duality theorems for optimization problems in ordered topological vector spaces, characterizations of the solutions of nonlinear best approximation problems, Lagrange multiplier rules, continuity and equicontinuity results for generalized convex functions and for set-valued functions, respectively for families of such functions. Beside these research papers he published a monograph "Introduction to the theory of convex optimization problems with restrictions", Dacia Publishers, Cluj-Napoca 1979.

The impact of his research on the mathematical community is reflected by over than 200 quotations of his papers, including some having in title "Breckner s-convex functions", nominating a class of functions introduced and studied by W. Breckner. Professor Breckner is a reviewer for Zentralblatt für Mathematik and for Mathematical Reviews, and member of the Editorial Boards of the journals Mathematica Pannonica (Hungary), Studia Universitatis Babes-Bolyai (Series Mathematica), Bulletin Mathématique de la Société des Sciences Mathématiques de Roumanie.

I tried to emphasize in this short presentation some of the highlights of the scientific, didactic and social achievements of Professor W. W. Breckner. Of course,

many things remained untold, some of them being presented at the official celebration of the 60th birthday of Professor Breckner organized by the faculty on November 8, 2002.

On my part and on the behalf of my colleagues, I wish Professor Breckner a long life, good health and all the best for many years to come.

LIST OF PUBLICATIONS

I. Articles

1. *A characterization theorem of the elements of best approximation* (Romanian). Studia Univ. Babeş-Bolyai, Ser. Math.-Phys., **13**, No. 1, 39-42 (1968)

2. *Théorèmes de caractérisation des éléments de la meilleure approximation.* C. R. Acad. Sc. Paris, Sér. A, **266**, 206-208 (1968) (with I. Kolumbán)

3. *Über die Charakterisierung von Minimallösungen in linearen normierten Räumen.* Mathematica, **10(33)**, 33-46 (1968) (with I. Kolumbán)

4. *Bemerkungen über die Existenz von Minimallösungen in normierten linearen Räumen.* Mathematica, **10(33)**, 223-228 (1968)

5. *Dualität bei Optimierungsaufgaben in topologischen Vektorräumen.* Mathematica, **10(33)**, 229-244 (1968) (with I. Kolumbán)

6. *Konvexe Optimierungsaufgaben in topologischen Vektorräumen.* Math. Scand., **25**, 227-247 (1969) (with I. Kolumbán)

7. *Zur Charakterisierung von Minimallösungen in normierten linearen Räumen.* Mathematica, **11(34)**, 49-52 (1969) (with B. Brosowski)

8. *On the characterization of the elements of best approximation in normed vector spaces* (Romanian). Studii Cerc. Mat., **22**, 957-982 (1970)

9. *Zur Charakterisierung von Minimallösungen.* Mathematica, **12(35)**, 25-38 (1970)

10. *Ein Kriterium zur Charakterisierung von Sonnen.* Mathematica, **13(36)**, 181-188 (1971) (with B. Brosowski)

11. *On a certain generalization of the problem of best approximation* (Romanian). Rev. Anal. Numer. Teoria Aproximaţiei, **1**, 41-48 (1972)

12. *Dualität bei Optimierungsaufgaben in halbgeordneten topologischen Vektorräumen*. I. Rev. Anal. Numér. Théorie Approx., **1**, 5-35 (1972)

13. *Dualität bei Optimierungsaufgaben in halbgeordneten topologischen Vektorräumen*. II. Rev. Anal. Numér. Théorie Approx., **2**, 27-35 (1973)

14. *Eine Verallgemeinerung des Dualitätssatzes aus der linearen Optimierung*. XVIII. Internat. Wiss. Koll. TH Ilmenau, Heft 1, Vortragsreihe A1, 41-42 (1973)

15. *On certain ordered topological vector spaces occurring in optimization theory* (Romanian). Rev. Anal. Numer. Teoria Aproximaţiei, **2**, 45-50 (1973)

16. *On teaching of the congruence of triangles to sixth form pupils* (Romanian). In: Chircev A., Lăscuş V., Fodor T. (eds.), *School and Pupils* (Romanian). Casa Corpului Didactic a Judeţului Cluj, Cluj-Napoca, 1974, 325-333 (with M. Breckner)

17. *Charakterisierung der Minimallösungen bei Optimierungsaufgaben mit vektorwertigen Funktionen*. I. Operations Research Verfahren, **21**, 39-47 (1975)

18. *On the continuity of convex mappings*. Mathematica - Rev. Anal. Numér. Théorie Approx., Ser. L'Analyse Numér. Théorie Approx., **6**, 117-123 (1977) (with G. Orbán)

19. *A Hahn-Banach type extension theorem for linear mappings into ordered modules*. Mathematica - Rev. Anal. Numér. Théorie Approx., Ser. Mathematica, **19(42)**, 13-27 (1977) (with E. Scheiber)

20. *Stetigkeitsaussagen für eine Klasse verallgemeinerter konvexer Funktionen in topologischen linearen Räumen*. Publ. Inst. Math. (Beograd), **23(37)**, 13-20 (1978)

21. *On the continuity of s-convex mappings*. In: Maruşciac I., Breckner W. W. (eds.), *Proceedings of the Third Colloquium on Operations Research, Cluj-Napoca, October 20-21, 1978*, Babeş-Bolyai University of Cluj-Napoca, Department of Mathematics, 1979, 23-29 (with G. Orbán)

22. *Eine Verallgemeinerung des Prinzips der gleichmäßigen Beschränktheit*. Mathematica - Rev. Anal. Numér. Théorie Approx., Ser. L'Analyse Numér. Théorie Approx., **9**, 11-18 (1980)

23. *Continuity of generalized convex mappings taking values in an ordered topological linear space*. Mathematica - Rev. Anal. Numér. Théorie Approx., Ser. L'Analyse Numér. Théorie Approx., **11**, 15-33 (1982) (with G. Orbán)

24. *A principle of condensation of singularities for set-valued functions*. Mathematica - Rev. Anal. Numér. Théorie Approx., Ser. L'Analyse Numér. Théorie Approx., **12**, 101-111 (1983)

25. *Equicontinuous families of generalized convex mappings*. Mathematica - Rev. Anal. Numér. Théorie Approx., Ser. Mathematica, **26(49)**, 9-20 (1984)

26. *Condensation and double condensation of the singularities of families of numerical functions*. In: Maruşciac I., Breckner W. W. (eds.), *Proceedings of the Colloquium on Approximation and Optimization, Cluj-Napoca, October 25-27, 1984*, University of Cluj-Napoca, Department of Mathematics, 1985, 201-212

27. *Functions which are locally bounded from above*. Babeş-Bolyai University Cluj-Napoca, Seminar on Optimization Theory, Report No. 5, 23-38 (1985) (with I. Kolumbán)

28. *The first mean value formula for integrals* (Romanian). Lucrările Seminarului de Didactica Matematicii 1985-1986, Univ. din Cluj-Napoca, Fac. de Matematică, 16-25 (1986)

29. *Darboux functions* (Romanian). Lucrările Seminarului de Didactica Matematicii 1986-1987, Univ. din Cluj-Napoca, Fac. de Matematică şi Fizică, **3**, 34-74 (1987)

30. *A multiplier rule for constrained optimization problems containing state and control variables*. Babeş-Bolyai University Cluj-Napoca, Seminar on Optimization Theory, Report No. 8, 1-22 (1987) (with I. Kolumbán)

31. *Multiplier rules for optimization problems with a finite number of constraints*. Studia Univ. Babeş-Bolyai, Ser. Math., **33**, No. 1, 15-37 (1988) (with I. Kolumbán)

32. *Finding the general terms of some recurrent sequences of matrices* (Romanian). Lucrările Seminarului de Didactica Matematicii 1987-1988, Univ. din Cluj-Napoca, Fac. de Matematică şi Fizică, **4**, 65-84 (1988)

33. *On a problem from the high school textbook Elements of Mathematical Analysis, nineth form, edition 1986* (Romanian). Gazeta Mat. Perfecţionare Metodică şi Metodologică în Matematică şi Informatică, **9**, No. 4, 168-171 (1988)

34. *Generalized quasiconvex functions.* Babeş-Bolyai University Cluj-Napoca, Seminar on Optimization Theory, Report No. 8, 13-26 (1989)

35. *Remarks concerning the finding of antiderivatives* (Romanian). Lucrările Seminarului de Didactica Matematicii 1989-1990, Universitatea Babeş-Bolyai Cluj-Napoca, Fac. de Matematică şi Informatică, **6**, 81-96 (1991)

36. *On the definition of Riemann integrability* (Romanian). Lucrările Seminarului de Didactica Matematicii 1990-1991, Universitatea Babeş-Bolyai Cluj-Napoca, Fac. de Matematică, **7**, 31-56 (1991)

37. *On the antiderivability of continuous functions* (Romanian). Lucrările Seminarului de Didactica Matematicii, Universitatea Babeş-Bolyai, Cluj-Napoca, Fac. de Matematică şi Informatică, **8**, 23-42 (1992)

38. *Uniform boundedness from above of families of numerical functions.* Studia Univ. Babeş-Bolyai, Ser. Math., **37**, No. 2, 29-40 (1992)

39. *Equivalent definitions for Riemann integrability.* In: *Selected Papers from Didactica Matematicii, Volumes 1984-1992*, Babeş-Bolyai University Cluj-Napoca, 63-88 (1992)

40. *On the formula of the change of variables in Riemann integrals* (Hungarian). Mat. Lapok, **98(41)**, 125-128 (1993)

41. *Continuity of generalized convex and generalized concave set-valued functions.* (a) Schriftenreihe des Fachbereichs Mathematik, Universität Duisburg, SM-DU-210, 1993; (b) Rev. Anal. Numér. Théorie Approx., **22**, 39-51 (1993)

42. *On the change of variables in Riemann integrals* (Romanian). Lucrările Seminarului de Didactica Matematicii, Universitatea Babeş-Bolyai, Cluj-Napoca, Fac. de Matematică şi Informatică, **9**, 81-88 (1993)

43. *Hölder-continuity of certain generalized convex functions.* Optimization, **28**, 201-209 (1994)

44. *On the characterization of the continuity of generalized convex functions by means of hyponorms.* Mathematica, **36(59)**, 5-13 (1994)

45. *Derived sets in multiobjective optimization.* Z. Anal. Anwendungen, **13**, 725-738 (1994)

46. *On the singularities of certain families of nonlinear mappings.* Pure Math. Appl., **6**, 121-137 (1995) (with T. Trif)

47. *Multiplier rules for weak Pareto optimization problems.* (a) Reports of the Institute of Optimization and Stochastics, Martin-Luther-Universität Halle–Wittenberg, Report No. 6 (1996); (b) Optimization, **38**, 23-37 (1996) (with A. Göpfert)

48. *Characterizations of ultrabarrelledness and barrelledness involving singularities of families of convex mappings.* (a) Reports of the Institute of Optimization and Stochastics, Martin-Luther-Universität Halle–Wittenberg, Report No. 34 (1996); (b) Manuscripta Math., **91**, 17-34 (1996) (with A. Göpfert and T. Trif)

49. *On the Riemann integrability of composite functions* (Romanian). Lucrările Seminarului de Didactica Matematicii, Universitatea Babeş-Bolyai Cluj-Napoca, Fac. de Matematică şi Informatică, **12**, 25-38 (1996)

50. *A systematization of convexity concepts for sets and functions.* J. Convex Anal., **4**, 109-127 (1997) (with G. Kassay)

51. *Derived sets for weak multiobjective optimization problems with state and control variables.* J. Optim. Theory Appl., **93**, 73-102 (1997)

52. *Characterizations of barrelled and ultrabarrelled spaces by means of convex mappings.* In: Göpfert A., Seeländer J., Tammer Chr. (eds.), *Methods of Multicriteria Decision Theory, Proceedings of the 6th Workshop of the DGOR-Working Group Multicriteria Optimization and Decision Theory, Alexisbad 1996*, Verlag Dr. Markus Hänsel-Hohenhausen, Egelsbach, 1997, 13-18 (with A. Göpfert and T. Trif)

53. *Lagrange multipliers in vector optimization.* Z. Angew. Math. Mech., **77**, S525-S526 (1997) (with A. Göpfert and M. Sekatzek)

54. *On the condensation of the singularities of families of nonlinear functions.* In: Stancu D. D., Coman G., Breckner W. W., Blaga P. (eds.), *Approximation and Optimization*,Transilvania Press, Cluj-Napoca, 1997, Vol.1, 35-44

55. *Some applications of the condensation of the singularities of families of nonnegative functions* (II). In: Stancu D. D., Coman G., Breckner W. W., Blaga

P. (eds.), *Approximation and Optimization*,Transilvania Press, Cluj-Napoca, 1997, Vol.1, 193-202 (with T. Trif and C. Varga)

56. *Some applications of the condensation of the singularities of families of nonnegative functions*. Anal. Math., **25**, 15-32 (1999) (with T. Trif and C. Varga)

57. *Equicontinuity and Hölder equicontinuity of families of generalized convex mappings*. New Zealand Math. J., **28**, 155-170 (1999) (with T. Trif)

58. *Approximate saddle point assertions for a general class of approximation problems*. (a) Reports of the Institute of Optimization and Stochastics, Martin-Luther-Universität Halle–Wittenberg, Report No. 25 (1999); (b) In: Lassonde M. (ed.), *Approximation, Optimization and Mathematical Economics*, Physica-Verlag, Heidelberg–New York, 2001, 71-80 (with M. Sekatzek, C. Tammer)

59. *Condensation of the singularities in the theory of operators ideals*. Rev. Anal. Numér. Théorie Approx., **30** (2001) (with C. Antonescu) [in print]

60. *A maximum principle for a multiobjective optimal control problem*.[to appear]

II. Books, monographs, proceedings

1. *Dual Optimization Problems in Ordered Topological Vector Spaces* (Romanian). Academia R.S.R., Filiala din Cluj, Institutul de Calcul, 1969, iv+93 pages

2. *Characterization Theorems for the Solutions of Certain Optimization Problems* (Romanian). Teză de doctorat. Universitatea Babeş-Bolyai Cluj, Fac. de Matematică-Mecanică, 1970, ii+138 pages

3. *Introduction to the Theory of Convex Constrained Optimization Problems* (Romanian). Editura Dacia, Cluj, 1974, 220 pages

4. *Continuity Properties of Rationally s-Convex Mappings with Values in an Ordered Topological Linear Space.* Universitatea Babeş-Bolyai Cluj-Napoca, Fac. de Matematică, 1978, viii+92 pages (with G. Orbn)

5. Jointly with I. Maruşciac editor of the volume *Proceedings of the Third Colloquium on Operations Research.* Babeş-Bolyai-University of Cluj-Napoca, Department of Mathematics, 1979, 302 pages

6. Jointly with I. Maruşciac editor of the volume *Proceedings of the Colloquium on Approximation and Optimization.* University of Cluj-Napoca, Department of Mathematics, 1985, 352 pages

7. Jointly with D. D. Stancu, G. Coman and P. Blaga editor of the volumes *Approximation and Optimization*,Transilvania Press, Cluj-Napoca,1997, Vol. 1: xiv+374 pages; Vol. 2: vii+252 pages

III. Textbooks

1. *Problem Book in Mathematics for Students in the Preparatory Year* (Romanian). Universitatea Babeş-Bolyai Cluj-Napoca, 1977, viii+159 pages (in collaboration)

2. *Problem Book in Mathematical Analysis* (Romanian). Universitatea Babeş-Bolyai Cluj-Napoca, Fac. de Matematică, Catedra de Analiză, 1977, ii+365 pages (in collaboration)

3. *Operations Research* (Romanian). Universitatea Babeş-Bolyai Cluj-Napoca, Fac. de Matematică, 1981, xii+445 pages

4. *Problem Book in Operations Research* (Romanian). Universitatea din Cluj-Napoca, Fac. de Matematică, 1983, ii+201 pages (with D. I. Duca)

5. *Mathematical Analysis. The Topology of the Space* $\mathbb{R}^n$ (Romanian). Universitatea din Cluj-Napoca, Fac. de Matematică, 1985, x+335 pages

IV. Miscellanea

1. *János Bolyai und das Parallelenpostulat.* Neuer Weg No. 6917 from 3rd August 1971

2. *Professor József Kolumbán at his 60th anniversary.* Studia Univ. Babeş-Bolyai, Ser. Math., 41, No. 1, 109-116 (1996)

3. *Professor Elena Popoviciu at the age of 75* (Romanian). In: Lupşa L., Ivan M. (eds.): *Analysis, Functional Equations, Approximation and Convexity; Proceedings of the Conference Held in Honour of Professor Elena Popoviciu on the Occasion of her 75th Birthday.* Editura Carpatica, Cluj-Napoca, 1999, vii-x

4. *The multicultural Babeş-Bolyai University of Cluj-Napoca.* Higher Education in Europe, **26**, 391-398 (2001)