

EDITORIAL

FCAA NEWS, BOOKS, MEETINGS, ANNIVERSARIES

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Dear readers,

in the Editorial Notes we will announce some important news for our journal, related anniversaries, information on new books and international meetings in FCAA (Fractional Calculus and Applied Analysis) areas, etc.

1. FCAA News

Our recent news is that the FCAA journal has been accepted for inclusion in Scopus by the Content Selection & Advisory Board (CSAB) of Elsevier B.V. The review is now complete and the CSAB has advised that *this title will be added in the Scopus list.*

Separately, our Editorial team performed *searchings through the databases of Web of Science (WoS), Scopus, Google Scholar, QuadSearch and Publish-or-Perish (PoP)*, so to achieve a preliminary evaluation for the journal's performance, based on the generally accepted ranking criteria. Overall, the information found for FCAA sounds really impressing. A lot of excellent articles have been published in FCAA, frequently cited by authors in other estimated journals, and a lot of hard editorial work has been done to achieve these results, over 13 years since 1998. Thanks to *the team of Igor Podlubny, Tomas Skovranek, Ivo Petras* (BERG Faculty, Technical University of Kosice, Slovak R.), it was found that *FCAA would have an Impact Factor IF=1.0, if it was calculated by Thomson Reuters.* This means a *nearly 50th place of the top ranked 255 journals in Mathematics category of JCR 2009.* This is absolutely clean calculation, without self-citations, based only on citations indexed in WoS and external to FCAA.

To achieve a proper and uniform journal's indexing, all authors are kindly asked *to refer to articles* in FCAA exactly and only *by its abbreviated name*, as officially accepted in Math. Rev. and ZBL für Math., namely:

Fract. Calc. Appl. Anal., Vol. **X**, No # (YYYY), pp. zzz-zzz; DOI: (pls. add DOI for papers published on SpringerLink since 2011).

2. Recent Springer Books by FCAA Editors and Authors

Ivo Petráš, *Fractional-Order Nonlinear Systems: Modeling, Analysis and Simulation*, Series: Nonlinear Physical Science, Springer-Verlag, jointly published with Higher Education Press, 1st Edition, 2011, 218 p. with 119 illustrations, Hardcover, ISBN 978-3-642-18100-9.

Find this book's information on SpringerLink,

<http://www.springer.com/engineering/control/book/978-3-642-18100-9>

The Matlab Toolbox for this book is freely downloadable on the link

<http://www.mathworks.com/matlabcentral/fileexchange/27336>

The author Ivo Petráš is Asso. Professor of automatic control and Director of the Institute of Control and Informatization of Production Processes, Faculty of BERG, Technical University of Košice, Slovak Republic, and *Member of Editorial Board of FCAA journal*. His main research interests are in control systems, industrial automation, and applied mathematics.

His book addresses to mathematicians, physicists, engineers, and other scientists interested in chaos phenomena or in fractional-order systems. It can be used in courses on dynamical systems, control theory, and applied mathematics at graduate or postgraduate level. The book presents a study of fractional-order chaotic systems accompanied by MATLAB programs for simulating their state space trajectories, which are shown in the illustrations therein. Description of the chaotic systems is clearly presented and their analysis and numerical solution are done in an easy-to-follow manner. Simulink models for the selected fractional-order systems are also presented. The readers will understand the fundamentals of the fractional calculus, how real dynamical systems can be described using fractional derivatives and fractional differential equations, how such equations can be solved, and how to simulate and explore chaotic systems of fractional order. Keywords: Control of chaos - Fractional calculus - Fractional chaotic systems - Matlab programs chaos - Simulink models - Stability of fractional order systems. Related subjects: Control Engineering - Dynamical Systems & Differential Equations - Statistical Physics & Dynamical Systems

Kai Diethelm, *The Analysis of Fractional Differential Equations*, Series: Lecture Notes in Math., Vol. 2004, Springer-Verlag, jointly published with Higher Education Press, 1st Edition, 1st Edition, 2010, VIII, 247 p. with 10 illustr., Softcover, ISBN 978-3-642-14573-5.

Find this book's information on SpringerLink,

www.springer.com/mathematics/dynamical+systems/book/978-3-642-14573-5

The author Kai Diethelm is Professor at the Institut of Computational Mathematics, Technische Universität Braunschweig / FEM Software Development, GNS Gesellschaft für numerische Simulation mbH, Germany,

and *Member of Editorial Board of FCAA journal*. His main research interests include numerical methods in fractional calculus, analysis of fractional differential equations, Caputo operators, applications of fractional calculus (FC) outside of mathematics.

FC was first developed by pure mathematicians in the middle of the 19th century. Some 100 years later, engineers and physicists have found applications for these concepts in their areas. However there has traditionally been little interaction between these two communities. In particular, typical mathematical works provide extensive findings on aspects with comparatively little significance in applications, and the engineering literature often lacks mathematical detail and precision. This book bridges the gap between the two communities. It concentrates on the class of fractional derivatives most important in applications, the Caputo operators, and provides a self-contained, deep and mathematically rigorous study of their properties and of corresponding differential equations. The text is a useful tool for mathematicians and researchers from the applied sciences. It can also be used as a basis for teaching graduate courses on fractional differential equations. Key Words: Mittag-Leffler functions - existence, uniqueness and stability of solutions - fractional derivative of Caputo type - fractional differential equation - single- and multi-term differential equations.

Other recent Springer's books published by authors in this FCAA issue:

L. Diening, P. Harjulehto, P. Hästö, M. Ruzicka, *Lebesgue and Sobolev Spaces with Variable Exponents*, LNM, Vol. 2017, Springer-Verlag, 2011;
<http://www.springer.com/mathematics/analysis/book/978-3-642-18362-1>

J.P.N. Bishwal, *Parameter Estimation in Stochastic Differential Equations*, LNM, Vol. 1923, Springer-Verlag, 2008;
<http://www.springer.com/mathematics/probability/book/978-3-540-74447-4>

3. Forthcoming Meetings on FCAA Topics

AMADE - 2011, Minsk – Belarus, September 12-17, 2011

6th International Conference “Analytical Methods of Analysis and Differential Equations”, dedicated to the memory of Anatoly A. Kilbas, Honorary Editor of FCAA (<http://versita.com/kilbas/>)

”Professor Anatoly Kilbas: to the memory of the great scientist and the faithful friend” - read at <http://amade-bsu.na.by/sixth.html>, and at *Fract. Calc. Appl. Anal.*, Vol. **13**, No 2 (2010), pp. 221-223;
http://www.math.bas.bg/~fcaa/volume13/fcaa132/Kilbas_Obituary.pdf

Details are on the website: <http://amade-bsu.na.by/>.

Contacts by e-mail: amade@bsu.by, or by letter to the postal address.

TMSF' 2011, Sofia – Bulgaria, October 20-23, 2011

6th International Conference “Transform Methods and Special Functions”, on the occasion of 80th anniversary of Prof. Peter Rusev

All details are on <http://www.math.bas.bg/~tmsf/2011/>, contacts by e-mail: tmsf@math.bas.bg, virginia@diogenes.bg (Virginia Kiryakova).

Host: Institute of Mathematics and Informatics – Bulgarian Academy of Sciences. Topics: - Special Functions, Classical Orthogonal Polynomials; - Classical and Generalized Integral Transforms; - Fractional Calculus and its Applications; - Operational and Convolutional Calculus; - Geometric Function Theory, Functions of One Complex Variable; - Related Topics of Analysis, Several Complex Variables.

Please, register by July, or ASAP. Deadline for abstracts is September 10, 2011. A special issue of the journal “Mathematica Balkanica” (<http://www.mathbalkanica.info/>) is planned as Proceedings, dedicated to the anniversary of Prof. Rusev, Editor in FCAA (<http://versita.com/rusev/>).

**4. 80th Anniversary
of Professor Danuta Przeworska-Rolewicz,
Honorary Editor of FCAA**

Prof. Emeritus, D.Sci. Danuta Przeworska-Rolewicz is born in Warsaw, on May 25, 1931. For her activities (as a child) in the Resistance Movement during the second World War and the Warsaw Uprising in 1944, she has been distinguished in 1982 by the Warsaw Uprising Cross. In 1952 she married Stefan Rolewicz, another World known Professor in Mathematics.

Her main research interest and contributions are in the areas of: – singular integral equations; – algebraic methods in analysis; – functional analysis.

She obtained Ph.D. degree at Institute of Mathematics of Polish Academy of Sciences in 1958, D.Sci. (habilitation) at the same institute in 1964, and the title of Full Professor, granted by the Council of State, in 1974. First was appointed at the Technical University of Warsaw 1954-1960 as an assistant and lecturer, and since 1960 – at the Institute of Mathematics of the Polish Academy of Sciences. In the academic years 1973/4 and 1974/5, Prof. Przeworska-Rolewicz was appointed at the Faculty of Cybernetics of Technical Military Academy in Warsaw in order to lead an experimental course of Mathematics based on her ideas of Algebraic Analysis.

She is author (or co-author) of more than 160 scientific papers, 50 other publications, 7 monographs (edited in Poland, the Netherlands and England) and 4 text-books (in Polish). Nine persons were granted Ph.D. degrees under her supervision.

Among her books in the areas related to FCAA, are:

- D. Przeworska-Rolewicz, with S. Rolewicz: *Equations in Linear Spaces*. Monografie Matem. 47, PWN, Warsaw (1968).
- D. Przeworska-Rolewicz: *Equations with Transformed Argument. An Algebraic Approach*. PWN & Elsevier, Warsaw-Amsterdam (1973).
- D. Przeworska-Rolewicz: *Linear Spaces and Linear Operators* (in Polish). WNT, Warsaw (1977). Electronic 2-nd edition, IM PAN, 2007 .
- D. Przeworska-Rolewicz: *Introduction to Algebraic Analysis and its Applications* (in Polish). WNT, Warsaw (1979).
- D. Przeworska-Rolewicz: *Shifts and Periodicity for Right Invertible Operators*. Res. Notes in Mathematics, 43; Pitman Adv. Publish. Program, Boston-London-Melbourne (1980).
- D. Przeworska-Rolewicz: *Algebraic Analysis*. PWN & D. Reidel, Warsaw-Dordrecht (1988).
- D. Przeworska-Rolewicz: *Spaces of D-Paraanalytic Elements*. Dissertationes Math. 302, Warsaw (1994).
- D. Przeworska-Rolewicz: *Logarithms and Antilogarithms. An Algebraic Approach*. With Appendix by Z. Binderman. Kluwer Academic Publishers, Dordrecht-Boston-London (1998).

Prof. D. Przeworska-Rolewicz was invited several times for lectures to Canada, USA, Germany, The Netherlands, Belgium, Soviet Union, Bulgaria, also to France, England, Sweden, Italy, Australia, Czech Republic, Hungary, Greece, etc. She was organizing the periodic international conferences “Functional-Differential Systems and Related Topics” (1979, 1981, 1983, 1985) and “Different Aspects of Differentiability” (1993, 1995 together with Piotr Antosik and Krystyna Skornik, in 1995 also with Ryszard Rudnicki, in 1999 with Krystyna Skornik), and Editor of their proceedings.

She is a member of the editorial board of *Demonstratio Mathematica*, an international journal published by the Warsaw University of Technology; of *Scientiae Mathematicae*, an electronic journal connected with *Matematica Japonica*, of *Matematica Japonica* and of *Fractional Calculus and Applied Analysis* (Honorary Editor).

For her activities, Prof. D. Przeworska-Rolewicz has been distinguished by including her name in several international biographical dictionaries, for instance: Who’s Who in the World (1978/79), 5000 personalities of the World (American Biograph. Institute, 1984) and others, also by the Golden Cross of Merit in 1985.

More details on the CV and lists of publications of Prof. D. Przeworska-Rolewicz can be seen at:

- <http://wersita.com/przeworska-rolewicz/>
- www.impan.pl/User/rolewicz/Przeworska.html

– "70th Anniversary of Professor Danuta Przeworska-Rolewicz: Letters by the Editor and K. Skornik". *Fract. Calc. Appl. Anal.* **4**, No 2 (2001), pp. 255–256; "CV and List of Publications", in Same Issue, pp. 256–266.

Prof. Przeworska-Rolewicz has published several survey papers on her results in this journal FCAA, since Vol. **1**, No 1 (1998) (see at <http://www.math.bas.bg/~fcaa>), to a very recent one:

D. Przeworska-Rolewicz, Shifts and periodicity in algebraic analysis. *Fract. Calc. Appl. Anal.*, Vol. **14**, No 2 (2011), pp. 164–200; DOI: 10.2478/s13540-011-0012-x; <http://www.springerlink.com/content/1311-0454/14/2/>

Let us pass to Prof. Danuta and her family our best regards and wishes on occasion of her 80th anniversary,

On behalf of the Editorial Board

5. 70th Anniversary of Professor Stefan Samko, Editor of FCAA

Prof. Dr.Sc. Stefan Samko is born on 28 March 1941 in the Russian city of Rostov-on-Don.

His main research interests and World known achievements are in the areas of: – Harmonic Analysis and Operator Theory in Variable Exponent Function Spaces; – Function spaces; – Potential type operators; – Hyper-singular integrals and the method of approximative inverse operators; – Fractional calculus of one and many variables; – Integral equations of the first kind (including multi-dimensional ones); – other close areas of Mathematical Analysis.

Nowadays, he has more than 40 years of professional experience, including scientific research presented in numerous publication, among them 4 scientific monographs:

S.G. Samko, A.A. Kilbas, O.I. Marichev: *Fractional Integrals and Derivatives and Some of Their Applications*. Minsk, Nauka i Tekhnika, 1987 (in Russian).

S. Samko, A. Kilbas, O. Marichev: *Fractional Integrals and Derivatives. Theory and Applications*. Gordon & Breach Sci. Publishers, 1993.

S. Samko, N. Karapetyants: *Equations with Involutive Operators*. Birkhauser, 2001.

S. Samko: *Hypersingular Integrals and Their Applications*. Taylor & Francis, 2002.

He is author of more than 230 articles, scientific advisor of 21 Ph.D. students (see <http://w3.ualg.pt/~ssamko/phdstudents/>), member of Editorial Boards of 9 scientific journals, among them our "*Fractional Calculus and*

Applied Analysis". Winner of a Fulbright grant, awarded the International Cultural Diploma of Honor by the American Bibliographical Institute, Honorary Member of Ukrainian Academy of Sciences of Superior School, and several other awards.

In 1966-1967 S. Samko took doctor courses in Department of Mathematics of Rostov State University under the supervisorship of Academician of Belarusian Academy of Sciences Fedor Dmitrievich Gakhov. He defended his Ph.D. in the Belarusian State University, Minsk, 1967 and the higher level dissertation for Doctor of Sciences – in the Steklov Mathematical Institute, Moscow, 1978. Since 1967 he had been working at the Rostov State University and became a Full Professor in 1981, was a Dean of Department of Mathematics and Mechanics (1979-1981) and Chair of Differential and Integral Equations (1988-1996). Later, he moved to the University of Algarve in Faro, Portugal, where is a Full Professor since 2002.

The main area of Samko's mathematical research is connected with hypersingular integrals, potential type operators and functional spaces of fractional smoothness. He is well known for his results involving the characterization of the spaces of Riesz-type potentials in terms of hypersingular integrals and the algorithmic approach to the solution of integral equations of the first kind with potential type kernels according to which their solutions are expressed in closed form in terms of hypersingular integrals. The results of these investigations were presented in the monograph by S.G. Samko "*Hypersingular Integrals and Their Applications*", published in Russian (1984, Rostov State University). The English revised and extended edition of this book is by Taylor & Francis, in 2002.

Another area of Samko's research concerns the development of various problems of one- and multi-dimensional mathematical analysis. A new step in this direction was done in the monograph by S.G. Samko, A.A. Kilbas and O.I. Marichev "*Integrals and Derivatives of Fractional Order and Some of Their Applications*", published first in Russian (1987, Nauka i Tekhnika). In this book a systematic and all-round exposition of the classical and modern results on the theory of fractional calculus of functions of one and several variables, mainly based on Samko's papers, was given for the first time in the world literature. Applications of fractional calculus to integral and differential equations were presented together with the historical information, reviews of connected results and a wide bibliography. All these facts gave an encyclopedic nature to this monograph. Its English revised and extended edition was published in 1993 by Gordon and Breach Science Publishers. These books gave a vast impact to the further development of the fractional calculus and its applications, and obtained hundreds of citations, including by authors in the journal *Fract. Calc. Appl. Anal.*

Next area of Samko's research is connected with singular equations. In his Ph.D. thesis he constructed the theory of abstract singular operators in the exceptional case. Further investigations in this field were carried out together with N.K. Karapetiants. On the basis of the axiomatic approach they developed a general method for investigation of singular equations and convolution type equations with Carleman shift. The results were presented in the book by N.K. Karapetiants and S.G. Samko "*Equations with Involute Operators and Their Applications*", published first in Russian (1988, Rostov State University), and as an English revised and extended edition, "*Equations with Involutive Operators*", by Birkhauser, 2001.

Professor Samko pays a lot of attention to mathematical education, devoting much strength and energy to the supervision of postgraduates and trainees, having 21 Ph.D students, organizing seminars, etc. He was invited to give talks at international conferences, seminars and workshops in many countries, himself – organizing several international conferences, leading and coordinating many research projects and groups.

Samko gives a lot of his energy to publishing activity, being member of Editorial Boards of 9 international mathematical journals, including FCAA, namely: *Izvestia Vuzov. Matematika* (Russian), published in English by Springer as *Russian Mathematics*; *Integral Transforms and Special Functions* by Taylor & Francis; *International Journal of Mathematical and Statistical Science*; *Proceedings of A. Razmadze Mathematical Institute*; *Journal of Mathematical Inequalities*; *Armenian Journal of Mathematics*; *Mathematics in Engineering, Science and Aerospace (MESA)*; *International Journal of Mathematics and Mathematical Sciences*.

Detailed CV and list of publications of Prof. Samko can be found at:

– <http://w3.ualg.pt/~ssamko/>

– <http://versita.com/samko/>

– "60th Anniversary of Professor S. SAMKO: Letters by the Editor, N. Karapetiants and A. Kilbas, B. Rubin". *Fract. Calc. Appl. Anal.* **4**, No 1 (2001), pp. 113–116; "CV and List of Publications of S. Samko", in Same Issue, pp. 117–130.

Many of the Editors and Authors in FCAA journal have been happy to collaborate with Professor Stefan Samko. Always active and enthusiastic, he keeps a permanent interest in various mathematical ideas and problems. 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. Therefore his friends lovely call him Stiva. We wish Stiva on his 70th birthday good health, happiness in family life, new great success in research.

On behalf of the Editorial Board

**Main directions of S.G. Samko's results having
an essential influence on the establishing and development
of the theory of fractional differential equations**

by **Sergei Rogosin**

Prof. Stefan Samko has essential contributions in the following areas, closely related to the FCAA topics: – singular integral equations and boundary value problems; – Abel integral equations and their applications; – integral equations with weak singularities; – integral equations of convolution type; – fractional calculus; – fractional powers of operators; – one- and multi-dimensional theory of potential type operators; – hypersingular operators; – functional spaces with variable exponents.

Singular integral equations and boundary value problems:

- Abstract theory (Noether theory) of general singular integral equations (including in the case of open arc Γ)

$$a(t)\varphi(t) + b(t) \int_{\Gamma} \frac{\varphi(\tau)}{\tau - t} d\tau + \int_{\Gamma} k(t, \tau)\varphi(\tau) d\tau = f(t).$$

- Classes of general singular integral solvable in closed form.
- Generalized argument principle.
- Acting properties of singular integral operators (including, SIO on Carleson curves) in spaces with variable exponents and applications to the investigation of boundary value problems in classes of analytic functions represented by the Cauchy type integrals.

Abel integral equations and their generalizations:

- Solution in closed form of generalized Abel type integral equations.
- Proof of the relation formulas of fractional integration operators with singular integral operators, in particular,

$$I_-^\alpha \varphi = \cos \alpha \pi I_+^\alpha \varphi + \sin \alpha \pi S I_+^\alpha \varphi.$$

- Noether theory of generalized Abel type integral equations:

$$u(x) \int_a^x \frac{\varphi(t) dt}{(x-t)^\mu} + v(x) \int_x^b \frac{\varphi(t) dt}{(t-x)^\mu} = f(x).$$

Integral equations with weak singularities:

- Solution in closed form of integral equations with logarithmic kernel.
- Normal solvability, asymptotic method of solution to integral equations with logarithmic kernel.
- Inversion of integral equation

$$\int_{-\infty}^x k(x-t)\varphi(t)dt = f(x)$$

with Sonine's kernel $k \in L_1^{loc}(\mathbb{R}_+^1)$ (i.e. such that there exists $l \in L_1^{loc}(\mathbb{R}_+^1)$):

$$\int_0^x k(x-t)l(t)dt \equiv 1).$$

- Classes of correctness in weighted Hölder spaces for Sonine's integral equation.

Convolution type integral equations:

- Introducing and investigation of properties of Banach spaces, appropriate to the solution of convolution type integral equations

$$a_0(t)\varphi(t) + \sum_{j=1}^n a_j(t) \int_{-\infty}^{\infty} b_j(\tau)h_j(t-\tau)\varphi(\tau)d\tau = f(t).$$

- Solution in closed form of special kinds of convolution type integral equations.

- Noether theory of convolution type integral equations.

Fractional integro-differentiation:

- Description of the image $\mathbf{I}^\alpha(L_p)$ of the Riesz potential.

- Isomorphism of weighted Hölder spaces under the acting of the operator of fractional derivative.

- Marchaud-type formula for the operator of fractional derivative in domains $\Omega \subset \mathbb{R}^n$

$$D_\Omega^\alpha \varphi(x) = c(\alpha) \left[\varphi(x) \int_{\mathbb{R}^n \setminus \Omega} \frac{d\mathbf{y}}{|\mathbf{x} - \mathbf{y}|^{n+\alpha}} + \int_\Omega \frac{\varphi(\mathbf{x}) - \varphi(\mathbf{y})}{|\mathbf{x} - \mathbf{y}|^{n+\alpha}} d\mathbf{y} \right].$$

- Conditions for Noethericity and index formula for one-dimensional integral operators generalizing the operators of fractional integration in spaces with variable exponents.

- Description of the acting properties of generalized Riemann-Liouville operator of fractional integration of variable order

$$I_{a+}^{\alpha(x)} \varphi(x) = \frac{1}{\Gamma(\alpha(x))} \int_a^x \frac{\varphi(t)dt}{(x-t)^{1-\alpha(x)}}$$

in generalized Hölder spaces.

- Formula for a left inverse to Liouville operator of fractional integration (i.e. with $a = -\infty$) of variable order.

Fractional powers of operators:

- Application of the hypersingular integrals' method to construction of effective formulas for fractional powers of the classical operators of mathematical physics

$$I - \Delta, \quad -\Delta_x + \frac{\partial}{\partial t}, \quad I - \Delta_x + \frac{\partial}{\partial t}.$$

Theory of (1- and multi-dimensional) potential type operators:

- Inversion of the Riesz type fractional potential

$$(\mathcal{K}^\alpha \varphi)(x) = \frac{1}{\gamma_{n-1}(\alpha)} \int_{|\mathbf{x}|=1} \frac{\varphi(\sigma) d\sigma}{|\mathbf{x} - \sigma|^{n-1-\alpha}}.$$

- Investigation of properties of operators generalizing fractional integration operators

$$\left(I_m^{\alpha(\cdot)} \varphi \right) (x) = \int_{\Omega} \frac{\varphi(\mathbf{y}) d\mu(\mathbf{y})}{d(\mathbf{x}, \mathbf{y})^{m-\alpha(x)}}$$

in the Lebesgue spaces with variable exponents.

- Characterization of the space of Bessel potentials in terms of convergence of the Poisson semigroup P_t .

Hypersingular operators:

- Inversion and regularization of the multidimensional operator of potential type.
- Method of the approximative inverse operator applied to the construction of an inverse operator to the potential type operator (based on the approximation of the symbol of the potential type operator).
- Application of the approximative inverse operator' method to the study of the fractional powers of the differential operator

$$-\Delta_{\mathbf{x}'} + c \cdot \nabla, \quad \mathbf{x}' = (x_1, \dots, x_k), \quad k \leq n - 1.$$

Results in other related areas:

- Complete monotonicity property $((-1)^n f^{(n)}(x) \geq 0, \forall x > 0)$ for a wide class of special functions.
- Positive answer to the question: whether exists a function f , having continuous fractional derivatives D^α of any order $\alpha < \alpha_0$, for which does not exist the fractional derivative of order α_0 .

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