

"Influence, create, increase! The country clears to light."  
("Hass, alkoss, gyarapíts! A haza fényre derül." - Kölcsey F.)

## Preface to the series MB

Lectori salutem! The kind reader begins to study the first volume of a new series. Worthy to look at the *present circumstances* of this starting: a) the series MB with matters b) from the *Applied & Computing Mathematics* (ACM) is starting onto its way c) just in the *Millecentenary Year* (MCY) of the *Hungarian Conquest* (HC) in the *Danube Basin* (DB), d) by our Pannonian society PAMM e) having its *Centre* at the *Technical University* of Budapest (TU-Bp), f) namely as *Interuniversity Network* (IN) in Central Europe g) at my Editor in Chief's (ECh) activity and h) printed by the *Publisher* of (TU-Bp). These brought along - inevitably - the mentioned **starting** and will yield - hopefully - the birth of many booklets till the *Millenary Year 2000* of the *Hungarian State* too.

Useful to consider the *past circumstances* of the 28 years old life of PAMM: a) its rich *working experiences*, b) the professional-amical *cooperation* in its suitable frame IN by *engineers-mathematicians* etc. c) arrived mostly from the *DB's universities* of technics and sciences, d) the PAMM's periodical "*Bulletins for Applied Mathematics*" (BAM) with its 1200 papers in 79 volumes from about 2800 lectures of 116 Conferences (PC), e) the *Pannonian traditions*, e.g. the pleasant, friendly, useful, thinking, creative, mobil lifestyle, f) the cultural-scientific *impressions* obtained in the *PC's Hungarian cities* and universities (e.g. Bp, B.füred, B.almádi, Göd, Veszprém, Miskolc, Debrecen, Szeged, Pécs, Sopron, Győr, Baja etc.), g) similar and greater impressions in the *PC's European ones* (e.g. Kosice, Krakow, Wien, Belgrade, Rijeka, Trieste, Cluj, Timisoara, Istanbul, Athen, Roma, Paris, London, etc.), h) on these traces, the PAMM's international "*foreguard*" (with young professors and colleagues) and its international "*governing board*" (in numerous committees, with respected rectors, deans, directors of inst, professors) as *motors* of planning and acting in the PAMM's multilateral life etc. After such precedents, it was *almost natural* - in this festive MCY still better - the starting of MB, namely *beginning the* authorial works for about 26 *initial volumes* at my *ECh's activity* (with earlier experiences from the series "*Practice in Engineering Mathematics*" (PEM in 23 vol., 4 edit./vol.) and from the periodical BAM in 79 vol. etc.).

Of course, *the MB's purpose* is drawn clearly. Each booklet must intend a) to give a *survey* - in the present situation of the ACM's special (scientific) literature - *on the small domain* chosen by the author, b) to build in *the author's scientific results* got in these domain (e.g. new theorems or developments, recent methods or algorithms for known tasks etc.), c) *numerical examples and computing ones*, possibly with programmes, d) to show *various applications* of this ACM-domain in the modern technical, physical, economical, biological, medical etc. sciences. Obviously, there is talking about *scientific booklets* for special experts, but *not* about *ordinary lecture notes* for graduate students.

*For which readers are recommend these booklets?* It follows from the former purpose, that these are written and proposed for *dipl. engineers, physicists, economists, biologists, physicians, moreover for such doctorands, postgraduates, lecturers, occasionally for eminent graduate student too.*

*This reading public wishes really various mathematics applied in technics, physics, economics, biology, medicine and counted in such tasks by computers at their rich languages and programmes. These public respects the pure mathematics, but utilises them only together with applications and computers. - Our PAMM-authors - working in various countries, cities, universities, faculties, branches - will produce generally a balancing among the mathematical, computer and applying (e.g. technical) sciences, but some booklets will be made - occasionally - with an overweight of one side from the triangle ACM. Obviously, such medial and extremal booklets can occur alike in a such series. Only the enthusiasm of this interuniversity professional cooperation is the sole common property of our PAMM-authors and just the same one promises useful reading matters for you, kind Reader! If you find so at this volume, that our former promise is fulfilled, please, read our following booklets too!*

Necessary to express our *best thanks to Sir Vice Rector Prof. Dr. G. Gordos* for his excellent assistance to buy and develop the *PAMM's Computer System* and to starting of these series MB, moreover to *Sir Dean Prof. Dr. J. Zobory* for his durable aiding to open and furnish the *new, separate PAMM-Centre*, just the *birthplace* of the series MB.

Vale, noster Lector and Collegal! Farewell is nodded friendly for you by the ECh:

Budapest - Göd, 12th October 1996

Prof. Dr. F. FAZEKAS

### *Autobiography of Francis Fazekas (in 2000)*

Birth: 1922, Csenger. - Middle schools: from 1933; final exam.: 1941. -Technical University of Budapest (TU-Bp); from 1941; Dipl. Mech. Eng.: 1947.

From 1948 up to date: activity at TU-Bp; Dept. of Math.: assistant, sen. lecturer, associate professor, since 1983 senior researcher scientific (also today). From this year, the head of PAMM-Centre at the Dept. of Transp. Automatics.

dr.tech: 1965, TU-Bp; Dr. Math. Sci.: 1968, U-Novi Sad.

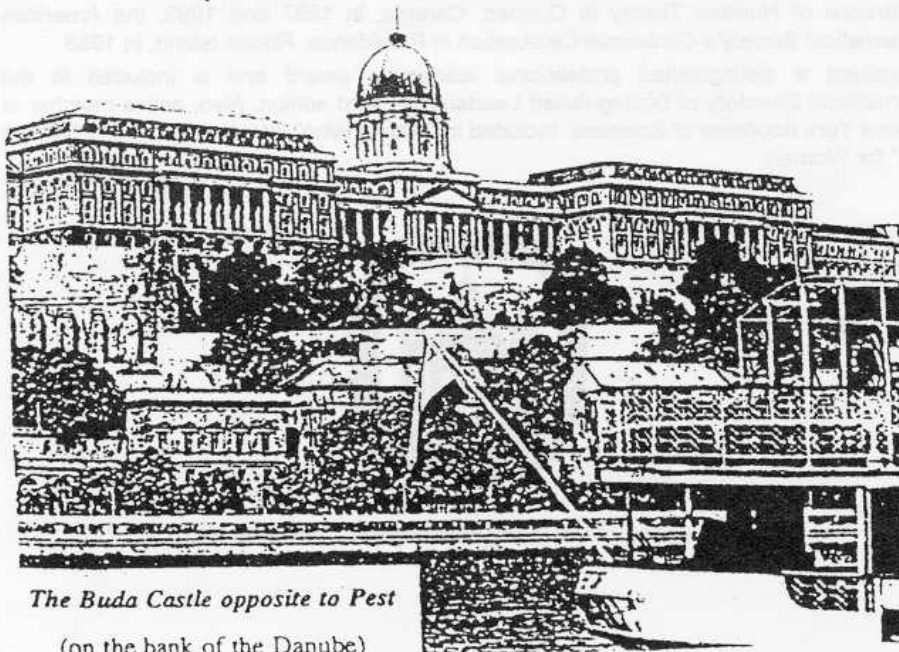
Travels in Europe (to conferences, with lectures) till now: about 55 (e.g. Bruxelles, Aachen, Zürich, Moscow, Wien, Prague, Weimar, etc.).

Pannonian Appl. Math. Meeting (PAMM), founded by me in 1969; till now 118 Conferences, whose 28 in foreign countries (e.g. In Belgrade, Istanbul, Athen, Roma, Paris, London, etc.).

Publications, mostly on matrix methods, diff. equations, dyn. systems, stochastics, diff. geom.: about 150 papers (in ZAMM, ISNM, KF, BAM etc.); about 15 univ. lecture notes & bulletins. - Editor of Practice Eng. Math. in 23 vol., mean 4 edit./vol., till 1980; from these 10 vol. written by me. - Editor of PAMM's Bull. of Appl. Math. (BAM) since 1971; till now 80 vol. with 1300 papers.

- Editor in Chief of PAMM's MB, started in former year, beginning the authorial works for 26 volumes and publishing quickly 2 booklets, then newer 2 ones in this year from them too.

Decorations: Memorial Medal from TU-Kosice (1994), and from TU-Bp (1997, Summer), Honorary Diploma from U-Novi Sad (1997), „Golden” Diploma from TU-Bp (1997, Autumn), „dr. honoris causa” Diploma from the Ovidius University of Constanta (2000, Autumn) etc.



*The Buda Castle opposite to Pest  
(on the bank of the Danube)*

**Supervisor of MB-21: Professor Richard Schauer**

**Biography of Malvina BAICA**

Born in Oravița, Romania, on the 3rd of November 1942.

Education degrees: BS in Mathematics and Physics (Mechanics) and an European MS in Mathematics (Projective and Differential Geometry), for five years at the University of Timisoara, Romania, in 1965, MS in Mathematics (Algebra and Number Theory) at the Illinois Institute of Technology of Chicago in 1974, Ph. D in Mathematics (Algebraic Number Theory and Algebra) at the University of Houston, Texas in 1980.

Professional experience: Assistant Professor at Western Illinois University (Illionis), Marquette University (Wisconsin), Marshall University (West Virginia), Valparaiso University (Indiana) from 1978-1984. Professor (1992) of Mathematical and Computer Sciences at the University of Wisconsin - Whitewater, U.S.A. from 1984 - present.

Research results were published by reputable journals in more than 30 papers, and some of them are summarized in the content of the book (MB-15/ PAMM) titled "The Euler System for the Algebraic Number Theory and Mathematical Models in Pollution", published in Monographical Booklets in Applied and Computer Mathematics, on the year 2000.

Among these publications the most significant are "An Algorithm in a Complex Field (ACF) and its Applications to the Calculations of Units", a new and very powerful algorithm, which turned out to be the Generalized Euclidean Algorithm, known as Baica's General Euclidean Algorithm (BGEA); "Trigonometric identities" (now known in mathematical literature as Baica's Trigonometric Identities), where Gauss' two trigonometric identities given by Gauss without proof became particular cases of Baica's Trigonometric Identities proved true in general; "Putting last Digits first yields Multiples" with H. Hasse. Using her (BGEA) algorithm she proved all the famous open problems in Algebraic Number Theory, including Fermat Last Theorem (FLT).

Professional talks at conferences and meetings including the International Congress of Mathematicians, held at the University of California, Berkeley, in 1986, the International Conference of Number Theory in Quebec, Canada, in 1987 and 1993, the American Mathematical Society's Centennial Celebration in Providence, Rhode Island, in 1988.

Received a distinguished professional leadership award and is included in the "International Directory of Distinguished Leadership", third edition. Also, active member of the New York Academy of Sciences. Included in "Who is Who" International and in "Who is Who" for Women.



Old main building of University of Wisconsin - Whitewater U.S.A.

## **Preface to the volume MB - 21**

The purpose of this book is to bring together all the results in the author's work on the Algorithmic solution of the original Euclidean Fermat's Last Theorem (EFLT) that was given in her eight published papers.

We will describe the Generalized Euclidean Algorithm known as "Baica's General Euclidean Algorithm (BGEA) elaborated by the author and published for the first time in the Pacific Journal of Mathematics in 1984.

Historically, the problem started with the so-called Hilbert's Tenth problem.

Hilbert's goal (Zahlbericht) was to determine a universal algorithm by mean of which all the open problems in Algebraic Number Theory of  $n$  – dimensions could be solved. All of these problems solved in quadratics from the periodicity of the Euclidean Algorithm remained open problems in higher dimensions and among them is the solution of Fermat's Last Theorem, which was originally started in Euclidean terms (EFLT). In his 10-th Problem Hilbert asked for the Generalized Euclidean Algorithm (BGEA) now Baica's Generalized Euclidean Algorithm, described in Chapter II of this book which solves all of these  $n$ -dimensional open problems, making (BGEA) the Euler System of the Algebraic Number Theory. (BGEA) is the work of Euclid, Euler, Lagrange, Hermite, Jacobi, Perron, Hilbert, Hasse, Bernstein and Baica put together. Their work is described in Chapter I, of this book.

In Chapter III of this book we will discuss A. Wiles's attempt to prove the Elliptical Fermat's Last Theorem (ELFLT). Actually it was G. Faltings who finished the proof. Also, we will show that (ELFLT) is equivalent to (not the same as) the original Fermat's Last Theorem (EFLT) stated by Fermat in Euclidean terms.

This book may be profitably used by researchers in Mathematical and Computer Sciences, postgraduates and well prepared graduate students who use algorithms in Applied Mathematics.

In publishing this book I would like to express my gratitude to my late doctoral research advisors Jürgen Schmidt, Helmut Hasse and Leon Bernstein. Without their generous help, advice and encouragement I could never have begun to work on this very challenging problem. They encouraged me to extend my research beyond my dissertation, which finally brought me to prove the Euclidean Fermat's Last Theorem (EFLT).

Also, to my husband Adrian, I address my warmest thanks, for his continuous support, understanding and encouragement. The publication of this book became possible with the financial support of the University of Wisconsin-Witewater.

I am grateful to my friends professors Drs. Nicolae Boja, Richard Schauer, Edwin Klein, and Vasile Bacria for their valuable assistance and useful suggestions given to me while writing this book.

All of the author's results contained in this book were published in professionally reviewed international Journals and are quoted in the references.

Timișoara, 7-th of July 2001

Malvina BAICA

University of Wisconsin -Whitewater