



## PROFESSOR ALEXANDRU T. BALABAN'S 80<sup>th</sup> ANNIVERSARY



The Editorial Board of *Revue Roumaine de Chimie* continues the traditional dedication of a special issue for Professor A. T. Balaban's anniversary, in line with two previous occasions (60<sup>th</sup> and 70<sup>th</sup> anniversaries): *Rev. Roum. Chim.*, **1991**, 36, 281-311 and **2001**, 46, 261-275. As it was done in these issues, the list of publications continues, with a few unavoidable overlaps for publications that were misnumbered.

**Didactic and organizational activities.** After retiring from the Polytechnic University of Bucharest in 2000 and becoming a tenured professor at the Texas A&M University in Galveston (TAMUG), Department of Marine Sciences, USA, Professor A. T. Balaban taught between 1991 and 2011 one-semester courses (Organic Chemistry I and II, as well as Fundamentals of Chemistry I and II) with the exception of a sabbatical leave for the Fall Semester of 2007. In 2010 a new Science Building was inaugurated for TAMUG.

Together with a few other mathematical chemists, he founded in 2005 the *International Academy of Mathematical Chemistry*, whose first President he became for a duration of three years. The official location is in Dubrovnik, Croatia, and at present there are 81 members from 22 countries. Every year in June there is a meeting of IAMC (so far in Croatia, Slovenia, Italy) with lectures and election of a few new members.

In 2001 the Hungarian Academy of Sciences elected Professor Balaban as an Honorary Member. In 2007, the Association of Former Students of the Texas A&M University presented to Professor Balaban their annual Distinguished Achievement Award for Research (by an interesting coincidence, another awardee in the same year also originated from Roumania, Dr. Ciprian Foiaş, Professor of Mathematics).

As a member in the editorial boards of several journals, Professor Balaban spends a considerable time in refereeing manuscripts prior to publication. He is at present regional editor for *Polycyclic Aromatic Compounds* (Taylor and Francis, Publ.); Associate Editor for *Current Organic Synthesis* (Bentham Publ.); Editorial Board member for the following journals: *The Open Chemical Physics Journal*; *The Open*

*Information Science Journal; The Open Applied Informatics Journal; Current Computer-Aided Drug Design; Current Bioactive Compounds* (all from Bentham Publ.); *Advances in Heterocyclic Chemistry*, USA; *Fullerene Science and Technology*, USA; *Organic Preparations and Procedures International*, USA; *MATCH, Communications in Mathematical and Computational Chemistry*, Serbia; *Journal of Radioanalytical and Nuclear Chemistry*, Holland; *Heterocyclic Communications*, England; *Scientometrics*, Hungary; *Structural Chemistry* (Springer Publ.); *Central European Journal of Chemistry*, Poland; *Internet Electronic Journal of Molecular Modeling* (USA); *Revista de Chimie București*, Roumania; *Revue Roumaine de Chimie*, Roumania. Previously, he was a member in the editorial boards of *Journal of Chemical Information and Computer Sciences*, USA; *Journal of Labelled Compounds and Radiopharmaceuticals*, USA; *Journal of Computational Chemistry*, USA; *Journal of Mathematical Chemistry*, Canada; *SAR and QSAR in Environmental Research*, France; *Bulletin des Sociétés Chimiques Belges*, Belgium; *Acta Chemica Hungarica – Models in Chemistry*, Hungary; and *Roumanian Chemical Quarterly Reviews*.

**Scientific research.** In **experimental chemistry**, with his former Ph. D. student in Bucharest, Marc Antoniu Ilieș (who is now an Assistant Professor at the Temple University in Philadelphia), and several coworkers from TAMUG, Professor Balaban applied the Balaban-Nenitzescu-Praill reaction to the synthesis of pyrylium salts with long hydrophobic substituents. These compounds can be easily converted into pyridinium cationic lipids which self-aggregate into liposomes that can carry polynucleotides across biological membranes. A US patent was issued and several articles were published describing this new class of gene-transfer agents. Similar synthetic research is being carried out at the Center for Organic Chemistry of the Roumanian Academy in Bucharest. Another application of this reaction has led to the synthesis of new ionic liquids derived from pyrylium and pyridinium salts. On demand from the editor of the *Encyclopedia of Reagents for Organic Synthesis*, a few monographs on pyrylium salts have been included both in the printed and the electronic version. A comprehensive review of methods for preparing pyrylium salts was published by Balaban Senior (A. T.) and Junior (Teodor-Silviu) in *Science of Synthesis; Houben-Weyl Methods of Molecular Transformations* (with an up-date to appear in 2011). An experimental example of double Janus-effect was obtained with 4-ethyl-2,6-diisopropylpyridine, where the buttressing of isopropyl groups causes them to behave like *tert*-butyl groups reducing substantially the basicity of this pyridine; 2,6-diisopropylpyrylium salts and the corresponding pyridinium derivatives have interesting biological applications due to their fluorescence. Biomedical applications of such heterocyclic cations have been discovered in collaborations with Professor Claudiu Supuran, a well-known authority on carbonic anhydrase. New ionic liquids based on pyrylium and pyridinium cations were synthesized.

In collaboration with Dr. Titus Constantinescu and his coworkers from the Institute of Physical Chemistry of the Roumanian Academy in Bucharest, Professor Balaban has published several papers on the synthesis of new stable free radicals, new metal complexes involving macrocyclic polyethers, and new fluorescent compounds. This collaboration continues even after Dr. Constantinescu's retirement. In-depth investigation of fluorescent properties have benefitted from collaborations with Professor Mihaela Hillebrand from the Bucharest University and her Ph. D. students.

In **theoretical chemistry**, Professor Balaban has authored two book chapters on the aromaticity of heterocycles. In collaboration with Professor Katritzky and Dr. Daniela Oniciu, Dr. Balaban has published a review about "aromaticity as a cornerstone in heterocyclic chemistry". Other reviews worthy of mention are a chapter on nanocones in a book edited by Mircea Diudea, and a chapter on molecular descriptors in drug design published in *Encyclopedia of Complexity and Systems Science*. In a paper published in 2006, the complexity of graphs was analyzed in terms of size, branching, and centrality. Some reflections about mathematical chemistry were published in 2005. Together with Professor D. J. Klein, the central place of chemistry in relationship with other disciplines was critically assessed.

Continuing the collaboration with Professor D. J. Klein from TAMUG, involving often also Dr. Ovidiu Ivanciuc, his former Ph. D. student in Bucharest, Professor Balaban has published several papers on fullerenes, nanocones, and nanotubes. The most numerous collaborations – publications – have been with Professor Milan Randić, who became interested in graph-theoretical problems after having listened to a lecture presented by Professor Balaban in 1975 at Harvard University, and who was Vice-President of the *International Academy of Mathematical Chemistry* in 2005-2008. They published a series of six papers on the partitioning of  $\pi$ -electrons in rings of polycyclic conjugated hydrocarbons; this sharing of  $\pi$ -electrons accounts for several

characteristics of such compounds and correlates well with Eric Clar's theory. Also with Professor Randić and three other collaborators, an ample review on "graphical representations of proteins" was published in *Chemical Reviews* in 2011.

Benzenoids that have only "Clar sextets" and "empty rings" have been characterized by Professors Balaban, Klein, and Schmalz from TAMUG as "claromatics". Also in collaboration with Professor Randić several publications have concentrated on graph-theoretical analysis of biological networks and biomolecules.

During the last few years, Professor Emeritus Norman H. March, who chaired the Department of Theoretical Chemistry of Oxford University between 1977 and 1994, visited TAMUG for one month; several collaborations with him and Professor D.J. Klein involved theoretical analyses of ionic liquids, phase transitions, and the "wetting index" of liquids.

Among topological indices (TIs) useful for quantitative structure-property relationships, the Balaban index  $J$  has several unique properties, including high discrimination ability among isomeric structures. Several studies revealed how alkanes are ordered by various TIs, relationships among TIs which can be clustered accordingly, and correlations with the structure of polycyclic benzenoid hydrocarbons.

An interesting development has occurred with Professor Balaban's conjectured *trivalent cages* (minimal regular graphs of degree three with smallest circuits involving  $g$  vertices). Mathematicians have described  $g$ -cages with  $g = 3, 4, 5, 6, 7, 8$ , and 12; the 5-cage with 10 vertices (called the Petersen graph) plays an important role in graph theory, and happens to represent a particular case of "reaction graphs" introduced by Professor Balaban in 1966. Having tried to find solutions to the unknown cases with  $g = 9, 10$ , and 11, he dared to publish conjectures on these cases. By an extremely hard and long computer search, it was proved that the conjectured 11-cage (known as Balaban's 11-cage) is unique, whereas there are exactly three 10-cages, the first of which is known as Balaban's 10-cage, and is on the cover of the book by N. Hartsfield and G. Ringel, *Pearls in Graph Theory: A Comprehensive Introduction*, Academic Press, San Diego, 1990.

An index of scientific productivity, measuring both the number of publications in peer-reviewed journals and the number of citations per publication, was introduced by A. Hirsch: the  $h$ -index is the number  $h$  of articles each of which has been cited by others at least  $h$  times. The *Web of Science* (an online academic citation index provided by Thomson Reuters), which allows easy access to citations, lists Professor Balaban's  $h$ -index as 49 (in December 2010), and provides charts for the numbers of papers and citations per year. Figs. 1 and 2 (from Thomson Reuters) illustrate yearly plots of publications and citations, respectively. The paper from *Chemical Physics Letters* that introduced index  $J$  has been cited more than 600 times.

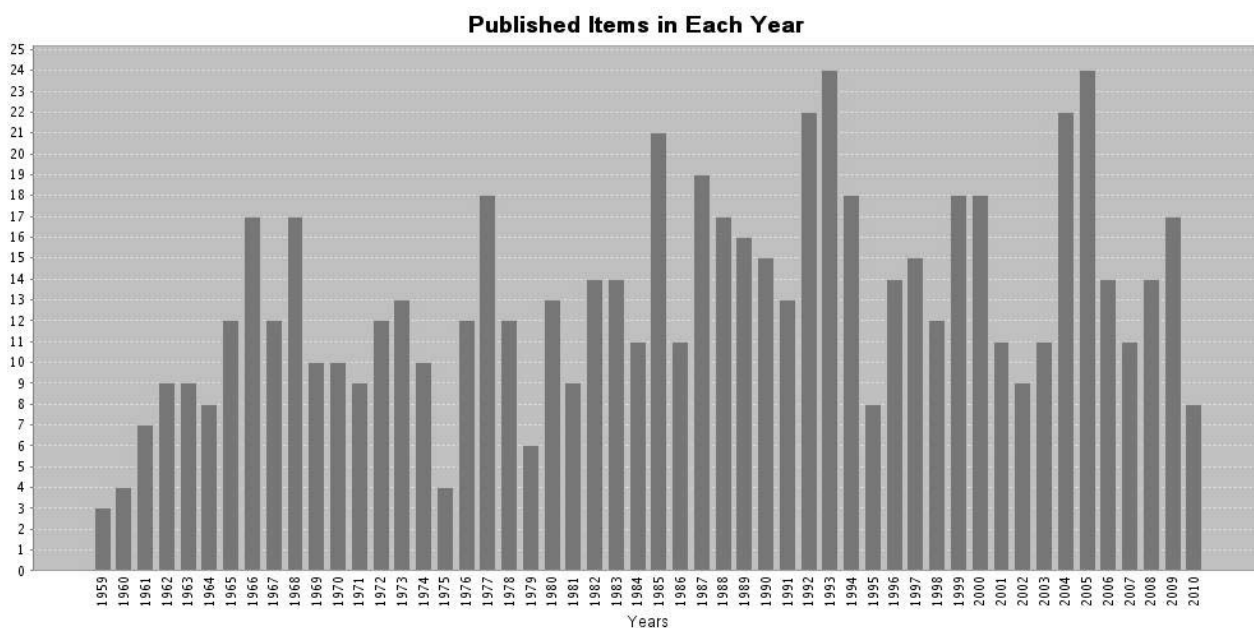


Fig. 1 – Numbers of papers published yearly by A. T. Balaban in peer-reviewed journals from 1959 till mid-2010.

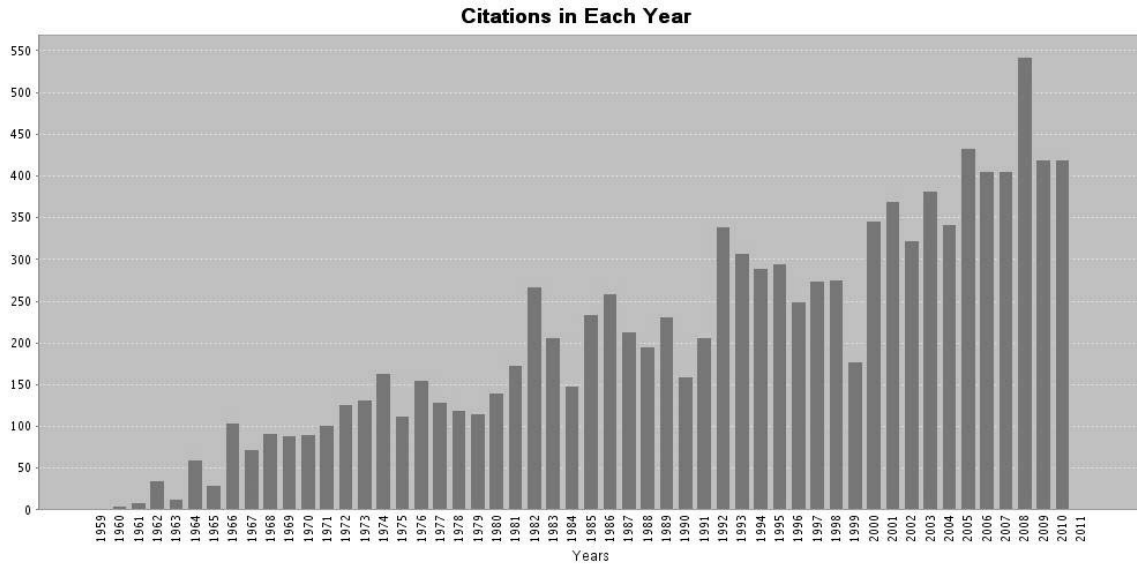


Fig. 2 – Numbers of yearly citations for A. T. Balaban's papers between 1960 and mid-2010.

## SCIENTIFIC PUBLICATIONS OF ALEXANDRU T. BALABAN

### A. Books

#### A. 1. Edited Books

8. A.T. Balaban and C. Balaban (coordinating authors), "Small Encyclopedia of Chemical Technology" (in Roumanian), two volumes, Editura Zecasin, Bucharest, 1999-2000, 434 and 450 p.

### B. Book Chapters

57. A. T. Balaban, "QSAR and computational methods in drug discovery" in "Encyclopedia of Analytical Chemistry", R. A. Meyers (Ed.), Wiley, Chichester, 2000, vol. 8, p. 7288-7311.
58. A. T. Balaban, "A personal view about topological indices for QSAR/QSPR" in "QSAR/QSPR Studies by Molecular Descriptors", M. Diudea (Ed.), Huntington, New York, 2000, p. 1-25.
59. A. T. Balaban, "A comparison between various topological indices, particularly index J and Wiener's index W" in "Topology in Chemistry: Discrete Mathematics of Molecules", D. H. Rouvray and R. B. King (Eds.), Horwood Publishing Ltd., Chichester, 2002, p. 89-112.
60. S. C. Basak, D. Mills, B. D. Gute, G. D. Grunwald and A. T. Balaban, "Applications of topological indices in predicting property/bioactivity/toxicity of chemicals" in "Toppology in Chemistry: Discrete Mathematics of Molecules", D. H. Rouvray and R. B. King (Eds.), Horwood Publishing Ltd., Chichester, 2002, p. 113-184.
61. T. S. Balaban and A. T. Balaban, "Pyrilium Salts" in "Science of Synthesis; Houben-Weyl Methods of Molecular Transformations", Georg Thieme Verlag, Stuttgart, 2003, vol. 14, p. 11-200.
62. A. T. Balaban, "2,6-Di-tert-butyl-4-methylpyridine (DTBMP)" in "Encyclopedia of Reagents for Organic Synthesis", L.A. Paquette (Ed.), Wiley, New York, 2004.
63. M. Randic, X. Guo, D. Plavšić and A. T. Balaban, "On the complexity of fullerenes and nanotubes" in "Complexity in Chemistry, Biology, and Ecology", D. Bonchev and D. Rouvray (Eds.), Springer, New York, 2005, p. 1-48.
64. A. T. Balaban, "Theoretical investigations of single-wall nanocones" in "Nanostructures. Novel Architecture", M. V. Diudea (Ed.), Nova Publishers, New York, 2005, p.113-142.
65. A. T. Balaban, "Molecular descriptors in drug design" in "Encyclopedia of Complexity and Systems Science", R. A. Meyers (Ed.), Springer, New York, 2009, Part 4, p. 2196-2215: DOI 10.1007/978-0-387-30440-3\_136.
66. A. T. Balaban, "Aromaticity of six-membered rings with one heteroatom" in "Topics in Heterocyclic Chemistry vol. 19, Aromaticity in Heterocyclic Compounds", T. M. Krygowski and M.K.Cyranski (Eds.), Springer, New York, 2009, p. 203-246.
67. T. S. Balaban and A. T. Balaban, "Five-membered Rings with Three Oxygen or Sulfur Atoms in 1,2,4-Positions" in "Comprehensive Heterocyclic Chemistry III", A. R. Katritzky, C. A. Ramsden, E. F. V. Scriven and R. J. K. Taylor (Eds.), Elsevier Oxford, 2008, Vol. 6, Chapter 6.06, p. 191-256.
68. A. T. Balaban, "Monocyclic hetarenes with  $\pi$ -electron aromatic sextet" in "Advances in Heterocyclic Chemistry", A. R. Katritzky ", (Ed.), Vol. 99, Elsevier, Amsterdam, 2010, p. 61-105.
69. A. T. Balaban, "Centennial of Acad. Ecaterina Cioranescu-Nenitzescu's birthday", *Rev. Roum. Chim.* **2009**, *54*, 859-863,
70. A. T. Balaban, "Balaban-Nenitzescu-Prail Reaction" in "Name Reactions in Heterocyclic Chemistry", J. J. Li (Ed.), Wiley, New York, 2011.

### C . Articles in peer-reviewed scientific periodicals

568. A. T. Balaban and M. Randic, Proposal for using an untapped source of citations characterizing scientific areas, *Scientometrics*, **2000**, *49*, 57-521.
569. O. Ivanciuc, T. Ivanciuc, D. Cabrol-Bass and A. T. Balaban, Comparison of weighting schemes for molecular graph descriptors. Application in quantitative structure-retention relationship models for alkylphenols in gas-liquid chromatography, *J. Chem. Inf. Comput. Sci.* **2000**, *40*, 732-743.

570. O. Ivanciuc, T. Ivanciuc, D. Cabrol-Bass and A.T. Balaban, Investigation of alkane branching (and resulting partial ordering) by topological indices, *Math. Chem. (MATCH)*, **2000**, *42*, 155-180.
571. O. Ivanciuc, T. Ivanciuc and A. T. Balaban, The complementary distance matrix, a new molecular graph descriptor, *Acta Chem. Hung., Models Chem.*, **2000**, *137*, 57-82.
572. A. T. Balaban, D. Mills, O. Ivanciuc and S. C. Basak, Reverse Wiener indices, *Croat. Chem. Acta*, **2000**, *73*, 923-941.
573. S. C. Basak, D. Mills, B. D. Gute, G. D. Grunwald and A. T. Balaban, Topological indices: their nature and mutual relatedness, *J. Chem. Inf. Comput. Sci.*, **2000**, *40*, 891-898.
574. A. T. Balaban, L. Pogliani, M. Randić and N. Trinajstić, Discrete versus continuous entities – keynote in the discussion about zero, *Kem. Ind.*, **2000**, *49*, 69-72.
575. A. L. Marton, G. I. Marton, C. Draghici and A. T. Balaban, Pseudobases of various 3-benzyl-2,4,6-triphenylpyrylium salts, *Rev. Roum. Chim.*, **2000**, *45*, 609-616.
576. D. Popovici, O. Maior, A. Racoveanu-Schiketanz and A. T. Balaban, Aminoketone, oxazole and thiazole synthesis. Part 14. Acylaminoacylation with the azlactone of *para*-tert-butylhippuric acid and derived 2,5-diaryloxazoles (1), *Analele Univ. București (Chimie)*, **2000**, *9*, 69-74.
577. D. Popovici, O. Maior, A. Racoveanu-Schiketanz and A. T. Balaban, Aminoketone, oxazole and thiazole synthesis. Part 15. Acylaminoacylation with the azlactone of *para*-benzoylhippuric acid and derived 2,5-diaryloxazoles (2), *Analele Univ. București (Chimie)*, **2000**, *9*, 75-81.
578. D. Popovici, M. Moraru, O. Maior, and A. T. Balaban, Syntheses of 3,5-dimethylhippuric acid, an intermediate for obtaining 2,5-diaryl-substituted oxazoles (in Roumanian), *Revista de Chimie (București)*, **2000**, *51*, 995-997.
579. O. Ivanciuc, T. Ivanciuc, D. Cabrol-Bass and A. T. Balaban, Evaluation in quantitative structure-property relationship models of structural descriptors derived from information-theory operators, *J. Chem. Inf. Comput. Sci.*, **2000**, *40*, 631-643.
580. I. C. Covaci, T. Constantinescu, M. T. Caproiu, C. Luca and A. T. Balaban, Solid supramolecular complexes of potassium salts of N-methoxynitroaniline derivatives and methoxyamino-3,5-dinitropyridine with 18-crown-6 ether, *Eur. J. Org. Chem.*, **2000**, 3569-3473.
581. P. Ionita, M. T. Caproiu and A. T. Balaban, New sulfonyl derivatives of 2,2-diphenyl-1-picrylhydrazyl and their supramolecular complexes with crown ethers of kryptands, *Rev. Roum. Chim.*, **2000**, *45*, 935-941.
582. E. N. Hristea, M. Hillebrand, A. C. Radutiu, H. Caldaru, M. T. Caproiu, P. Ionita, T. Constantinescu, and A. T. Balaban, Reaction between 2,2-diphenyl-1-picryl-hydrazyl or -hydrazine and sodium borohydride in the presence of 18-crown-6 ether, *Rev. Roum. Chim.*, **2000**, *45*, 1089-1096.
583. A. T. Balaban, The parallel and antiparallel lives of Newton and Leibniz, *Indian J. Math. Teaching*, **2000**, *26*, 1-9.
584. A. T. Balaban and D. Babić, Details about a (3,11)-cage on 112 vertices, *Math. Reports (Bucharest)*, **2000**, *2*, 269-274.
585. O. Ivanciuc, T. Ivanciuc, D. J. Klein, W. A. Seitz and A. T. Balaban, Quantitative structure-retention relationships for gas chromatographic retention indices of alkylbenzenes with molecular graph descriptors, *SAR QSAR Environ. Res.*, **2001**, *11*, 419-452.
586. T. S. Balaban, A. T. Balaban, and D. Bonchev, A topological approach to predicting properties of infinite polymers. Part VI. Rational formulas for the normalized Wiener index and a comparison with index J., *J. Mol. Struct. (Theochem)*, **2001**, *535*, 81-92.
587. O. Ivanciuc, T. Ivanciuc, D. J. Klein, W. Seitz and A. T. Balaban, Wiener index extension by counting even/odd graph distances, *J. Chem. Inf. Comput. Sci.*, **2001**, *41*, 536-549.
588. S. C. Basak, D. Mills, A. T. Balaban and B. D. Gute, Prediction of mutagenicity of aromatic and heteroaromatic amines from structure: a hierarchical QSAR approach, *J. Chem. Inf. Comput. Sci.*, **2001**, *41*, 671-678.
589. M. Randić, A. T. Balaban and S. C. Basak, On structural interpretation of several distance related topological indices, *J. Chem. Inf. Comput. Sci.*, **2001**, *41*, 593-601.
590. C. Uncuta, A. Tudose, M. T. Caproiu, C. Stavarache and A. T. Balaban, Reaction of pyrylium salts with nucleophiles. Part 26. The reaction with the cyanide anion revisited, *J. Chem. Res. (S)*, **2001**, 170-171, *J. Chem. Res. (M)*, **2001**, 523-535.
591. A. T. Balaban, Novel antiviral agents: phosphoramidates or mono/di/tri-phosphate esters of carbocyclic adenosine analogues, *Exp. Opin. Ther. Patents*, **2001**, *11*, 355-359.

592. A. T. Balaban and C. Rücker, Using prochirons for three-dimensional coding of certain chemical structures, *J. Chem. Inf. Comput. Sci.*, **2001**, *41*, 1145-1149.
593. M. A. Ilies and A. T. Balaban, Novel antiviral agents: phosphoramidates or mono/di/tri-phosphate esters of carbocyclic adenosine analogues, *Exp. Opin. Ther. Patents*, **2001**, *11*, 1729-1752.
594. I. C. Covaci, T. Constantinescu, M. T. Caproiu, H. Caldararu, P. Ionita and A. T. Balaban, New congeners of 1-picryl-2-phenyl-2-(*para*-picramidophenyl)-diazonium betaine whose picramido groups are replaced by 4-cyano-2,6-dinitrophenyl analogs, *Polish J. Chem.*, **2001**, *75*, 1427-1440.
595. V. Dragutan, I. Dragutan and A.T. Balaban, Progress in the design and synthesis of novel single-site ruthenium metathesis catalysts, *Platinum Metals Rev.*, **2001**, *45*, 155-163.
596. T. S. Balaban, A. T. Balaban, S. Foro and H. J. Lindner, 1,2,6-Trimethyl-3,5-nonamethylenepyridinium perchlorate. Crystal structure and molecular mechanics calculations for *ansa*-[9]-*meta*-cyclophanes, *ARKIVOC* 2001, (i), 1-6.
597. M. D. Banciu, E. E. Castellano, J. Ellena, I. Haiduc, C. Draghici and A. T. Balaban, Serendipitous, one-pot formation of 2,3,7-triphenyl-cyclopenta[*c*]pyran from 1,2-diphenylethanedione ("benzil") and cyclopentadiene, *New J. Chem.*, **2001**, *25*, 1472-1474.
598. I. Schiketanz, C. Draghici, I. Saramet and A.T. Balaban, Aminoketone, oxazole and thiazole synthesis. Part 16. Novel 5-aryl-2-(*para*-benzenesulfonylphenyl)-oxazoles, *Rev. Roum. Chim.*, **2002**, *47*, 235-238.
599. A. T. Balaban, D. Mills and S. C. Basak, Alkane ordering as a criterion for similarity between topological indices: index J as a "sharpened Wiener index, *MATCH*, **2002**, *45*, 5-26.
600. I Schiketanz, C. Draghici, I Saramet and A.T. Balaban, Aminoketone, oxazole and thiazole synthesis. Part 15. 2-[4-(4-Halobenzenesulfonyl)-phenyl]-5-aryl-oxazoles, *ARKIVOC*, **2002**, (ii), 64-72.
601. E. N. Hristea, M. Hillebrand, M. T. Caproiu, H. Caldararu, T. Constantinescu, and A. T. Balaban, Scavenging the hydroxy radical by 2,2-diphenyl-1-picrylhydrazyl, *ARKIVOC*, **2002**, (ii), 123-132.
602. A. T. Balaban and D. J. Klein, Co-authorship, Erdős numbers, and resistance distances in graphs, *Scientometrics*, **2002**, *55*, 59-70.
603. O. Ivanciuc, T. Ivanciuc, and A. T. Balaban, Quantitative structure-property relationships for the normal boiling temperatures of acyclic carbonyl compounds, *Internet Electron J. Mol. Des.*, **2002**, *1*, 252-268.
604. O. Ivanciuc, T. Ivanciuc, D. Cabrol-Bass and A. T. Balaban, Optimum structural descriptors from the Ivanciuc-Balaban operator, *Internet Electron J. Mol. Des.*, **2002**, *1*, 319-331.
605. O. Ivanciuc, T. Ivanciuc, and A. T. Balaban, Quantitative structure-property relationship evaluation of structural descriptors derived from the distance and reverse Wiener matrices, *Internet Electron J. Mol. Des.*, **2002**, *1*, 467-487.
606. M. A. Ilies, W. A. Seitz and A. T. Balaban, Cationic lipids in gene delivery: principles, vector design, and therapeutical applications, *Curr. Pharm. Design*, **2002**, *8*, 2441-2473.
607. O. Ivanciuc, T. Ivanciuc, and A. T. Balaban, QSAR models for the dermal penetration of polycyclic aromatic hydrocarbons, *Internet Electron J. Mol. Des.*, **2002**, *1*, 559-571.
608. A. L. Marton, G. I. Marton, C. Draghici and A. T. Balaban, New pyridinium salts with potential biochemical activity. Synthesis and NMR study, *Proc. Romanian Acad. Series B: Chem., Life Sci., Geosci.*, **2002**, *4*, 7-10.
609. R. M. Nemba and A. T. Balaban, Enumeration of chiral and achiral isomers of an *n*-membered ring with *n* homomorphic alkyl groups, *MATCH*, **2002**, *46*, 235-250.
610. M. D. Banciu, A. T. Balaban, C. Draghici, I. Haiduc and O. Ivanciuc, Unexpected formation of 2,3,7-triphenylcyclopenta-*[c]*pyran from the reaction of 1,2-diphenylethanedione (benzil) with cyclopentadiene, *Rev. Roum. Chim.*, **2002**, *47*, 705-713.
611. A. T. Balaban, Theoretical examination of new forms of carbon formed by intra- or intermolecular dehydrogenation of polycyclic aromatic hydrocarbons, *Polycyclic Aromatic Comp.*, **2003**, *23*, 277-296.
612. M. Randić and A. T. Balaban, On a four-dimensional representation of DNA primary sequences, *J. Chem. Inf. Comput. Sci.*, **2003**, *43*, 532-539.
613. I. C. Covaci, P. Ionita, M. T. Caproiu, R. Socoteanu, T. Constantinescu and A. T. Balaban, 1,3-bis-(2,4,6-Trinitrophenylaminoxy)propane and its 4-cyano-2,6-dinitrophenyl congener: synthesis and properties, *Central Eur. Chem. J.*, **2003**, *1*, 57-68.

614. A. T. Balaban, A. Tudose and M. T. Caproiu, Synthesis of 2,4-dimethyl-6-oxo-2,4-heptadienoic acid derivatives from 2,4,6-trimethylpyrylium salts, *Tetrahedron*, **2003**, *59*, 3291-3295.
615. A. T. Balaban and W. Seitz, Relevance of chemical kinetics for medicine: The case of nitric oxide, *J. Chem. Educ.*, **2003**, *80*, 662-664.
616. M. A. Ilies, W. A. Seitz, M. T. Caproiu, M. Wentz, R. E. Garfield and A. T. Balaban, Pyridinium-based cationic lipids as gene transfer agents, *Eur. J. Org. Chem.*, **2003**, 2645-2655.
617. A. T. Balaban, D. Plavsic and M. Randic, DNA invariants based on nonoverlapping triplets of nucleotide bases, *Chem. Phys. Lett.*, **2003**, *379*, 147-154.
618. N. H. March, A. T. Balaban, F. E. Leys, D. J. Klein and W. A. Seitz, Regularities in melting points of lithium halides: Is LiH anomalous?, *Phys. Chem. Liquids*, **2003**, *41*, 303-308.
619. A. T. Balaban, Evolution of biomolecules, *Amer. Romanian Acad. J.*, **2003**, *28*, 141-144.
620. A. T. Balaban and S. C. Basak, How and why did our view of the world change during the last six hundred years?, *Amer. Romanian Acad. J.*, **2003**, *28*, 25-35.
621. A. T. Balaban, Periodic system of elements: history, isotopes, magic numbers of electrons and nucleons, *Amer. Romanian Acad. J.*, **2003**, *28*, 133-140.
622. M. Bem, M. T. Caproiu, D. Stoicescu, T. Constantinescu and A. T. Balaban, Synthesis of 4-aryloxy-7-nitrobenzofurazan derivatives from 4-chloro-7-nitrobenzofurazan and various phenoxide anions (including pharmaceuticals) in the presence of crown ethers, *Central Eur. J. Chem.*, **2003**, *3*, 260-276.
623. A. Beteringhe, I. Baciuc, M. T. Caproiu, T. Constantinescu and A. T. Balaban, *O*-Methyloximes of testosterone and of 17 $\alpha$ -methyltestosterone: TLC and QSPR study of RF values, *J. Planar Chromatog.*, **2003**, *16*, 268-270.
624. L. Pogliani, D. J. Klein and A. T. Balaban, The number two and the intriguing dualism of nature. Scientific curiosity and everyday concepts, *Match, Commun. Math. Computer Chem.*, **2004**, *51*, 213-240.
625. A. T. Balaban, I. Ghiviriga, E. W. Czerwinski, P. De and R. Faust, Simple synthesis of a weak nucleophilic base (4-ethyl-2,6-diisopropylpyridine) evidencing a double Janus group effect, *J. Org. Chem.*, **2004**, *69*, 536-542.
626. M. Randić and A. T. Balaban, Partitioning of  $\pi$ -electrons in rings of polycyclic conjugated hydrocarbons. Part 1. Catacondensed benzenoids, *Polycyclic Arom. Comp.*, **2004**, *24*, 173-193.
627. A. T. Balaban and M. Randić, Partitioning of  $\pi$ -electrons in rings of polycyclic benzenoid hydrocarbons. Part 2. Catacondensed coronoids, *J. Chem. Inf. Comput. Sci.*, **2004**, *44*, 50-59.
628. A. T. Balaban and M. Randić, Partitioning of  $\pi$ -electrons in rings of polycyclic conjugated hydrocarbons. Part 3. Perifusenes, *New J. Chem.*, **2004**, *28*, 800-806.
629. D. Vukicevic, M. Randić and A. T. Balaban, Partitioning of  $\pi$ -electrons in rings of polycyclic conjugated hydrocarbons. Part 4. Benzenoids with more than one geometric Kekule structure corresponding to the same algebraic Kekule structure, *J. Math. Chem.*, **2004**, *36*, 271-279.
630. A. T. Balaban and M. Randić, Partitioning of  $\pi$ -electrons in rings of polycyclic conjugated hydrocarbons. Part 5. Nonalternant compounds, *J. Chem. Inf. Comput. Sci.*, **2004**, *44*, 1701-1707.
631. I. Ghiviriga, E. W. Czerwinski and A. T. Balaban, Rotation barriers in pyridinium salts depend on the number of available ground state conformations, *Croat. Chem. Acta*, **2004**, *77*, 391-396.
632. C. A. Simion, C. Postolache, C. Deleanu, C. M. Barna, I. Bally and A. T. Balaban, Synthesis of N[1-<sup>13</sup>C]caproyl-N'-phenylthiourea, *J. Labelled Comp. Radiopharm.*, **2004**, *47*, 719-722.
633. A. Beteringhe and A. T. Balaban, QSAR for toxicities of polychlorodibenzofurans, polychlorodibenzo-1,4-dioxins, and polychlorobiphenyls, *ARKIVOC*, **2004**, (i), 163-182.
634. A. T. Balaban, D. C. Oniciu and A. R. Katritzky, Aromaticity as a cornerstone in heterocyclic chemistry, *Chem. Rev.*, **2004**, *104*, 2777-2812.
635. M. Randić, J. Zupan and A. T. Balaban, Unique graphical representation of protein sequences based on nucleotide triplet codons, *Chem. Phys. Lett.*, **2004**, *397*, 247-252.
636. M. A. Ilies, W. A. Seitz, I. Ghiviriga, B. H. Johnson, A. Miller, E. B. Thompson and A. T. Balaban, Pyridinium cationic lipids in gene delivery: a structure-activity correlation study, *J. Med. Chem.*, **2004**, *47*, 3744-3754.
637. S. C. Basak, B. D. Gute and A. T. Balaban, Interrelationship of major topological indices evidenced by clustering, *Croat. Chem. Acta*, **2004**, *77*, 331-344.



638. A. T. Balaban, Clar formulas: how to draw and how not to draw formulas of polycyclic aromatic compounds, *Polycyclic Arom. Comp.*, **2004**, *24*, 83-89.
639. A. T. Balaban, S. C. Basak, A. Beteringhe, D. Mills and C. T. Supuran, QSAR study using topological indices for inhibition for carbonic anhydrase II by sulfanilamides and Schiff bases, *Mol. Diversity*, **2004**, *8*, 401-412.
640. M. Bem, M. Vasilescu, M. T. Caproiu, C. Draghici, A. Beteringhe, T. Constantinescu, M. D. Banciu and A. T. Balaban, Structural factors influencing the reaction rates of 4-aryloxy-7-nitrobenzofurazans with amino acids, *Central Eur. Chem. J.*, **2004**, *2*, 672-685.
641. A. T. Balaban, Chemistry is as easy as 2-3-4 (types of: atoms – chemical bonds – crystal lattices), *Chem. Educator*, **2004**, *9*, 1-3.
642. M. Pompe, M. Veber, A. T. Balaban and M. Randić, Use of variable and fixed topological indices for the prediction of rate constants for reactions of selected organic compounds with OH<sup>•</sup> Radicals, *Molecules*, **2004**, *9*, 1160-1176.
643. C. G. Matasa and A. T. Balaban, Challenges in medical in-situ biometarials polymerization, *Orthodont. Materials Insider*, **2004**, *16*, 2-8.
644. A. T. Balaban, D. J. Klein and O. Ivanciuc, Large “pillow” fullerenes hydrogenated at the inter-sheet “seam”, *Fullerenes, Nanotubes and Carbon Nanostructures*, **2005**, *13*, 109-129, Erratum, *ibid.* **2005**, *13*, 277.
645. A. T. Balaban, D. J. Klein, N. H. March, M. P. Tosi and M. Ausloos, Phase transition regularities in critical constants, fusion temperatures and enthalpies of some chemically similar chainlike structures, *Chem. Phys. Chem.*, **2005**, *6*, 1741-1745.
646. S. Ionescu, D. Popovici, A. T. Balaban and M. Hillebrand, Experimental and theoretical study of 2,5-diaryloxazoles whose aryl are *para*-substituted phenyl groups, *Spectrochim. Acta A*, **2005**, *62*, 252-260.
647. M. A. Ilies, B. H. Johnson, F. Makori, A. Miller, W. A. Seitz, E. B. Thompson and A. T. Balaban, An in vitro and in vivo comparison of transfection efficiency versus a tetraalkylammonium congener, *Archives Biochem. Biophys.*, **2005**, *435*, 217-226.
648. A. T. Balaban, Recollections about Professor Oskar E. Polansky: A personal account occasioned by the 30<sup>th</sup> anniversary of *MATCH*, *MATCH, Commun. Math. Comput. Chem*, **2005**, *37*, 7-14.
649. A. T. Balaban, Mathematical chemistry: (3,g)-cages with girth g, topological indices, and other graph-theoretical problems, *Fundamenta Informaticae*, **2005**, *64*, 1-16.
650. A. T. Balaban, Reflections about mathematical chemistry, *Foundations Chem.*, **2005**, *7*, 289-306.
651. I. Gutman, A. T. Balaban, M. Randić and C. Kiss-Tóth, Partitioning of  $\pi$ -electrons in rings of fibonacenes, *Z. Naturforsch.*, **2005**, *60a*, 171-176.
652. A. T. Balaban and D. Bonchev, Complexity, sphericity, and ordering of regular and semiregular polyhedra, *MATCH, Commun. Math. Comput. Chem.*, **2005**, *54*, 137-152.
653. A. T. Balaban and M. Randić, Partitioning of p-electrons in rings of polycyclic conjugated hydrocarbons. Part 6. Comparison with other methods for estimating the local aromaticity of rings in polycyclic benzenoids, *J. Math. Chem.*, **2005**, *37*, 443-453.
654. D. Vukicevic and A. T. Balaban, On the degeneracy of the topological index J, *Internet Electron. J. Mol. Des.*, **2005**, *4*, 491-500.
655. M. Randić, N. Lers, D. Plavsic, S. C. Basak and A. T. Balaban, Four-color map representation of DNA or RNA sequences and their numerical characterization, *Chem. Phys. Lett.*, **2005**, *407*, 205-208.
656. J. Klun, A. T. Balaban, R. Natarajan, S. C. Basak and W. Schmidt, Chirality index, molecular overlay and the activity of stereoisomeric topical mosquito repellents, *Pest Management Sci.*, **2005**, *61*, 1193-1201.
657. A. T. Balaban, D. J. Klein, N. H. March and C. C. Matthai, Transport and thermodynamic properties in low melting point ionic liquids related to n-alkyl chain length, *Phys. Chem. Liquids*, **2005**, *43*, 403-407.
658. I. Gutman, M. Randić, A. T. Balaban, B. Furtula and V. Vuckovic,  $\pi$ -Electron contents of rings in the double-hexagonal chain homologous series (pyrene, anthanthrene and other acenoacenes), *Polycyclic Arom. Comp.*, **2005**, *25*, 215-226.
659. A. T. Balaban, Can topological indices transmit information on properties but not on structures?, *J. Comp.-Aided Mol. Design*, **2005**, *19*, 651-660.
660. A. T. Balaban, P.V.R. Schleyer and H. S. Rzepa, Crocker, not Armit and Robinson, begat the six aromatic electrons, *Chem. Rev.*, **2005**, *105*, 3436-3447.

661. C. G. Matasa and A. T. Balaban, In situ polymerizable resins and the “nano” era, *Bull. Mol. Med.*, **2005**, 19-32.
662. L. Pogliani, D. J. Klein and A. T. Balaban, The intriguing human preference for a ternary patterned reality, *Kragujevac J. Sci.*, **2005**, 27, 75-114.
663. A. T. Balaban, A scientometric index for individual scientific performance (in Roumanian), *Revista de Politica Științei și Scientometrie*, **2005**, 3, 95-96.
664. M. A. Ilies, B. H. Johnson, W. A. Seitz, E. L. Ezell, A. Miller, E. B. Thompson and A. T. Balaban, Structure-activity relationships in two series of pyridinium gemini surfactants for gene delivery (Meeting Abstract # 588), *Molecular Therapy*, **2005**, 11, Suppl. 1, S227.
665. M. Randić, A.T. Balaban, M. Novic, A. Zaloznik and T. Pisanski, A novel graphical representation of proteins, *Periodicum Biologorum*, **2005**, 197, 403-414.
666. M. Tudose, P. Ionita, F. Dumitrascu, C. Draghici, M. T. Caproiu, I. C. Covaci, T. Constantinescu, M. D. Banciu and A. T. Balaban, Synthesis and properties of dinitrobenzamido-TEMPO derivatives, *Arkivoc*, **2005**, (iv), 225-237.
667. V. Dragutan, I. Dragutan and A. T. Balaban, 2005 Nobel Prize in Chemistry awarded for the development of the metathesis reaction in organic synthesis, *Platinum Metals Rev.*, **2006**, 50, 35-37.
668. A. T. Balaban, P.V. Khadikar, C. T. Supuran, A. Thakur and M. Thakur, Study on supramolecular complexing ability vis-à-vis estimation of  $pK_a$  of substituted sulfonamides: dominating role of Balaban index ( $J$ ), *Bioorg. Med. Chem. Lett.*, **2005**, 15, 3966-3973.
669. I. Gutman, B. Furtula and A. T. Balaban, Algorithm for simultaneous calculation of Kekulé and Clar structure counts, and Clar number of benzenoid molecules, *Polycyclic Aromatic Compounds*, **2006**, 26, 17-35.
670. M. Randić and A. T. Balaban, Partitioning of  $\pi$ -electrons in rings for Clar structures of benzenoid hydrocarbons, *J. Chem. Inf. Model.*, **2006**, 46, 57-64.
671. D. J. Klein and A. T. Balaban, The eight classes of positive-curvature graphitic nanocones, *J. Chem. Inf. Modeling.*, **2006**, 46, 307-320.
672. E. Hristea, M. T. Caproiu, G. Pencu, M. Hillebrand, T. Constantinescu and A. T. Balaban, Reaction of 2,2-diphenyl-1-picrylhydrazyl with  $HO^\cdot$ ,  $O_2^\cdot$ ,  $HO^-$ , and  $HOO^-$  radicals and anions, *Int. J. Mol. Sci.*, **2006**, 7, 130-143.
673. L. Pogliani, D. J. Klein and A. T. Balaban, Does science also prefer a ternary pattern?, *Internat. J. Math. Educ. Sci. Technol.*, **2006**, 37, 379-399.
674. P. V. Khadikar, B. W. Clare, A. T. Balaban, C. T. Supuran, V. K. Agarwal, J. Singh, A. K. Joshi and M. Lakhwani, QSAR Modeling of carbonic anhydrase-I, -II, and -IV inhibitory activities: relative correlation potential of six topological indices, *Rev. Roum. Chim.*, **2006**, 51, 703-717.
675. A. T. Balaban and T. Schmalz, Sextet-resonant benzenoids and their anti-sextet dualists, *J. Chem. Inf. Model.*, **2006**, 46, 1563-1579.
676. A. T. Balaban, M. J. Lesko, I. Ghiviriga and W. A. Seitz, 2,6-Dialkyl-4-methylpyrylium and 6-alkyl-2,4-dimethylpyrylium salts, and the corresponding N-alkylpyridinium salts, as new ionic liquids, *Rev. Chim. (București)*, **2006**, 57, 25-28.
677. A. C. Radutiu, I. Baci, M. T. Caproiu, C. Draghici, A. Nicolae, T. Constantinescu and A. T. Balaban, 2-( $\alpha$ -Aryloxyacetyl)-phenoxathiin derivatives. Synthesis and properties. *Rev. Roum. Chim.*, **2006**, 51, 653-661.
678. A.T. Balaban, D. Mills, V. Kodali and S.C. Basak, Complexity of chemical graphs in terms of size, branching, and cyclicity, *SAR QSAR Environ. Res.*, **2006**, 17, 429-450.
679. M. A. Ilies, W. A. Seitz, B. H. Johnson, E. L. Ezell, A. L. Miller, E. B. Thompson, and A. T. Balaban, Lipophilic pyrylium salts in the synthesis of efficient pyridinium-based cationic lipids, gemini surfactants, and lipophilic oligomers for gene delivery, *J. Med. Chem.*, **2006**, 49, 3872-3887.
680. A. Beteringhe, A. C. Radutiu, M. Bem, T. Constantinescu and A. T. Balaban, QSPR Study for the hydrophobicity of 4-aryloxy-7-nitrobenzofurazan and 2-aryloxy-( $\alpha$ -acetyl)-phenoxathiin derivatives, *Internet Electron. J. Mol. Des.*, **2006**, 5, 237-246.
681. J. Singh, M. Lakhwani, P. V. Khadikar, A. T. Balaban, B. W. Clare and C.T. Supuran, QSAR study on the inhibition of the human carbonic anhydrase cytosolic isozyme VII, *Rev. Roum. Chim.*, **2006**, 51, 691-701.
682. A. T. Balaban, I. Haiduc, C. G. Matasa and R.I. Sha’afi, Who discovered the water channel proteins (aquaporins)?, *Cellular Molec. Biol.*, **2006**, 52, 6-7.

683. J. Singh, S. Singh, S. Meer, V. K. Agrawal, P. V. Khadikar and A. T. Balaban, QSPR Correlations of half-wave reduction potentials of *cata*-condensed benzenoid hydrocarbons, *Arkivoc*, **2006**, (xv), 104-109.
684. A. T. Balaban and D. J. Klein, Is chemistry 'The Central Science'? How are different sciences related? Co-citations, reductionism, emergence, and posets, *Scientometrics*, **2006**, *69*, 615-637.
685. S. Ionescu, D. Popovici, A. T. Balaban and M. Hillebrand, Theoretical study of the excited state properties of some alkyl substituted 2,5-diphenyloxazole derivatives, *Annals West. Univ. Timisoara (Sect. Chem.)*, **2006**, *15*, 1-8.
686. A. C. Radutiu, I. Baci, M. T. Caproiu, C. Draghici, A. Nicolae, T. Constantinescu and A. T. Balaban, Reaction of 2-( $\alpha$ -bromoacetyl)-phenoxathiin with *o*-, *m*-, or *p*-formyl-aroxides, *Arkivoc*, **2007**, (xiii), 8-22.
687. S. Ionescu, D. Popovici, A. T. Balaban and M. Hillebrand, 2-Phenoxathiinyl-5-phenyloxazole and 5-phenoxathiinyl-2-phenyloxazole derivatives: Experimental and theoretical study of emission properties, *Spectrochim. Acta A*, **2007**, *66*, 1165-1170.
688. A. T. Balaban, A. Beteringhe, T. Constantinescu, P. A. Filip and O. Ivanciuc, Four new topological indices based on the molecular path code, *J. Chem. Inf. Model.*, **2007**, *47*, 716-731.
689. A. T. Balaban, B. Furtula, I. Gutman and R. Kovacevic, Partitioning of  $\pi$ -electrons in rings of aza-derivatives of polycyclic benzenoid hydrocarbons, *Polycyclic Arom. Comp.*, **2007**, *27*, 51-63.
690. M. Tudose, P. Ionita, T. Constantinescu and A. T. Balaban, Synthesis and EPR study of covalently bonded dinitrophenylamido-TEMPO on ultrafine aminopropyl-silica gel, *Austral. J. Chem.*, **2007**, *60*, 173-1799.
691. A. T. Balaban and M. Pompe, QSPR for physical properties of cata-condensed benzenoids using two simple dualist-based descriptors. Erratum, *ibid.* 4871, *J. Phys. Chem. A*, **2007**, *111*, 2448-2454.
692. A. T. Balaban, D. J. Klein and N. H. March, Aqueous solutions of a "green" ionic liquid and of lithium chloride compared and contrasted, *Physics and Chemistry of Liquids*, **2007**, *45*, 597-600.
693. T. S. Balaban, V. L. Horhoiu and A. T. Balaban, 2,6-Diisopropyl-4-methylpyrylium hexafluorophosphate, *Org. Prep. Proc. Internat.*, **2007**, *39*, 305-308.
694. M. Bem, F. Badea, C. Draghici, M. T. Caproiu, M. Vasilescu, M. Voicescu, A. Beteringhe, A. Caragheorghopol, M. Maganu, T. Constantinescu and A. T. Balaban, Synthesis and fluorescent properties of new derivatives of 4-amino-7-nitrobenzofurazan, *Arkivoc*, **2007**, (xiii), 87-104.
695. P. Ionita, F. Tuna, M. Andruh, T. Constantinescu and A. T. Balaban, Synthesis and characterization of some novel homo- and hetero-diradicals of hydrazyl and nitroxide type, *Austral. J. Chem.*, **2007**, *60*, 173-179.
696. A. T. Balaban, D.J. Klein, J.E. Dahl and R.M.K. Carlson, Molecular descriptors for natural diamondoid hydrocarbons and quantitative structure-property relationships for their chromatographic data, *The Open Org. Chem. J.*, **2007**, *1*, 13-31.
697. A. T. Balaban and M. Randić, Perfect matchings in polyhexes, or recent graph-theoretical contributions to benzenoids, *J. Universal Comput. Sci.*, **2007**, *13*, 1514-1539.
698. A. T. Balaban, M. Randić and D. Vukicevic, Partition of  $\pi$ -electrons between faces of polyhedral carbon aggregates, *J. Math. Chem.*, **2008**, *43*, 773-779.
699. A. T. Balaban, I. Gutman and S. Stanković, Effect of heteroatoms on partitioning of  $\pi$ -electrons in rings of catafusenes, *Polycyclic Arom. Comp.*, **2008**, *28*, 85-97.
700. M. Tudose, A. T. Balaban, T. Constantinescu and P. Ionita, Synthesis and electron paramagnetic resonance study of a nitroxide free radical covalently bonded on aminopropyl-silica gel, *Appl. Surface Sci.*, **2008**, *254*, 1904-1908.
701. M. Randić and A.T. Balaban, Ring signatures for benzenoids with up to seven rings. Part 1. Catacondensed systems, *Internat. J. Quantum Chem.*, **2008**, *108*, 865-897.
702. A. T. Balaban and M. Randić, Ring signatures for benzenoids with up to seven rings. Part 2. Pericondensed systems, *Internat. J. Quantum Chem.*, **2008**, *108*, 898-926.
703. A. T. Balaban, N. H. March and D. J. Klein, Melting points and other properties of ionic liquids, with emphasis on the pressure dependence, *Phys. Chem. Liquids*, **2008**, *46*, 682-686.
704. M. Bem, F. Badea, C. Draghici, M. T. Caproiu, M. Vasilescu, M. Voicescu, G. Pencu, A. Beteringhe, M. Maganu, I. C. Covaci, T. Constantinescu and A. T. Balaban, 4-(D-Glucosamino)-7-nitrobenzoxadiazole: Synthesis, anomers, spectra, TLC behavior, and applications, *Arkivoc*, **2008**, (ii), 218-234.

705. A. T. Balaban and M. Randić, Correlations between various ways of accounting for the distribution of  $\pi$ -electrons in benzenoids, *New J. Chem.*, **2008**, 32, 1071-1078.
706. A. T. Balaban and M. Lesko, Is there any connection between *The da Vinci Code* and the tetrahedral bond angle? A simple geometrical construction of the latter, *The Chemical Educator*, **2008**, 13, 59-60.
707. A. T. Balaban, C. Párkányi, I. Ghiviriga, J.-J. Aaron, Z. Zajíčková and O. R. Martínez, Curcumin-benzodioxaborole chelates, *Arkivoc*, **2008**, (xiii), 1-9.
708. A. T. Balaban, K. B. Chilakamarri and D. J. Klein, Protochirons and protohelices, *J. Math. Chem.*, **2009**, 45, 725-747.
709. R. D. Baratoiu, R. Socoteanu, R. C. Mutihac, A. E. Barbu, A. Beteringhe, H.-J. Bushmann, E. Cleve, L. Mutihac, T. Constantinescu and A. T. Balaban, Chromo-ionophoric properties of *para*-(5-phthalhydrazide-azo)-phenylene-*N*-aza-15-crown-5 in the presence of lithium and sodium ions, *Rev. Chim. (Bucuresti)*, **2008**, 59, 1073-1076.
710. A. T. Balaban, M. Pompe and M. Randić,  $\pi$ -Electron partitions, signatures, and Clar structures of selected benzenoid hydrocarbons, *J. Phys. Chem. A*, **2008**, 112, 4148-4157.
711. M. Pompe, M. Randić and A. T. Balaban, A new yardstick for benzenoid polycyclic aromatic hydrocarbons, *J. Phys. Chem. A*, **2008**, 112, 11769-11776.
712. R. D. Baratoiu, L. Mutihac, M. T. Caproiu, C. Draghici, F. Dumitrascu, R. Socoteanu, A. Beteringhe, M. Maganu, I. C. Covaci, M. Bem, T. Constantinescu and A. T. Balaban, 3,5-Dinitro-*N*-(4'-benzo-15-crown-5)-benzamide derivatives. Synthesis and properties, *Arkivoc*, **2008**, (xi), 307-321.
713. A. Beteringhe, A. C. Radutiu, T. Constantinescu and Alexandru T. Balaban, Quantitative structure-property relationship (QSPR) study of the hydrophobicity of phenols and 2-(aryloxy- $\alpha$ -acetyl)-phenoxathiin derivatives, *Rev. Chim. (Bucuresti)*, **2008**, 59, 1175-1179.
714. D. Vukičević and A. T. Balaban, Note on ordering and complexity of Platonic and Archimedean polyhedra based on solid angles, *J. Math. Chem.*, **2008**, 44, 725-730.
715. A. T. Balaban, N. H. March and D. J. Klein, Relation of surface tension to compressibility at room temperature and wetting index involving also viscosity for twenty-two organic liquids, *Phys. Chem. Liquids*, **2009**, 47, 1-4.
716. Ö. Güzel, A. Maresca, A. Scozzafava, A. Salman, A. T. Balaban and C. T. Supuran, Carbonic anhydrase inhibitors. Synthesis of membrane-impermeant, potent inhibitors of the tumor-associated isoform IX based on pyridinium derivatives of 2-(hydrazinocarbonyl)-3-substituted-phenyl-1*H*-indole-5-sulfonamides, *Org. Bioorg. Molec. Chem.*, **2009**, 19, 2931-2934.
717. E. N. Hristea, I. C. Covaci-Cimpeanu, G. Ionita, P. Ionita, C. Draghici, M. T. Caproiu, M. Hillebrand, T. Constantinescu and A. T. Balaban, Reaction of 2,2-diphenyl-1-picrylhydrazyl (DPPH) with two syringylic phenols and one aroxide, *Eur. J. Org. Chem.*, **2009**, 626-634.
718. I. Gutman, J. Durđević and A. T. Balaban, A regularity for cyclic conjugation in acenaphthylene, fluoranthene and their congeners., *Polycyclic Arom. Comp.*, **2009**, 29, 3-11.
719. A. T. Balaban, J. Đurđević and I. Gutman, Comments on  $\pi$ -electron conjugation in the five-membered ring of benzo-derivatives of corannulene, *Polycyclic Arom. Comp.*, **2009**, 29, 185-208.
720. Ö. Güzel, A. Maresca, A. Scozzafava, A. Salman, A. T. Balaban and C. T. Supuran, Discovery of nanomolar and subnanomolar inhibitors of the mycobacterial  $\beta$  carbonic anhydrases Rv1284 and Rv3273, *J. Med. Chem.*, **2009**, 52, 4063-4067.
721. J. Durđević, I. Gutman, J. Terzić and A. T. Balaban, Cyclic conjugation in fluoranthene and its benzo-derivatives. Part 1. Catacondensed systems, *Polycyclic Arom. Comp.*, **2009**, 29, 90-102.
722. R. D. Baratoiu, L. Mutihac, M. Vasilescu, M. Voicescu, A. Latus, G. Ionita, A. Beteringhe, T. Constantinescu and A. T. Balaban, Chemiluminescence of 5-(azo-*para*-phenylene-*N*-aza-15-crown-5)-phthalhydrazide, *Arkivoc*, **2009**, (xiii), 300-310.
723. A. T. Balaban and D. J. Klein, Claromatic carbon nano-structures, *J. Phys. Chem. C*, **2009**, 113, 19123-19133.
724. A. C. Răduțiu, I. Baci, M. T. Caproiu, C. Draghici, A. Beteringhe, G. Ionita, P. Ionita, T. Spataru, N. Spataru, R. D. Baratoiu, T. Constantinescu and A. T. Balaban, Wurster aza-crown-ethers with *N*-*para*-phenylene-phenothiazine or -phenoxazine groups, *Arkivoc*, **2009**, (xiii), 342-362.
725. A. C. Răduțiu, I. Baci, M. T. Caproiu, C. Draghici, A. Beteringhe, M. Maganu, R. Socoteanu, T. Constantinescu and A. T. Balaban, Two isomeric bis-dinitrocarboxyphenyl-kryptofix-22 derivatives: synthesis and characteristics, *Rev. Roum. Chim.*, **2009**, 54, 889-894.

726. A. Ciesielski, T. M. Krygowski, M. K. Cyranski, M. A. Dobrowolski, and A. T. Balaban, Are thermodynamic and kinetic stabilities correlated? A topological index of reactivity toward electrophiles used as a criterion of aromaticity of polycyclic benzenoid hydrocarbons, *J. Chem. Inf. Model.*, **2009**, *49*, 369-376.
727. A. T. Balaban, Nonconvex polyhedra by repeated truncation of semiregular polyhedra, *J. Math. Chem.*, **2010**, *47*, 1177-1183.
728. A. T. Balaban, T. K. Dickens, I. Gutman and R. B. Mallion, Ring currents and the PCP rule, *Croat. Chem. Acta*, **2010**, *83*, 209-215.
729. A. T. Balaban, J. Đurđević, I. Gutman, S. Jeremić and S. Radenković, Correlations between local aromaticity indices of bipartite conjugated hydrocarbons, *J. Phys. Chem. A*, **2010**, *114*, 5870-5877.
730. A. T. Balaban, D. E. Bean and P. W. Fowler, Patterns of ring current in coronene isomers, *Acta Chem. Slov.*, **2010**, *57*, 507-512.
731. A. T. Balaban, P. V. Khadikar and S. Aziz, Comparison of topological indices based on iterated 'sum' versus 'product' operations, *Iranian J. Math. Chem.*, **2010**, *1*, 43-67.
732. L. Türker, Ç. Ç. Bayar and A. T. Balaban, A DFT study on push-pull (amino-nitro) fulminenes and hexahelicenes, *Polycyclic Arom. Comp.*, **2010**, *30*, 91-111.
733. A. Ciesielski, T. M. Krygowski, M. K. Cyranski and A. T. Balaban, Defining rules of aromaticity: A unified approach to the Hückel, Clar and Randić concepts, *Phys. Chem. Chem. Phys.*, **2011**, *13*, 3737-3747.
734. A. T. Balaban, M. A. Ilies, A. Eichhöfer and T. S. Balaban, Molecular and crystal structure of a self-assembling pyridinium cationic lipid, *J. Mol. Struct.*, **2010**, *30*, 91-111.
735. M. Tudose, F. D. Badea, G. Ionita, M. Maganu, M. T. Caproiu, P. Ionita, T. Constantinescu and A. T. Balaban, *N*-Alkoxy-3,5-dinitro-4-aminobenzoic acid derivatives with controlled physico-chemical properties, *Struct. Chem.*, **2010**, *21*, 1227-1234.
736. M. Tudose, F. D. Badea, M. T. Caproiu, A. Beteringhe, M. Maganu, P. Ionita, T. Constantinescu and A. T. Balaban, New *N*-aryloxy-phthalimide derivatives. Synthesis, physico-chemical properties, and QSPR studies, *Central Eur. J.*, **2010**, *8*, 789-796.
737. S. C. Basak, D. Mills, B. D. Gute, A. T. Balaban, K. Basak and G. D. Grunwald, Use of mathematical structural invariants in analyzing combinatorial libraries: a case study with psoralen derivatives, *Curr. Comput.-Aided Drug Des.*, **2010**, *6*, 240-251.
738. A. T. Balaban, S. Aziz, A. D. Manikpuri and P. V. Khadikar, Simple correlations for the  $\pi$ -electron energy and other properties of cata-condensed benzenoids, *J. Indian Chem. Soc.*, **2011**, *88*, 1-11.
739. A. T. Balaban, I. Gutman, S. Jeremić and J. Đurđević, Effect of benzo-annulation on cyclic conjugation, *Monatsh. Chem.*, **2011**, *142*, 53-57.
740. M. Randić, J. Zupan, A. T. Balaban D. Vikić-Topić and D. Plavšić, On graphical representation of proteins, *Chem. Rev.*, **2011**, *111*, 790-862.
741. A. T. Balaban and R. B. Mallion, Investigation of correlations between topological  $\pi$ -electron ring-currents and  $\pi$ -electron partitions in condensed benzenoid hydrocarbons, *Croat. Chem. Acta*, **2011**, *in press*.
742. A. T. Balaban, On protochirons and known or predicted helical structures, *MATCH, Commun. Math. Comput. Chem.*, **2011**, *66*, 139-162.
743. A. T. Balaban, Autobiographical notes: 80 years of age, 68 years of chemistry, *MATCH, Commun. Math. Comput. Chem.*, **2011**, *66*, 7-32.
744. A. T. Balaban and K.P.C. Vollhardt, Heliphenes and related structures, *The Open Org. Chem. T.*, **2011**, *5*, *in press*.
745. I. Gutman, B. Furtula and A. T. Balaban, Effect of benzocyclobutadieno-annulation on cyclic conjugation in fluoranthene congeners, *J. Serb. Chem. Soc.*, *in press*.
746. M. Randić, D. Vukicević, A. T. Balaban and D. Plavšić, Ring currents in hexabenzocoronene and its derivatives formed by joining proximal carbons, *J. Comput. Chem.*, *in press*.
747. E. N. Hristea, M. Bem, T. S. Balaban, A. Eichhofer, M. T. Caproiu, C. Draghici, G. Ionita, T. Spataru, C. Enache, M. Maganu, A. Beteringhe, M. Hillebrand, T. Constantinescu and A. T. Balaban, Diphenylhydrazine derivatives with one or two benzofurazan moieties, *Eur. J. Org. Chem.*, (submitted)

748. I. Gutman and A. T. Balaban, Simple mathematical model for the effect of benzo-annulation on cyclic conjugation, *J. Serb. Chem. Soc.*, *in press*.
749. Guest Editor of the Special Issue of *The Open Organic Chemistry Journal* dedicated to **Aromaticity**.

#### **D. Patents**

27. A. T. Balaban, W. A. Seitz, M. A. Ilies, E. B. Thompson, R. E. Garfield, B. H. Johnson, A. L. Miller and M. J. Wentz, Pyridinium cationic lipids as gene transfer agents, U. S. Patent 7, 456, 197, Nov. 25, **2008**.