

$\int$ rational Calculus  
&  $\int$ ppplied  $\mathcal{C}$ alysis  
An International Journal for Theory and Applications  
VOLUME 9, NUMBER 2 (2006) ISSN 1311-0454

This No 2 of Volume 9 (2006)  
is dedicated to the 70th Anniversary  
of our colleague

Professor Megumi Saigo

Many Happy Returns and Cheers!

EB of “FCAA” Journal

**On the Occasion  
of Professor Megumi Saigo's 70<sup>th</sup> Anniversary**

Professor **Megumi Saigo**, now a Honorary Professor at Department of Applied Mathematics, Faculty of Science - Fukuoka University (JAPAN), a **Member of Editorial Board of our "FCAA" Journal**, had on 21 May, 2006 his 70<sup>th</sup> jubilee.

It seems to me it was not so long ago, when I met him for the first time in Bulgaria in 1985, at the "International Conference on Differential Equations and Applications", in the town of Rousse. We took then some joint pictures, a precious souvenir of our younger days, which I was glad to find out again in his family albums (a huge collection, arranged with a mathematical and ... Japanese precision) many years ago, in 2003 ... Since then, Prof. Saigo visited Bulgaria many times to participate in our international conferences "Complex Analysis and Applications" (Varna'1991) and "Transform Methods and Special Functions" (Bankya'1994, Varna'1996, Blagoevgrad'1999). I also visited him twice in Japan, in years 1997 and 2003, and was able to experience (like many other colleagues of the long list published at the end of this note) the impressive modesty and work-a-holism of the Japanese people and their warm hospitality as hosts. Especially, "to a square" or to a "fractional power" but strictly greater than 2, this can be said for my host Prof. Saigo and his wife Yasuko! She has been my tireless and enthusiastic guide around Fukuoka and excellent hostess at their home, impressively well decorated with her own beautiful paintings and with a pleiad of the typical Japanese dolls (as the famous "Dolls' festival" has been shifted a little bit ahead, specially for my visit;)

Prof. Saigo is a member of our Editorial Board since the beginning of the "FCAA" journal, a great moral and real support of him, despite of all his other everyday educational and chief's duties at Fukuoka University, editorial activities, some recent health problems. During our meetings we have been able to discuss and solve together some mathematical problems in the common fields of interest, presented in a list of our joint publications. During that time, I have been a witness of his constant cares for his students, pupils and collaborators, as well as of their enormous respect to Saigo Sensei!

On behalf of the Editorial Board of the journal, I like to pass him our wishes for health, long years' creative work and continuing youth spirit and enthusiasm in mathematical research. My special best regards to his family and in particular, to his wife Yasuko! Arigato gozaimashita and Kan(m)pai!

**Virginia Kiryakova**, MANAGING EDITOR OF "FCAA"

### Congratulating Address to Professor Megumi Saigo

Professor Megumi Saigo, born on May 21, 1936 in the Japanese city of Kumamoto, is a well-known authority in the field of analysis. He started his mathematical career in Kyushu Island. He took Bachelor course at the Department of Mathematics of Faculty of Sciences of the Kumamoto University from 1956 to 1961, and Master course at the Department of Mathematics of Graduate School of Sciences of the Kyushu University (Fukuoka) from 1962 to 1964. In 1964-1966 he was working as Assistant Professor in the Kyushu University, in 1966-1980 as lecturer and Associate Professor in the Kumamoto Women's and Kumamoto Universities. On December of 1980 Professor Megumi Saigo successfully defended his PhD Thesis in the Kyushu University and after that he was working at the Fukuoka University (Fukuoka) as Professor from 1981 to 2006. In March of 2006 he has been awarded there the title of Honorary Professor.

The first area of Saigo's mathematical research is related to special functions and fractional calculus. He is well known for his results involving the properties of hypergeometric functions of one and many variables, of the  $H$ -function and of fractional integrals and derivatives, generalizing the classical Riemann-Liouville fractional integrals and derivatives and involving the Gauss hypergeometric function and other special functions in the kernels, and their applications to various problems in the theory of functions.

Another area of Prof. Saigo's studies, closely connected with the above one, concerns the development of various problems of integral transforms with special functions in the kernels. A new step in this direction was done in the monograph "*H-transforms. Theory and Applications*" written together with A.A. Kilbas and published in Volume 9 of an International Series of Monographs in Mathematics "Analytical Methods and Special Functions" (2004, Chapman and Hall/CRC). In this book the classical and modern results in the theory of the  $H$ -function and of the one-dimensional integral transforms with  $H$ -function as kernels were presented together with their applications to integral transforms with Meijer  $G$ -function and hypergeometric and Bessel functions in the kernels. It should be also noted that Professor Saigo put many new interesting results in the development of the theory of index transforms.

Next area of Saigo's mathematical research is concerned with the application of fractional calculus to the study of integral and differential equa-

tions. He considered different aspects of nonlinear and linear integral equations with weak singularities and with the Gauss hypergeometric function in the kernels, of dual integral equations, of integro-differential equations with generalized Mittag-Leffler functions as kernels, of ordinary differential equations of integer and fractional order, and of boundary value problems for the Euler-Darboux equation and for partial differential equations of hyperbolic and mixed parabolic-hyperbolic type.

The results of Saigo's scientific activities have been published in more than 160 articles and one monograph. This book mentioned above has become a table handbook for many researchers.

Professor Megumi Saigo pays a lot of attention to mathematical education, devoting much strength and energy to the supervision of Bachelor's and Master's students. 3 mathematicians defended PhD thesis under his supervisorship: Hitoshi Saitoh (1996), Jae Ho Choi (1998, from Korea) and Seiichi Fukui (1999).

Professor Saigo is in close touch with mathematicians from many countries. He was invited to give talks at many International Conferences, Seminars and Workshops in Bulgaria, Germany, Great Britain, Japan, Korea, Kuwait, Poland and Taiwan. He was a Visiting Professor in Friedrich-Schiller Universität Jena (Jena, Germany), the University of Victoria (Victoria, Canada), Freie Universität Berlin and Academia Sinica (Taipei, Taiwan) and many times he was invited by his colleagues from Bulgaria, Germany, Japan and Korea. Professor Megumi Saigo was also organizer of Invitation Program for Foreign Mathematicians in Fukuoka University. Many mathematicians from Belarus, Bulgaria, Canada, Germany, Korea, Kuwait and Russia have visited Fukuoka University as Visiting Professors, Research Assistants and Visiting Scholars from 1983 to 2004.

Professor Saigo took an active part in organizing many International Conferences. He was a member of the Organizing Committees of five International Conferences *Boundary Value Problems, Special Functions and Fractional Calculus* (Minsk, Belarus, 1996), *Analytic Methods of Analysis and Differential Equations* (Minsk, Belarus, 1999, 2001, 2003, 2006) and a member of the Scientific Committee of *International Conference on Abstract and Applied Analysis* (Hanoi, Vietnam, 2002).

Professor Saigo gives a lot of his energy to publishing activity. He translated several mathematical textbooks from Russian to Japanese. He is an Associate Editor of the journal *Integral Transforms and Special Functions* (from May 1992), a member of the Editorial Boards of *Ganita Sandesh* (from

January 1995), *Journal of Fractional Calculus* (from July 1995), *Fractional Calculus and Applied Analysis* (from November 1997), *International Journal of Applied Mathematics* (from September 1998), a member of the International Advisory Board of *Kuwait Journal of Science Engineering* (from September 2002) and an Editor of International Series of Monographs in Mathematics *Analytical Methods and Special Functions* (from April 1995). He is also a referee of *Zentralblatt für Mathematik* (from 1973) and *Mathematical Reviews* (from 1975).

The scientific research and activity of Professor Megumi Saigo was highly estimated by Academic Societies. At present he is a member of *Mathematical Society of Japan* (Japan; from 1964), *Society for Industrial and Applied Mathematics* (USA; from 1969), *American Mathematical Society* (USA; from 1988) and *The Vijnana Parishad of India* (India; from 1988).

Professor Saigo took a very active part in the public life of the Fukuoka University. He was the Dean of Graduate School of Science (1993-1997), the Dean of Faculty of Sciences (1997-2001), the Chair of General Education Center (2001-2003).

I have been very happy to collaborate with Professor Megumi Saigo from the end of 80th of 20th century when I have met him at the Third International Conference "Fractional Calculus and Applications" (Tokyo, May 29 - June 1 of 1989). Always active and enthusiastic, he keeps a permanent interest in various mathematical ideas and problems.

It would be impossible to enumerate his personal qualities. In this connection it is necessary to point out his cordial hospitality and readiness to help other people, which makes the life for his friends, colleagues and students more pleasant.

I also would like to tell good words to the family of Professor Megumi Saigo: to his wife Yasuko, mathematician as speciality, and very good painter which exhibition was presented in New York (USA), to his son Motoki, to his daughter Aki and her husband and to his grandson Taku.

In conclusion, I would like to forward my congratulations to Professor Megumi Saigo and to wish him on his 70th birthday good health, happiness in family life and new great success in research.

**Anatoly A. Kilbas**, MEMBER OF EDITORIAL BOARD OF "FCAA"  
 Belarusian State University  
 Minsk, BELARUS

### LIST OF PUBLICATIONS (Selection) of Prof. M. Saigo

• **Articles:**

- A remark on integral operators involving the Gauss hypergeometric functions, Mathematical Reports of College of General Education, Kyushu University, Vol. 11, No. 2, 135-143, (1978).
- A certain boundary value problem for the Euler-Darboux equation, Mathematica Japonica, Vol. 24, No. 4, 377-385, (1979).
- A certain boundary value problem for the Euler-Darboux equation, II, Mathematica Japonica, Vol. 25, No. 2, 211-220, (1980).
- A certain boundary value problem for the Euler-Darboux equation, III, Mathematica Japonica, Vol. 26, No. 1, 103-119, (1981).
- Multiplication of fractional calculus operators and boundary value problems involving the Euler-Darboux equation (with H.M. Srivastava), Journal of Mathematical Analysis and Applications, Vol. 121, No. 3, 325-369, (1987).
- A class of distortion theorems involving certain operators of fractional calculus (with H.M. Srivastava and S. Owa), Journal of Mathematical Analysis and Applications, Vol. 131, No. 2, 412-420, (1988).
- Some characterization theorems for starlike and convex functions involving a certain fractional integral operator (with S. Owa and H.M. Srivastava), Journal of Mathematical Analysis and Applications, Vol. 140, No. 2, 419-426, (1989).
- On properties of hypergeometric functions of three variables,  $F_M$  and  $F_G$ , Rendiconti del Circolo Matematico di Palermo, Serie II, Tomo 37, Fasc. 3, 449-468, (1988).
- Fractional calculus operators involving the Gauss function in spaces  $F_{p,mu}$  and  $F'_{p,mu}$  (with H.-J. Glaeske), Mathematische Nachrichten, Band 147, 285-306, (1990).
- The behaviour of the fourth type of Lauricella's hypergeometric series in  $n$  variables near the boundaries of its convergence region (with H.M. Srivastava), Journal of the Australian Mathematical Society, Series A, Vol. 57, part 3, 281-294, (1994).
- The behavior of the zero-balanced hypergeometric series  ${}_pF_{p-1}$  near the boundary of its convergence region (with H.M. Srivastava), Proceedings of the American Mathematical Society, Vol. 110, No.1, 71-76, (1990).
- Some integral representations of multivariable hypergeometric functions (with Vu Kim Tuan), Rendiconti del Circolo Matematico di Palermo, Serie II, Tomo 41, Fasc. 1, 69-80, (1992).

- Multidimensional modified fractional calculus operators (with Vu Kim Tuan), *Mathematische Nachrichten*, Band 161, 253-270, (1993).
- Representation of generalized fractional integrals in terms of Laplace transforms on spaces  $L_p$  (with V.S. Kiryakova and R.K. Raina), *Mathematische Nachrichten*, Band 176, 149-158, (1995).
- On solution of integral equation of Abel-Volterra type (with A.A. Kilbas), *Differential and Integral Equations*, Vol. 8, No. 5, 993-1011, (1995).
- On Mittag-Leffler type function, fractional calculus operators and solutions of integral equations (with A.A. Kilbas), *Integral Transforms and Special Functions*, Vol. 4, No. 4, 355-370, (1996).
- On Mittag-Leffler type function and applications (with A.A. Kilbas), *Integral Transforms and Special Functions*, Vol. 7, No. 1-2, 97-112, (1998).
- On a non-local boundary value problem for an equation of mixed parabolic-hyperbolic type (with O.A. Repin and A.A. Kilbas), *International Journal of Mathematical and Statistical Sciences*, Vol. 5, No. 1, 103-117, (1996).
- On the  $H$ -function (with A.A. Kilbas), *Journal of Applied Mathematics and Stochastic Analysis*, Vol. 12, No. 2, 191-204, (1999).
- Expansions of  ${}_4F_3$  when the upper parameters differ by integers (with R.K. Saxena), *Kyungpook Mathematical Journal*, Vol. 38, No. 2, 293-299, (1998).
- Closed-form solution of a class of linear differential equations of fractional order (Russian) (with A.A. Kilbas), *Differential'nye Uravnenija*, Vol. 33, No. 2, 195-204, (1997); English translation: *Differential Equations*, Vol. 33, No. 2, 194-204, (1997).
- Some integral transforms in space of entire functions of exponential type (with Vu Kim Tuan and Dinh Thanh Duc), *Proceedings of the Japan Academy*, Vol. 72, No. 4, 75-77, (1996).
- Asymptotic behaviors of the Horn hypergeometric series  $G_1$ ,  $G_2$ ,  $H_1$ ,  $H_2$ ,  $H_4$ ,  $H_6$ ,  $H_7$  near boundaries of their convergence regions, *Integral Transforms and Special Functions*, Vol. 4, No. 3, 249-262, (1996).
- On solution of nonlinear Abel-Volterra integral equation (with A.A. Kilbas), *Journal of Mathematical Analysis and Applications*, Vol. 239, No. 1, 41-60, (1999).
- Integral transforms with  $H$ -function kernels on  $calL_{nu,r}$ -spaces (with H.-J. Glaeske, A.A. Kilbas and S.A. Shlapakov), *Applicable Analysis*, Vol. 79, 443-474, (2001).
- Solvability of some Abel-type integral equations involving the Gauss hyper-

- geometric function as kernels in the space of summable functions (with R.K. Raina, H.M. Srivastava and A.A. Kilbas), ANZIAM Journal, Vol. 43, No. 1, 291-320, (2001).
- On a hybrid Laguerre Fourier transform (with H.-J. Glaeske), Integral Transforms and Special Functions, Vol. 10, No.3-4, 227-238, (2000).
- Some properties of convolution operators involving Carlson-Shaffer operator (with Y.C. Kim and J.H. Choi), Panamerican Mathematical Journal, Vol. 10, No. 2, 51-60, (2000).
- Geometric properties of convolution operators defined by Gaussian hypergeometric functions (with Y.C. Kim and J.H. Choi), Integral Transforms and Special Functions, Vol. 13, No. 2, 117-130, (2002).
- Generalized fractional integral transforms with Gauss function kernels as  $G$ -transforms (with A.A. Kilbas, O.A. Repin), Integral Transforms and Special Functions, Vol. 13, No. 3, 285-307, (2002).
- Solution of Volterra integro-differential equations with generalized Mittag-Leffler function in the kernels (with A.A. Kilbas and R.K. Saxena), Journal of Integral Equations and Applications, Vol. 14, No. 4, 377-396, (2002).
- Inequalities for Saigo's fractional calculus operator (with S. Owa and V.S. Kiryakova), International Journal of Mathematical Sciences, Vol. 4, No. 1, 99-109, (2005).

• **Book:**

- H-Transforms. Theory and Applications* (with A.A. Kilbas), Analytical Methods and Special Functions (An International Series of Monographs in Mathematics, Founding Editor: A.P. Prudnikov, Series Editors: C.F. Dunkl, H.-J. Glaeske, M. Saigo), Chapman & Hall/ CRC, Boca Raton–London–New York–Washington, D.C., pp. xii+389, (2004).

• **Ph.D. THESES, SUPERVISED by Prof. Saigo:**

- 1996 **Hitoshi Saitoh** (Gunma College of Technology) of the title: *A Certain Linear Operator and its Applications to Univalent and Multivalent Functions*, pp. 1–66, September.
- 1998 **Jae Ho Choi** (Fukuoka University) of the title: *Univalent Functions Associated with Fractional Calculus Operators*, pp. 1–76, March.
- 1999 **Seiichi Fukui** (Wakayama University) of the title: *The Starlikeness Order of  $\alpha$ -Convex Functions in the Classes of  $p$ -Valently Analytic Functions and  $p$ -Valently Meromorphic Functions*, pp. 1–39, March.



**• INVITATION PROGRAM - FOREIGN MATHEMATICIANS:**

- 1983 **Hari Mohan Srivastava**, *University of Victoria, Canada* as a Visiting Professor.
- 1990 **Hari Mohan Srivastava**, *University of Victoria, Canada* as a Visiting Professor.
- 1991 **Hans-Jürgen Glaeske**, *Friedrich-Schiller University, Germany* as a Visiting Professor, (October 14 - November 1, 1991).
- 1992 **Anatoly Alexandrovich Kilbas**, *Belarusian State University, Belarus* as a Reserch Assistant (October 1, 1992 - January 31, 1994).
- 1993 **Wolfgang Bühning**, *University of Heidelberg, Germany* as a Visiting Professor.
- 1994 **Semen Bolisovich Yakubovich**, *Belarusian State University, Belarus* as a Reserch Assistant (April 1, 1994 - March 31, 1995).
- 1994 **Anatoli Pratonovich Prudnikov**, *Russian Academy of Sciences, Russia* as a Visiting Professor.
- 1995 **Rudolf Golenflo**, *Free University of Berlin, Germany* as a Visiting Professor, (June - , 1995).
- 1995 **Vu Kim Tuan**, *Kuwait University, Kuwait* as a Visiting Professor, (August 10 - September 13, 1995).
- 1995 **Anatoly Alexandrovich Kilbas**, *Belarusian State University, Belarus* as a Visiting Professor, (November 1 - 29, 1995).
- 1996 **Anatoly Alexandrovich Kilbas**, *Belarusian State University, Belarus* as a Visiting Professor, (June 15 - July 20, 1996).
- 1996 **Yong Chan Kim**, *Yeungnam University, Korea* as a Visiting Professor, (October 26 - 30, 1996).
- 1996 **Il Bong Jung**, *Kungpook University, Korea* as a Visiting Professor, (October 26 - 30, 1996).
- 1997 **Virginia S. Kiryakova**, *Bulgarian Academy of Sciences, Bulgaria* as a Visiting Professor, (January 18 - February 23, 1997).
- 1997 **Hari Mohan Srivastava**, *University of Victoria, Canada* as a Visiting Professor, (October 3 - 15, 1997).
- 1997 **Yong Chan Kim**, *Yeungnam University, Korea* as a Visiting Professor, (October 4 - 7, 1997).
- 1998 **Yong Chan Kim**, *Yeungnam University, Korea* as a Visiting Professor, (January 24 - February 23, 1998).

- 1998 **Anatoly Alexandrovich Kilbas**, *Belarusian State University, Belarus* as a Visiting Professor, (August 3 - September 6, 1998).
- 1998 **Hans-Jürgen Glaeske**, *Friedrich-Schiller University, Germany* as a Visiting Professor, (October 4 - 31, 1998).
- 1999 **Yong Chan Kim**, *Yeungnam University, Korea* as a Visiting Professor, (February 7 - 11, 1999).
- 1999 **Vu Kim Tuan**, *Kuwait University, Kuwait* as a Visiting Professor, (June 11 - July 11, 1999).
- 1999 **Richard Tremblay**, *University of Quebec of Chicoutimi, Canada* as a Visiting Professor, (October 5 - November 4, 1999).
- 2001 **Yong Chan Kim**, *Yeungnam University, Korea* as a Visiting Professor, (January 17 - 20, 2001).
- 2001 **Il Bong Jung**, *Kungpook University, Korea* as a Visiting Professor, (January 17 - 20, 2001).
- 2001 **Jae Ho Choi**, *Yeungnam University, Korea* as a Reserch Assistant, (April 1, 2001 - August 31, 2002).
- 2001 **Anatoly Alexandrovich Kilbas**, *Belarusian State University, Belarus* as a Visiting Professor, (June 11 - July 18, 2001).
- 2002 **Hari Mohan Srivastava**, *University of Victoria, Canada* as a Visiting Professor, (April 24 - 27, 2002).
- 2002 **Yong Chan Kim**, *Yeungnam University, Korea* as a Visiting Professor, (December 19 - 22, 2002).
- 2002 **Il Bong Jung**, *Kungpook University, Korea* as a Visiting Professor, (December 19 - 22, 2002).
- 2003 **Virginia S. Kiryakova**, *Bulgarian Academy of Sciences, Bulgaria* as a Visiting Professor, (February 12 - March 12, 2003).
- 2003 **Jae Ho Choi**, *Deagu National University of Education, Korea* as a Visiting Scholar, (February 20 - 23, 2003).
- 2004 **Anatoly Alexandrovich Kilbas**, *Belarusian State University, Belarus* as a Visiting Professor, (January 10 - January 31, 2004).
- 2004 **Jae Ho Choi**, *Deagu National University of Education, Korea* as a Visiting Scholar, (February 11 - 14, 2004).
- 2005 **Jae Ho Choi**, *Deagu National University of Education, Korea* as a Visiting Scholar, (August 16 - 18, 2004).