Atomic and Ionic Radii in the Structures of Inorganic, Organic and Biological Molecules: Reference Papers with Data and Figures

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Abstract:

Presented here is a collection of papers by the author with reference data on atomic and ionic radii which account for the chemical bonds in inorganic, organic and biological molecules, and relevant figures.

Introduction

The author has shown for the last nearly fifteen years that the structures of inorganic, organic and biological molecules can be explained at the atomic level based on the additivity of radii of adjacent atoms and or ions in bond lengths. The major breakthrough started with the reinterpretation of the ionization energy of the hydrogen atom. It was further found that covalent bond distances are exact sums of the Golden ratio based ionic radii. The exact additivity of the Golden ratio based ionic radii was demonstrated for alkali halides, typical ionic bonds. The additivity of covalent and ionic radii was also shown for partially ionic bonds. Here the various papers [1- 48] with the exact data on atomic and ionic radii and figures have been assembled together to form a reference source. The full texts of most of them are available as open articles.

References

(Atomic & ionic radii and bond lengths with Tables, data and figures):

1. R. Heyrovska**,** The Golden Ratio, Atomic, Ionic and Molecular Capacities and Bonding Distances in Hydrides.

2004 International Joint meeting of ECS, USA and Japanese, Korean and Australian Societies, Honolulu, Hawaii, October 2004, Vol. 2004 - 2, Extended. Abs. C2-0551.

http://www.electrochem.org/dl/ma/206/pdfs/0551.pdf

https://www.researchgate.net/publication/322926448 **(Hydrides of 42 elements)**

2. R. Heyrovska**,** The Golden ratio, ionic and atomic radii and bond lengths.

Molecular Physics, 103 (2005) 877 - 882. Special Issue of in honor of Nicholas Handy;

Other IDs: 10.1080/00268970412331333591 (Invited full paper)

https://www.researchgate.net/publication/233608127 DOI:

10.1080/00268970412331333591 **(Interionic distances in all alkali halides and many other covalent or partially ionic bonds)**

3. R. Heyrovska, Dependence of the length of the hydrogen bond on the covalent and cationic radii of hydrogen, and additivity of bonding distances.

Chem. Phys. Lett. 432 (2006) 348 - 351. http://dx.doi.org/10.1016/j.cplett.2006.10.037

https://www.researchgate.net/publication/244136232 DOI: 10.1016/j.cplett.2006.10.037

(Hydrogen bonds in 20 different contexts)

4. R. Heyrovska**,** Dependences of molar volumes in solids, partial molal and hydrated ionic volumes of alkali halides on covalent and ionic radii and the Golden ratio. Chem. Phys. Lett. 436 (2007) 287 - 293. http://dx.doi.org/10.1016/j.cplett.2007.01.042 https://www.researchgate.net/publication/244136426 DOI: 10.1016/j.cplett.2007.01.042 **(All alkali halides)**

5. R. Heyrovska**,** Linear Dependencies of Van Der Waals, Covalent and Valence Shell Radii of Atoms of Groups 1a - 8a on their Bohr Radii http://arxiv.org/ftp/arxiv/papers/0708/0708.1108.pdf (v1) and v(2). **(Various radii of atoms of all elements of the Periodic Table)**

6. R. Heyrovska**,** Atomic Structures of the Molecular Components in DNA and RNA based on Bond Lengths as Sums of Atomic Radii http://arxiv.org/abs/0708.1271v1 to v(4) **(Atomic radii in bond lengths: DNA & RNA and their constituents)**

7. R. Heyrovska and S. Narayan, Structures of molecules at the atomic level: Caffeine and related compounds 10th Eurasia Conference on Chemical Sciences, Manila, Phillipines, 7 - 11 January 2008, a) Book of Abstracts, Published by the Kapisanag Kimika ng Pilipinas (Chemical Society of the Philippines, Inc.), ISBN: 978-971-93848-1-6, Abstract number O-11, page 330. (Poster).

http://eurasiachem10.philippinechem.org/assets/EuAsC2S-10FINAL.doc

b) Full text in: http://arxiv.org/ftp/arxiv/papers/0801/0801.4261.pdf

(Atomic radii in caffeine and related compounds)

8. R. Heyrovska**,** Direct dependence of covalent, van der Waals and valence shell radii of atoms on their Bohr radii for elements of Groups 1A - 8A**.**

10th Eurasia Conference on Chemical Sciences, Manila, Phillipines, 7 - 11 January 2008, Ohtaki Memorial Lecture: a) Book of Abstracts, Published by the Kapisanag Kimika ng Pilipinas (Chemical Society of the Philippines, Inc.), ISBN: 978-971-93848-1-6, Abstract number OC-4-3, page 82. (Invited talk)

http://eurasiachem10.philippinechem.org/assets/EuAsC2S-10FINAL.doc

b) Full text (v2) in: http://arxiv.org/ftp/arxiv/papers/0708/0708.1108.pdf

(Various atomic radii of all elements of the Periodic Table)

9. R. Heyrovska**,** Structures of the Molecular Components in DNA and RNA with Bond Lengths Interpreted as Sums of Atomic Covalent Radii

The Open Structural Biology Journal, 2 (2008) 1 - 7;

http://www.bentham.org/open/articles.htm; (Open access full paper)

http://www.bentham.org/open/tosbj/openaccess2.htm;

http://dx.doi.org/10.2174/1874199100802010001 (Full downloadable text);

http://arxiv.org/abs/0708.1271v4, (v1 in Ref. 121)

https://www.researchgate.net/publication/242360521 DOI:

10.2174/1874199100802010001 **(Atomic radii in bond lengths: DNA & RNA and**

their constituents)

10. R. Heyrovska**,** Atomic Structures of all the Twenty Essential Amino Acids and a Tripeptide, with Bond Lengths as Sums of Atomic Covalent Radii.

Full text (v2) in: http://arxiv.org/ftp/arxiv/papers/0804/0804.2488.pdf;

http://www.doc88.com/p-2166158702619.html

https://www.researchgate.net/publication/1919566 **(Atomic radii in 20 essential amino acids and a tripeptide)**

11. R. Heyrovska**,** Atomic Structures of Graphene, Benzene and Methane with Bond Lengths as Sums of the Single, Double and Resonance Bond Radii of carbon.

Full text (v1) in: http://arxiv.org/ftp/arxiv/papers/0804/0804.4086.pdf

https://www.researchgate.net/publication/1920998 **(Atomic radii in graphene, benzene and methane)**

12. R. Heyrovska**,** Atomic Structures of Riboflavin (Vitamin B2) and its Reduced Form with Bond Lengths Based on Additivity of Atomic Radii

Full text in (v1): http://arxiv.org/ftp/arxiv/papers/0806/0806.3462.pdf

https://www.researchgate.net/publication/1737836 **(Atomic radii in riboflavin and its reduced form)**

13. R. Heyrovska**,** Atomic Structure of Benzene Which Accounts for Resonance Energy

http://arxiv.org/ftp/arxiv/papers/0806/0806.4502.pdf

https://www.researchgate.net/publication/1739031 **(Atomic radii in benzene and resonance energy)**

14. R. Heyrovska**,** Various Carbon to Carbon Bond Lengths Inter-related via the Golden Ratio, and their Linear Dependence on Bond Energies.
http://arxiv.org/ftp/arxiv/papers/0809/0809.1957.pdf
https://www.researchgate.net/publication/1774241 **(Atomic radii in carbon in various valence states)**

15. R. Heyrovska**,** Direct dependence of covalent, van der Waals and valence shell radii of atoms on their Bohr radii for elements of Groups 1A - 8A.
Philippine Journal of Science, 137 (2): 133-139, December 2008, ISSN 0031 - 7683;
http://www.stii.dost.gov.ph/pjsweb/vol137no2/Direct%20dependence%20of%20covalent.html; https://www.researchgate.net/publication/268350924 **(Various atomic radii of all elements of the Periodic Table)**

16. R. Heyrovska**,** Golden Sections of Interatomic Distances as Exact Ionic Radii and Additivity of Atomic and Ionic Radii in Chemical Bonds
arXiv:0902.1184 [pdf]; http://arxiv.org/ftp/arxiv/papers/0902/0902.1184.pdf ;
https://www.researchgate.net/publication/2398516 **(Atomic radii in 40 hydrides)**

17. R. Heyrovska**,** Golden sections of inter-atomic distances as exact ionic radii of atoms.

Nature Precedings http://precedings.nature.com/documents/2929/version/1 (2009), https://www.researchgate.net/publication/36789898 **(Atomic radii in 40 hydrides)**

18. R. Heyrovska**,** Bonding distances as Exact Sums of the Radii of the Constituent Atoms in Nanomaterials - Boron Nitride and Coronene http://arxiv.org/ftp/arxiv/papers/1004/1004.2667.pdf (2010); http://arxiv.org/abs/1004.2667v2 https://www.researchgate.net/publication/45912187 **(Atomic radii in boron nitride, coronene and graphene)**

19. R. Heyrovska**,** L. Atchison and S. Narayan, Precise Atomic Structures of Three Novel Nanomaterials in Nanotechnology, Biomedicine and Cosmology:Graphene, Boron Nitride and Coronene.
The Nanomaterials Symposium, April 19, 2010, JHU/APL Kossiakoff Center, MD, (Poster)
Nature Precedings http://precedings.nature.com/documents/4357/version/1 (2010) **(Atomic radii in boron nitride, coronene and graphene)**

20. R. Heyrovska**,** L. Atchison and S. Narayan, Precise atomic structures of two important molecules in biochemistry: Ascorbic acid (vitamin C) and aspirin (acetyl salicylic acid)
International Year of Chemistry 2011, ACS Spring Meeting March 2011, Anaheim, CA, USA, (poster).

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21. R. Heyrovska**,** Structures at the Atomic Level of Cobalt, Zinc and Lead Niobates (with an Appendix: Atomic structure of cobalt niobate crystal).

Nature Precedings http://precedings.nature.com/documents/6059/version/1

http://precedings.nature.com/documents/6059/version/2 ; (2011)

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(Atomic & ionic radii in cobalt, zinc and lead niobates)

22. R. Heyrovska**,** Atomic and molecular structures of positronium, dipositronium and positronium hydride**.**

Nature Precedings http://precedings.nature.com/documents/6290/version/1;

https://www.researchgate.net/publication/268286054 **(Atomic & ionic radii in positronium, dipositronium and positronium hydride)**

23. R. Heyrovska and S. Narayan, Structures of molecules at the atomic level: Caffeine and related compounds.

Philippine Journal of Science, 140(2): 119-124, **2011.**

https://www.researchgate.net/publication/1908623 **(Atomic radii in caffeine and related compounds)**

24. R. Heyrovska**,** Precise Molecular Structures of Cysteine, Cystine, Hydrogen-Bonded Dicysteine, Cysteine Dipeptide, Glutathione and Acetyl Cysteine Based on Additivity of Atomic Radii.

Nature Precedings, http://precedings.nature.com/documents/6692/version/1

(Atomic & ionic radii in Cysteine, Cystine, Hydrogen-Bonded Dicysteine, Cysteine Dipeptide, Glutathione and Acetyl Cysteine)

25. R. Heyrovska**,** New insight into DNA damage by cisplatin at the atomic scale

a) Nature Precedings http://precedings.nature.com/documents/6891/version/1

Presented at: the 12th Eurasia Conference on Chemical Sciences, Corfu, Greece, April 16-21, 2012. (Invited talk) Abstract in b):

http://eurasia12.uoi.gr/Abstracts_pdf/%281%29%20Bioinorganic/S1%20ORAL/OP8_Abstract_Heyrovska_Eurasia12.pdf **(Atomic & ionic radii in DNA & cisplatin)**

26. R. Heyrovska**,** Precise Atomic Structures of L-DOPA, Dopamine, Noradrenaline, Adrenaline, Isoprenaline, 5-HTP, Serotonin and Histamine with Bond Lengths as Exact Sums of Adjacent Atomic Radii.

International J. Sci., Vol 1, 1-9, Issue: Nov-012.http://www.ijsciences.com/pub/pdf/V1-201211-16.pdf [Research Article (ISSN 2305-3925)] **(Atomic radii in L-DOPA, Dopamine, Noradrenaline, Adrenaline, Isoprenaline, 5-HTP, Serotonin and Histamine)**

27. R. Heyrovska**,** Atomic and Ionic Radii of Elements and Bohr Radii from Ionization Potentials are Linked through the Golden Ratio

International J. Sci., Vol 2, 82-92, Issue: Mar-**2013.**

http://www.ijsciences.com/pub/pdf/V2-201303-19.pdf [Research Article (ISSN 2305-3925)] **(Atomic, ionic & Bohr radii in various elements of the Periodic Table)**

28. R. Heyrovska**,** Bond Lengths, Bond Angles and Bohr Radii from Ionization Potentials Related via the Golden Ratio for H_2^+, O_2, O_3, H_2O, SO_2, NO_2 and CO_2

International J. Sci., Vol 2, 1-4, Issue: Apr-**2013.**

http://www.ijsciences.com/pub/pdf/V2-201304-08.pdf [Research Article (ISSN 2305-3925)] **(Atomic & ionic radii and angles in H_2^+, O_2, O_3, H_2O, SO_2, NO_2 and CO_2)**

29. R. Heyrovska**,** Atomic, Ionic and Bohr Radii Linked via the Golden Ratio for Elements Including Lanthanides and Actinides

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30. R. Heyrovska**,** Atomic, ionic and Bohr radii linked via the golden ratio for the elements in DNA: C, N, O, P and H.

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Theme: "60 years DNA: 1953 - 2013";abstract: pp 146-147;

http://web2.mendelu.cz/af_239_nanotech/pracovni-setkani/program.html

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(Atomic radii in DNA)

31. R. Heyrovska**,** Bond Lengths in Carbon Dioxide, Carbon Monoxide and Carbonic Acid as Sums of Atomic, Ionic and Bohr Radii. - *Dedicated to Joseph Black (April 1728 - December 1799)*

International J. Sci., Vol 2, 30-32, Issue: Dec-**2013.**

http://www.ijsciences.com/pub/pdf/V220131214.pdf [Research Article]

(Atomic & ionic radii & angles in Carbon Dioxide, Carbon Monoxide and Carbonic Acid)

32. R. Heyrovska**,** Atomic Structures of Glucose, Fructose and Sucrose and Expalnation of Anomeric Carbon

http://biorxiv.org/content/biorxiv/early/2014/01/23/002022.full.pdf;

doi:10.1101/002022; January 2014 **(Atomic radii in Glucose, Fructose and Sucrose)**

33. R. Heyrovska**,** The long O-O bond in HOON: Comments on "Detection and Structure of HOON: Microwave Spectroscopy Reveals an O–O Bond Exceeding 1.9 Å by Crabtree et al.

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34. R. Heyrovska**,** The Golden Ratio In Atomic Architecture (Keynote talk) "Shechtman International Symposium, Cancun, Mexico, 29 June - 3 July 2014"; http://www.flogen.org/ShechtmanSymposium/plenary_abst.php?page=2&p=Raji_Heyrovska&e=rheyrovs@hotmail.com&pi=124

Full text of KEYNOTE TALK in: 2014 - Sustainable Industrial processing summit/Shechtman International Symposium;

Volume 5: Composite, Ceramic, Quasicrystals, Nanomaterials, High temperature Protection Coatings. Edited by Florian Kongoli, Flogen 2014, pp 395 - 402. https://www.researchgate.net/publication/321292841 **(Data and Figures for many compounds)**

35. R. Heyrovska**,** New Interpretation of the Structure and Formation of Ozone Based on the Atomic and Golden Ratio Based Ionic Radii of Oxygen. http://viXra.org/abs/1503.0269, http://vixra.org/pdf/1503.0269v1.pdf **(Atomic & ionic radii in oxygen and ozone)**

36. R. Heyrovska, STRUCTURAL INSIGHTS AT THE ATOMIC LEVEL OF IMPORTANT MATERIALS: Al and Mn as special examples in honor of D. Shechtman

http://vixra.org/abs/1506.0003, http://vixra.org/pdf/1506.0003v2.pdf;

http://www.flogen.org/sips2015/cv.php?page=2&p=Raji_Heyrovska&e=rheyrovs@hotmail.com&pi=308 (Text of Keynote talk: SIPS 2015, October 2015, Antalya, Turkey)

(Atomic & ionic radii in Al and Mn)

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(Atomic radii in various forms hydrogen and in alkali halides)

38. R. Heyrovska**,** Simple Interpretation of the Bond Lengths and Bond Angles in Stratospheric Chlorine Monoxide and Peroxide Based on Atomic and Ionic Radii

Author: R. Heyrovska

http://vixra.org/abs/1507.0190; http://vixra.org/pdf/1507.0190v1.pdf

(Atomic & ionic radii in chlorine monoxide and peroxide)

39. R. Heyrovska**,** The Coulombic Nature of the van der Waals Bond Connecting Conducting Graphene Layers in Graphite

http://vixra.org/abs/1601.0273?ref=8736553; http://vixra.org/pdf/1601.0273v2.pdf

(Atomic & ionic radii in graphene and graphite)

40. R. Heyrovska**,** A Simple and Precise Interpretation of the Bond Lengths and Angles in Diborane in Terms of Atomic and Ionic Radii**. -** *Dedicated to Dmitri Mendeleev (8*

Feb.1834 - 2 Feb 1907) on his birth anniversary.

http://www.vixra.org/abs/1602.0091; http://www.vixra.org/pdf/1602.0091v1.pdf

(Atomic & ionic radii in diborane)

41. R. Heyrovska**,** The Coulombic Nature of the van der Waals Bond Connecting Conducting Graphene Layers in Graphite**. -** *Dedicated to geo-carbon expert, Prof. Gustaf Arrhenius, of Scripps Institution of Oceanography, CA.*

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(Atomic & ionic radii in graphene and graphite)

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(Atomic radii in benzene and its dimers)

43. R. Heyrovska**,** Linear Dependence on Covalent Radii of Atomic and Ionic Radii of Elements Calculated by Rahm, Hoffmann and Ashcroft- *Dedicated to Alfred B. Nobel (21 Oct.1833 – 10 Dec.1896) to commemorate the 120th Anniversary of his demise.*

http://vixra.org/abs/1612.0173 ; http://vixra.org/pdf/1612.0173v1.pdf

(Atomic and ionic radii in alkali and halogen elements, etc)

44. R. Heyrovska**,** New Simple Relations Connecting Bond Lengths, Lattice Parameters and Bohr Radii for the Biologically Important Elements, C, N, O, P and S **–** *Dedicated to Sir J.J. Thomson ((18 Dec 1856 - 30 Aug 1940) to commemorate his 160th Birth Anniversary*

http://vixra.org/abs/1612.0290 (abstract); http://vixra.org/pdf/1612.0290v1.pdf

(Atomic radii for C, N, O, P and S)

45. R. Heyrovska**,** Coulomb's Law is Not Violated in Anion Dimers as Reported by Fatila et al - *Dedicated to Charles-Augustin de Coulomb* (14 June 1736 – 23 August 1806)

http://vixra.org/abs/1612.0325 (abstract), http://vixra.org/pdf/1612.0325v1.pdf

(Atomic & ionic radii in anion dimers)

46. R. Heyrovska**,** Simple Relation Between Proton Radius, Bohr Radius and Fine Structure Constant.

http://vixra.org/abs/1710.0105 (abstract); http://vixra.org/pdf/1710.0105v1.pdf

(Proton radius and Bohr radius)

47. R. Heyrovska**,** Proton radius related to Bohr radius and fine structure constant *E-Letter (*online: 10 October 2017) *In: Science* 06 Oct 2017:Vol. 358, Issue 6359, pp. 79-85, DOI: 10.1126/science.aah6677

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(Proton radius and Bohr radius)