

CURRICULUM VITAE

Stepan Douplii

PERSONAL INFORMATION

Passport name: **Stepan Douplii**
Pen/scientific name: **Steven Duplij**
Cyrillic name: **Степан Анатольевич Дуплий**

Address:

Center of Information Technology (CIT)
University of Münster
48149 Münster
Germany

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Homepage:

<https://www.uni-muenster.de/IT.StepanDouplii>



PERSONAL INFORMATION

Date and place of birth: August 29, 1954, Chernyshevsk, Russia.
Citizenship: Ukraine. Marital status: married, wife is EU citizen. Nonsmoking.

DEGREES

- 2002** The academic status of **Senior Research Fellow** is given by Higher Certifying Commission, Kiev, Ukraine
- 1999** Habilitation Thesis: "*Semigroup Methods in Supersymmetric Theories of Elementary Particles*", Bogolyubov Institute of Theoretical Physics, Kiev, Ukraine,
Doctor Habilitatus in Theoretical Physics
(Doctor of Science in Physics and Mathematics)
- 1983** Ph.D. Thesis: "*Theoretical Investigation of Hard Processes in QCD*";
- 1978-1982** Post Graduate Course in Theoretical Physics, Kharkov State University;
PhD (Candidate of Science in Physics and Mathematics); adviser M.P. Rekalov

EDUCATION

- 1994-1995** Special German Language Course, Goethe Institute, Mannheim, Germany;
Distinguished diploma
- 1974-1978** Department of Theoretical Physics, Kharkov State University;
The Distinguished Diploma in Theoretical Nuclear Physics - M.Sc.
- 1973-1976** Special English Language Course, Kharkov State University;
The Distinguished Diploma
- 1971-1973** Department of Theoretical Radiophysics, Kharkov State University

WORK EXPERIENCE

- 2019-now** Scientific Researcher at the Center of Information Technology (CIT),
Universität Münster, Münster, Germany
- 2016** Lecturer in Mathematics, Bochum University of Applied Sciences, Germany
- 2014-2016** Scientific Researcher at the Mathematisches Institut, Universität Münster,
Münster, Germany
- 2012** Lecturer in Mathematics, Rutgers University, Piscataway, USA
- 2011-2012** Visiting Fulbright Scholar, Rutgers University, USA
- 2000-2014** Lead Senior Staff Researcher at the Nuclear Physics Laboratory,
Kharkov National University, Kharkov, Ukraine
- 2000-now** CMS collaboration, CERN, Geneva
- 1997-2000** Senior Staff Researcher at the Nuclear Physics Laboratory,
Kharkov National University, Kharkov, Ukraine
- 1983-1997** Staff Researcher at the Nuclear Physics Laboratory,
Kharkov State University, Kharkov, Ukraine
- 1983-1992** Staff Researcher at the Nuclear Physics Laboratory,
Kharkov State University, Kharkov, Ukraine
- 1978-1983** Half-time Researcher at the Radiophysics Laboratory,
Kharkov State University, Kharkov, Ukraine

FELLOWSHIPS & GRANTS

- 2015-2016** European Research Council Grant at University of Münster (Host: J. Cuntz)
- 2010** Alexander von Humboldt Fellowship at University of Münster (Host: J. Cuntz)
- 2011-2012** Fulbright Scholar Program at the Rutgers University,
Piscataway, USA (Host: G. A. Goldin)
- 2010** Alexander von Humboldt Fellowship at University of Münster (Host: J. Cuntz)
- 2008** Alexander von Humboldt Fellowship at University of Köln (Host: M. Zirnbauer)
- 2007** American Physical Society Travel Grant at John Hopkins University
(Host: J. Bagger)
- 2005-2006** Alexander von Humboldt Fellowship, University of Münster (Host: J. Cuntz)
- 2004** Simons Foundation Travel Grant (Stony Brook, USA)
- 2001** Alexander von Humboldt Fellowship at Max-Planck-Institute for Dynamics
and Self-Organization, Göttingen (Host: F. Müller-Hoissen)
- 2001** National Natural Science Foundation of China Grant at Zhejiang University,
Hangzhou (Host: Fang Li)
- 1994-1997** Alexander von Humboldt Fellowship at the Physics Department,
University of Kaiserslautern, Kaiserslautern, Germany (Host: W. Rühl)

SCIENTIFIC PUBLICATIONS

In total: **202** publications, among them 9 books and 191 articles in *Physical Review*, *Journal of Physics*, *Communications in Mathematical Physics*, *Journal of Mathematical Physics*, *Communications in Algebra*, *Semigroup Forum*, *Letters in Mathematical Physics*, *Theoretical and Mathematical Physics*; *Journal of Lie Theory*, *International Journal of Geometric Methods in Modern Physics*, *Linear Algebra and Applications*, etc. Full lists are on the [homepage](#).

Scientific Books (available from publishers and on Amazon, Barnes&Noble, etc.):

1. S. Duplij, R. Vogl, “*Innovative Quantum Computing*”, IOP Publ., Bristol-London, 2023, 178 pp.
2. S. Duplij, “*Polyadic Algebraic Structures*”, IOP Publ., Bristol-London, 2022, 461 pp.
3. S. Duplij and M.L. Walker, eds, “*Selected Topics in Gravity, Field Theory and Quantum Mechanics*”, MDPI Books, Basel, 2022, 348 pp.
4. S. Duplij, “*Exotic Algebraic and Geometric Structures in Theoretical Physics*”, Nova Publishers, New York, 2018, 410 pp.
5. S. Duplij, “*Supersymmetry, Quantum Groups, Multigravity and Singular Theories*”, Central West Publ., Australia, 2018, 254 pp.
6. S. Duplij, W. Siegel, and J. Bagger, eds., “*Concise Encyclopedia of Supersymmetry And Noncommutative Structures In Mathematics And Physics*”, Kluwer Academic Publishers, Dordrecht-Boston-London, 2004, 584 pp. (Second printing, Springer Science and Business Media, Berlin- New York-Heidelberg, 2005).
7. S. Duplij and J. Wess, eds., “*Noncommutative Structures in Mathematics and Physics*”, Kluwer, Dordrecht, 2001, 493 pp.
8. S. Duplij and V. G. Zima, eds., “*Supersymmetric Structures in Mathematics and Physics*”, UkrINTI, Kiev, 2000, 262 pp.
9. S. Duplij “*Semisupermanifolds and Semigroups*”, Kharkov: Krok, 2000, 220 pp. (Second Print by CreateSpace Publ.: Charleston, 2013).

EDITOR EXPERIENCE

1999-2013 Editor of *Kharkov National University Journal* (Vestnik KSU), ser. Nuclei, Particles and Fields

2013-now Editor of *East European Journal of Physics*

2018 Invited Editor at *World Scientific Publishing Co*

Reviewing:

1998-now *Zentralblatt Mathematik*, Karlsruhe-Berlin, Germany

2005-now *Journal of Zhejiang University. Science*, Hangzhou, China

2007-now AIP, Melville, USA

2010-now *Reports of Mathematical Physics*, Warsaw, Poland
2012-now *Advances in Mathematical Physics*, New York, USA
2016-now *Modern Physics Letters A*, World Scientific, Singapore
2017-now *International Journal of Modern Physics B*, World Scientific, Singapore
2014-now *Advances in Applied Clifford Algebras*, Springer, Heidelberg, Germany
2015-now *Hindawi Publishing Co.*, London, UK
2018-now *Symmetry*, Basel, Switzerland

LECTURE COURSES

Calculus
Elementary Particle Physics
Quantum chromodynamics
Unified theories
Supersymmetry and supergravity

SUPERVISION

5 students received Distinguished M.Sc. Degree in Theoretical Physics
4 PhD students

PROFESSIONAL MEMBERSHIPS

2014 RUSSIAN UNION OF WRITERS (Moscow, Russia)
2008 AMERICAN PHYSICAL SOCIETY (College Park, MD)
2002 ALEXANDER VON HUMBOLDT CLUB Ukraine
1995 AMERICAN MATHEMATICAL SOCIETY (Providence, RJ)
1994 INTERNATIONAL ASSOCIATION OF MATHEMATICAL PHYSICS
(Cambridge, MA)
1993 ENGLISH INTERNATIONAL ASSOCIATION (Lund, Sweden)
1993 AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE
(Washington, DC)
1992 EUROPEAN PHYSICAL SOCIETY (Geneva, Switzerland)
1999 INTERNATIONAL MATHEMATICAL UNION (IAS, Princeton)

LISTED

World Directory Of Mathematicians
Marques Who Is Who In America
Encyclopedia of Modern Ukraine
Mathematical Portal (Math-Net)
MathSciNet (American Mathematical Society)
Academic Genealogy of Theoretical Physicists

Mathematics Genealogy Project
Wikipedia (UA)
Google Scholar
Microsoft Academics
Scopus
Semantic Scholar
MathSciNet (Author)
MathNet
ZMath
ORCID
Scopus
SciProfiles

CONFERENCE ORGANIZING

2017 December Workshop *Supergeometry And Applications* (Luxembourg),
as a member of Advisory Board
2005 June-International Workshop “*Pseudo-Hermitian Hamiltonians
in Quantum Physics*”, as a member of Advisory Board
2000 September-NATO Advanced Research Workshop “*Noncommutative Structures in
Mathematics and Physics*”, as a Partner Country Co-Director
(NATO Co-Director: Julius Wess)

CONFERENCE PARTICIPATION

Participated at numerous international conferences, workshops, schools and seminars
in USA, Germany, France, UK, Poland, Spain, Czech Republic, Russia, China, Ukraine.
2017 December Workshop *Supergeometry And Applications* (Luxembourg)
2016 January Workshop *Banach Methods In Noncommutative Geometry* (Münster,
Germany)
2015 April Workshop *Structure And Classification Of C^* -Algebras* (Münster, Germany)
2015 April Workshop *Structure And Classification Of C^* -Algebras* (Münster, Germany)
2014 May Workshop *Quantum groups and operator algebras* (Münster, Germany)
2011 August 3rd International Conference *Quantum Electrodynamics And Statistical
Physics* (Kharkov, Ukraine)
2010 June 26th Workshop *Foundations And Constructive Aspects Of QFT* (Münster,
Germany)
2010 May *Analytic And Algebraic Methods In Physics VI* (Prague, Czech Republic)
2009 October *Algebra, Geometry, And Mathematical Physics* (Bedlewo, Poland)
2009 September *The Fourth International Conference On p -Adic Mathematical Physics*
(Hrodna, Belarus)
2009 June *Symmetry In Nonlinear Mathematical Physics* (Kiev, Ukraine)
2009 May *Analytic And Algebraic Methods V* (Prague, Czech Republic)

2008 December 100th *Statistical Mechanics* Conference (Rutgers, USA)
2008 July Summer School And Conference On *Modern Mathematical Physics* (Belgrade, Serbia)
2007 May 97th Statistical Mechanics Conference (Rutgers, USA)
2004 July-August Simons Workshop In Mathematics And Physics (Stony Brook, USA)
2001 July XV Max Born Symposium *Schroedinger Operators, Random Potentials And Singular Perturbations* (Wroclaw, Poland)
2000 July International Conference On *Supersymmetry And Quantum Field Theory* 75th Birthday of D. V. Volkov (Kharkov, Ukraine)
1999 July International Conference On Supersymmetry And Quantum Symmetries in the memory of V. I. Ogievetsky (Dubna, Russia)
1999 July International Conference *Strings-99* (Potsdam, Germany)
1999 August International Conference On *Quantum Gravity And Superstrings* (Dubna, Russia)
1998 August *International Congress Of Mathematicians* (Berlin, Germany)
1997 January International Seminar On *Supersymmetry And Quantum Field Theory* in memory of D. V. Volkov (Kharkov, Ukraine)
1996 June *Supersymmetry-96* (College Park, MD, USA)
1996 June International Conference On *Higher Homotopy Structures In Mathematical Physics* (Poughkeepsie, NY)
1995 June Cracow *School Of Theoretical Physics* (Zakopane, Poland)
1995 July International Conference On *Gauge Theories, Applied Supersymmetry And Quantum Gravity* (Leuven, Belgium)
1995 July European School Of *Group Theory* (Valladolid, Spain)
1994 July International Congress On *Mathematical Physics* (Paris)
1993 June First Caribbean Spring School Of *Mathematics And Theoretical Physics* (Saint-Francois, Guadeloupe)

VISITS & TALKS

2025

Yantai, China (Yantai Res. Inst. Harbin Eng. Univ.)-*Qiang Guo*

2019

Heidelberg, Germany (Inst. Theor. Phys.)-*G. Wolschin*

Szczecin, Poland (Inst. Phys.)-*M. Dabrowski*

Wroclaw, Poland (Inst. Theor. Phys.)-*B. Jancewicz*

2018

Tianjin, China (Chern Inst. Math.)-*Chi-Keung Ng*

Harbin, China (Harbin Eng. Univ.)-*Qiang Guo, Zheng Yu*

2017

Luxembourg (Math. Research Unit)-*N. Poncin*

2016

Jena, Germany (Inst. Math.)-*D. Lenz*

2014

Münster, Germany (Inst. Math.)-*J. Cuntz, W. Werner, R. Wulkenhaar*
 Salerno, Italy (Univ. Salerno, Math. Dept.)-*C. Delizia*

2012

Davis, USA (UC, Math. Dept.)-*M. Mulase, A. Schwarz*
 Riverside, USA (UC, Math. Dept.)-*M. Lapidus*
 Honolulu, USA (Univ. Hawaii, Phys. Dept.)-*X. Tata*
 Syracuse, USA (Univ. Syracuse, Phys. Dept.)-*K. Wali*
 Medford, USA (Tufts Univ., Inst. Cosmology)-*A. Vilenkin*
 Boston, USA (Northeastern Univ., Math. Dept.)-*A. Martsinkovsky*
 Hangzhou, China (Zhejiang Univ., Math. Dept.)-*Fang Li*
 Nanchang, China (Nanchang Univ.)-*Jiejing Cheng*

2011

Chicago, USA (UIC, Math. Dept.)-*L. Kauffman*
 Minneapolis, USA (Univ. Minnesota, Phys. Dept.)-*M. Shifman*
 Philadelphia, USA (Univ. Penn., Math. Dept.)-*J. Stasheff*
 Piscataway, USA (Rutgers Univ., Math. Dept.)-*G.A. Goldin*
 Argonne, USA (ANL, HEP Division)-*C. Zachos*
 New York, USA (CUNY Graduate Center, Math. Dept.)-*A. Douglas*

2010

Münster, Germany (WWU, Inst. Math.)-*J. Cuntz, W. Werner,*
 Heidelberg, Germany (Inst. Theor. Phys.)-*G. Wolschin, J. Kupsch,*
 Wien, Austria (ESI, Univ. Wien)-*H. Grosse,*
 Prague, Czech. Rep. (Inst. Nucl. Phys., Rez)-*M. Znojil,*
 Wien, Austria (TUW, Inst. Theor. Phys.)-*D. Grumiller,*
 Padova, Italy (Inst. Nucl. Phys.)-*M. Tonin,*
 Naples, Italy (Inst. Phys.)-*G. Esposito,*
 Florence, Italy (Inst. Nucl. Phys.)-*R. Casalbuoni, L. Lusanna,*
 Rome, Italy (Inst. Theor. Phys.)-*M. Bianchi*

2009

Warsaw, Poland (Inst. Math.)-*S. Woronowicz, P. Urbanski,*
 Lodz, Poland (Univ. Lodz, Dept. Theor. Phys.)-*B. Broda,*
 Wroclaw, Poland (Inst. Theor. Phys.)-*J. Lukierski,*
 Zielona Gora, Poland (Inst. Phys.)-*M. Dudek,*
 Szczecin, Poland (Inst. Phys.)-*M. Dabrowski,*
 Krakow, Poland (Inst. Phys.)-*H. Arodz,*
 Prague, Czech. Rep. (Inst. Math.)-*B. Burgstaller*
 Potsdam, Germany (AEI)
 Dresden, Germany (Forsch. Zentrum Dresden-Rossendorf)-*U. Günther*

2008

Piscataway, USA (Rutgers Univ., Math. Dept.)-*G. Goldin,*
 Medford, USA (Tufts Univ., Inst. Cosmology)-*A. Vilenkin,*
 Cambridge, USA (MIT)-*E. Lomon,*

New York, USA (CUNY)-*S. Catto*,
 Köln, Germany (Inst. Theor. Phys.)-*M. Zirnbauer*,
 Belgrade, Serbia (Inst. Phys.)-*B. Dragovich*,
 Nic, Serbia (Inst. Phys.)-*M. Ciric*,
 Trieste, Italy (SISSA)-*L. Bonora*,
 Bielefeld, Germany (Univ. Bielefeld, Math. Dept.)-*C. Ringel*,
 Bonn, Germany (Phys. Inst.)-*V. Rittenberg*

2007

Princeton, USA (Inst. Adv. Study)-*S. Adler*,
 Chicago, USA (Univ. Illinois, Math. Dept.)-*L. Kauffman*,
 Medford, USA (Tufts Univ., Inst. Cosmology)-*A. Vilenkin*,
 Cambridge, USA (MIT)-*E. Lomon*,
 Baltimore, USA (Johns Hopkins, Univ., Phys. Dept.)-*J. Bagger*,
 Philadelphia, USA (Univ. Penn., Math. Dept.)-*J. Stasheff*

2006

Münster, Germany (Inst. Math.)-*J. Cuntz*,
 Bielefeld, Germany (Univ. Bielefeld, Math. Dept.)-*C. Ringel*

2004

Princeton, USA (Inst. Adv. Study)-*S. Adler*,
 Baltimore, USA (Johns Hopkins, Univ., Phys. Dept.)-*J. Bagger*,
 Stony Brook, USA (SUNY, Inst. Theor. Phys.)-*W. Siegel*,
 Minneapolis, USA (Univ. Minnesota, Theor. Phys. Inst.)-*M. Shifman*,
 Krakow, Poland (Jagellonian Univ.)

2003

Wroclaw, Poland (Inst. Theor. Phys.)-*W. Marcinek, J. Lukierski*

2001

Göttingen, Germany (ISF, Inst. Theor. Phys.)-*F. Müller-Hoissen*,
 Hangzhou, China (Zhejiang Univ., Math. Dept.)-*F. Li*,
 Shanghai, China (Inst. Phys.)-*Y.-L. Xu*,
 Wroclaw, Poland (Inst. Theor. Phys.)-*W. Marcinek, J. Lukierski*,
 Prague, Czech. Rep. (CTU, Math. Dept.)-*C. Burdick*,
 Rez, Czech. Rep. (Inst. Nucl. Phys.)-*M. Znojil*,
 Mannheim, Germany (Univ. Mannheim, Math. Dept.)-*M. Schlichenmaier*

2000

Warsaw, Poland (Inst. Math.)-*J. Okninski*,
 Wroclaw, Poland (Inst. Theor. Phys.)-*W. Marcinek, J. Lukierski*

1999 Potsdam, Germany (AI)

1998 Berlin, Germany (Hahn-Meitner-Inst., HZ)-*W. Von Oertzen*,
 Berlin, Germany (Tech. Univ.),
 Krakow, Poland (Inst. Nucl. Phys.)

1994

St. Andrews, UK (Univ. St. Andrews, Math. Dept.)-*J. Howie*
 Orsay, France (Inst. Nucl. Phys.)-*A. Comtet*

1993-1996

Kaiserslautern, Germany (Univ. Kaiserslautern, Phys. Dept.)-*W.Rühl*

1993

München, Germany (Max-Planck-Inst. Physik)-*J.Wess*,

Lyon, France (Inst. Phys.)

RESEARCH INTERESTS

Supersymmetry and semigroups; supermatrix models; superconformal symmetry; super Riemann surfaces; exotic supermanifolds; supersymmetric quantum mechanics.

Quantum groups and supergroups; weak Hopf algebras and Yang-Baxter equation; representations of quantized algebras, new actions of quantum algebras on quantum spaces.

Quantum computing and quantum information.

Polyadic algebraic structures, algebras, groups, fields, and their representations.

Nonlinear methods in (super)electrodynamics, Yang-Mills, gravity and multigravity.

Constrained systems and gauge theories, quantum chromodynamics and gravity.

Exactly solvable quantum field theory models, matrix models, numerical methods.

Secondary:

Symmetries of genetic code and visualization of DNA sequences;

Helicity formalism in quantum chromodynamics;

Polarization phenomena in low energy nuclear physics;

Rutherford backscattering method in ion implantation;

Nonstationary radio noise.

SCIENTIFIC RESULTS AND INNOVATIVE IDEAS

with direct links to articles

- A new direction in **supersymmetric models** of elementary particles, based on the inclusion of semigroups is proposed ([book](#), [thesis](#)). The concept of [semisupermanifold](#) having noninvertible transition functions (satisfying higher von Neumann regularity) is introduced, and its deviation from being an ordinary manifold is given by a newly defined variable, *obstructedness*. Based on this idea, the novel notions of *category regularization*, [regular topos](#), [regular functor](#), [higher regular braiding](#), [regular Yang-Baxter equation and regular module](#), [regular algebra and coalgebra](#), [regular graded algebras](#) are presented, and their [role in topological quantum field theory](#) is outlined. Even- and odd-reduced supermatrices are introduced and considered on a par, being complementary in terms of the newly obtained [Berezinian addition formula](#), and are unified into a kind of ["sandwich" semigroup](#). A special subset of odd-reduced supermatrices represent [higher order rectangular bands](#) for which new generalized ["fine" Green's relations and egg-box diagrams](#) are constructed.

[One-parameter semigroups of idempotent odd-reduced supermatrices](#) and corresponding superoperator semigroups are introduced and studied by the new *semigroup \times semigroup method*. The linear idempotent superoperators and exponential superoperators are mutually dual in some sense, and the first gives rise to an additional noninvertible [non-exponential solutions to the initial Cauchy problem](#). A novel [permanent-determinant symmetry](#) is found for even complex superplane. It is shown that the corresponding counterparts (*per analogs*) of the cross ratio, distance and harmonic set are invariant under the introduced [per mapping](#), a special noninvertible subset of the fractional linear transformation. The *per analogs* of the [Laquerre formula for distance and Schwarzian derivative](#) are presented. An [additional superextension of complex structure](#) is uncovered, which is noninvertible and can correspond to another (odd) superanalog of Riemann surfaces and to the counterpart of [superconformal-like transformations which twist the parity of tangent space](#) and their [nonlinear realization](#), which together with the ordinary ones form the [superconformal semigroup](#) having special [unusual properties](#). A unique formula connecting [berezinian, permanent and determinant](#) is obtained. From a physical viewpoint, the above conceptions can lead to [semistatistics](#), being [von Neumann regular analog](#) of the ordinary statistics.

- **Quantum groups:** a [generalization of the Hopf algebra](#) is introduced by relaxing the requirement for inverses of the generators of the Cartan subalgebra, which leads to a [regular quasi-R-matrix](#) structure. The classification of 6-vertex [constant solutions to Yang-Baxter equation over Grassmann algebra](#) is presented, including noninvertible ones which correspond to *von Neumann regular R-matrix*. The [actions of universal enveloping quantum algebras](#) on quantum planes (also of [arbitrary dimension](#)) are found. A novel [double-graded quantum superplane](#) and corresponding [double-graded Hopf algebra](#) are presented.
- **Singular theories** with degenerate Lagrangians are formulated [without involving constraints](#) using Clairaut equation theory and the corresponding generalized [Clairaut duality](#). A new *antisymmetric bracket* (an analogue of the Poisson bracket) describing the time evolution of singular systems is built. A novel [partial Hamiltonian formalism](#) is constructed. It is shown that a [singular theory can be interpreted as the multi-time dynamics](#).
- **Nonlinear gauge theories:** a [generalized approach to nonlinear classical electrodynamics and supersymmetric electrodynamics](#) is suggested, which takes into account all possible types of media and nonlocal effects, and is described in both Lagrangian and [non-Lagrangian](#) theories. First steps in the formulation of a general [nonlinear conformal-invariant electrodynamics](#) based on [nonlinear constitutive equations and conformal compactification](#) were made.
- **Gravity:** constitutive equations for [nonlinear gravito-electromagnetism](#) and an exact form of the Maxwell gravitational field equations are obtained. A general approach to describing the [interaction of multi-gravity models](#) in space-times of arbitrary dimension is formulated.

The gauge gravity vacuum is investigated in the [constraintless Clairaut-type formalism](#) (as in [QCD](#)). A special [fermionic lineal gravity](#) model which differs from standard supersymmetry is presented.

- **Quantum computing** ([book IOP](#), [FrontMatter](#)): a new conception of quantum computing which incorporates an additional kind of uncertainty, vagueness/fuzziness, by introducing a new ["obscure" class of qudits/qubits](#), is announced. A superqubit theory in super-Hilbert space is reconsidered, and a new kind of [superqubit carrying odd parity](#) is introduced. A new kind of quantum gates, namely [higher braiding gates](#), is suggested, which lead to a special type of multiqubit entanglement that can speed up key distribution and accelerate various algorithms. A novel visualization of quantum walks in terms of newly defined objects, [polyanders](#), is also proposed.
- **Polyadic structures** ([book IOP](#), [FrontMatter](#)): [polyadization](#), i.e. exchanging binary operations with higher arity ones, is proposed as a general new approach to the algebraic structures used in physics. A new form of the Hosszu-Gluskin theorem (giving the general shape of n -ary multiplication by the chain formula) in terms of polyadic powers is given, and its ["q-deformed" generalization](#) is found using the newly introduced [quasi-endomorphism](#). A polyadic analog of homomorphism, or [heteromorphism](#), a mapping between algebraic structures of different arities, is introduced, which leads to the definition of a new kind of n -ary group representation, [multiplace representations, as well as multiactions](#) and a [polyadic direct product](#).

The [arity invariance principle](#), a manifest expression of algebraic structure in terms of operations independent of their arities, is claimed. The relations of the von Neumann regular semigroups and the Artin braid group were found, and a higher arity generalization gave the [polyadic-binary correspondence](#), which allowed the definition of the following new structures: [higher braid groups](#), [higher degree analogs of Coxeter group and Artin braid group](#). The following were also uncovered: unusual [polyadic rings and fields](#) (which can, remarkably, be zeroless and nonunital) having addition and multiplication of different arities, [polyadic integer numbers](#) and [p-adic integers](#), [polyadic convolution products](#) having multiplication and comultiplication of different arities and their corresponding [polyadic Hopf algebra](#) and n -ary R -matrix, [polyadic multistar adjoints](#) and [polyadic operator \$C^*\$ -algebras and Cuntz algebras](#). The [polyadic analogs of the Lander–Parkin–Selfridge conjecture and Fermat's Last Theorem](#) were formulated.

It is proposed that mediality as a principle is more natural, unique and universal than commutativity in generalizing the latter to n -ary algebras (in the binary case commutativity directly follows from mediality). This is called the [commutativity-to-mediality ansatz](#), which is [applied](#) to obtain [almost medial \$n\$ -ary graded algebras](#), a new kind of tensor categories, [polyadic nonunital "groupal" categories](#) with "quertors" (analogs of querelements in n -ary groups), ["medialed" tensor categories and querefunctors](#). A principally new mechanism of additional "continuous noncommutativity", governed by a special ["membership deformation" of commutativity](#) for algebras with the underlying set as obscure/fuzzy set, is introduced.

Using the membership deformation factor together with the ordinary graded commutation factor, the almost commutative graded (n -ary) algebras and Lie algebras with [*double commutativity*](#) are obtained, and their projective representations are studied.

As a first step towards a the *polyadic algebraic K-theory*, the [*Grothendieck construction*](#) of the completion group for a monoid is generalized to the case, where both are of different, higher arities. As opposed to the binary case, an identity is not necessary for the initial m -ary semigroup to obtain a class n -ary group, which in turn need not contain an identity.

A new (infinite) class of division algebras, the [*hyperpolyadic algebras*](#), which correspond to the (only 4) binary division algebras R, C, H, O (reals, complex numbers, quaternions, octonions) are defined. A [*polyadic analog of the Cayley-Dickson construction*](#) is proposed, and a novel iterative process gives "*half-quaternions*" and "*half-octonions*". [*New polyadic algebras with higher brackets*](#) which have (as opposed to n -ary Lie algebras) different arity from the initial n -ary algebra multiplication, are introduced. The *sigma matrices* and the *Pauli group* are [*generalized to higher arities*](#). Using them, a toy model of one-dimensional supersymmetric quantum mechanics was constructed, as a first example of [*polyadic supersymmetry*](#), which is specially extended in a way different from the [*new multigraded SQM*](#) previously proposed.

- **DNA theory:** a new characteristic of nucleotides, the [*determinative degree*](#), which is proportional to the dipole moment and the weight of hydration site, is unveiled. The physical characteristics of nucleotides such as [*dipole moment, heat of formation and energy of the most stable formation*](#) are newly computed by advanced methods. The concept of a [*triander*](#) is set up, which leads to a new method of visual sequence analysis and identification using [*DNA walk diagrams*](#).

SPECIAL SKILLS

Languages: English (perfect), German (speaking), Russian (native), Ukrainian (native), Italian (basic).

Programming: Perl, Mathematica, Maple, LaTeX, BibTeX, HTML.

PC platforms: MS-DOS, Windows, Unix, Linux.

PC software: Scientific Work Place, dBase, Adobe products, Microsoft Excel, Word, Photoshop, Dreamweaver, PowerPoint.

MASS MEDIA & SOCIAL LIFE

TV programs and interviews at the Kharkov TV studios.

Scientific program "Logos" (interviews at the Central Kharkov radio station).

Articles about S. Duplij: in USA (SCOOP USA, Gazette, Library of Congress); in Germany, in Ukrainian press.

Alexander von Humboldt Fellows meetings/workshops.

LITERARY & MUSICAL ACTIVITY

Writing poetry and short stories

More than [200 publications](#) in USA/UK professional literary magazines in English, German, French, Spanish, etc. (the full list is on homepage).

Literary books (available on [Amazon](#), Barnes&Noble, etc.):

1. S. Duplij, "*Poephysics of Spirit*" (prose, bilingual English/Russian), 2024 Woodbridge Press, Toronto, 372 pp.
2. S. Duplij, "*Poetification of the Soul*" (poems in English), 2024 Woodbridge Press, Toronto, 168 pp.
3. S. Duplij, "*Poephysik der Seele*" (prose in German), 2023 Woodbridge Press, Toronto, 268 pp.
4. S. Duplij, "*Symmetry of Passion*" (U.S. Edition, full collection of poems and translations, in Russian) 2022, Cross-Cultural Communications, New York, 500 pp.
5. S. Duplij, "*Bosonization of Feelings*" (poems and prose in Russian), 2019 Central West Publ., Australia, 232 pp.
6. S. Duplij, "*Supermanifold of Life*" (poems and prose in 9 languages), 2014 Trilingual Press, Cambridge, USA, 222 pp.
7. S. Duplij, "*Dash-Dotted*" (poems, bilingual English/Russian), 2014 Trilingual Press, Cambridge, USA, 356 pp.
8. S. Duplij, "*In Cry*" (poems, bilingual English/Russian), 1999 Mitez, Kharkov, Ukraine, 72 pp.
9. S. Duplij, "*Angel*" (poems in English), 1997 JVC Books, Arcadia FL, USA, 125 pp.

Playing guitar and composing songs

CD audio albums of songs (for mp3's see [Music Site](#) on [homepage old](#)):

"*Blitz*" (Heidelberg, 1995)

"*Motifs of years*" (Heidelberg, 1996)

"*Supermanifold of life*" (Houston, 2007)

MC audio album of songs:

"*Blitz*" (GEMA, Berlin, 1996)