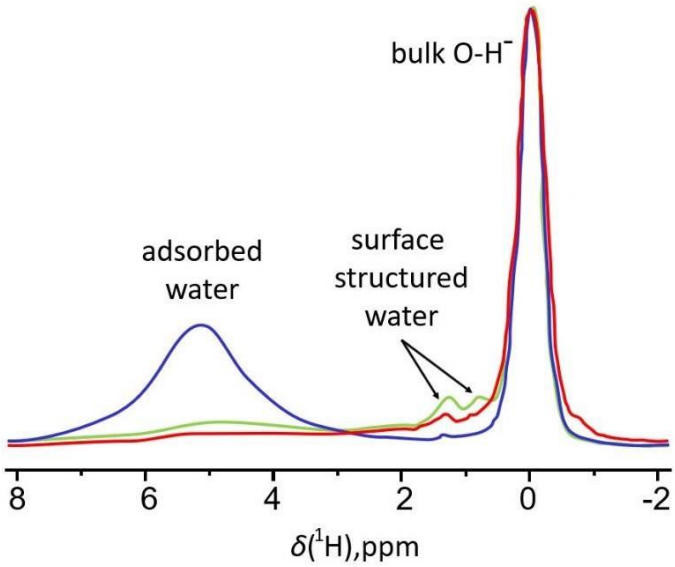
Structured water

Review

The first article on structured water was published in 1970.
Warner, D. T. Chapter 23. Structured Water in Biological Systems. Annual Reports in Medicinal Chemistry. 1970; 5: 256-265.
https://www.sciencedirect.com/science/article/abs/pii/S0065774308603462
In the same year, **Science** presented the structural models of water.
Frank, H. S. The Structure of Ordinary Water: New data and interpretations are yielding new insights into this fascinating substance. Science. 1970; 169: 3946: 635-641.
https://www.science.org/doi/abs/10.1126/science.169.3946.635

In 1980, it was published in **Nature** paper for structured water.
Neidle, S., Berman, H., Shieh, H. Highly structured water network in deoxydinucleoside–drug complex crystals. Nature. 1980; 288: 129–133.

The author team published in the **Journal of Molecular Liquids** article and figure for structured water:



Kristinailyte, K., Dagys, L., Kausteklis, J. et al. NMR and FTIR studies of clustering of water molecules: From low-temperature matrices to nano-structured materials used in innovative medicine. Journal of Molecular Liquids. 2017; 235; 1-6.
https://www.sciencedirect.com/science/article/abs/pii/S0167732216326174
Nobel winner **Luc Montagnier** and co-authors studied the DNA molecular structure of water molecules with the influence of electromagnetic fields.
Montagnier, L., Del Guidice, E., Aissa, J. et al. Transduction of DNA information through water and electromagnetic waves. Electromagnetic Biology and Medicine. 2015; 34(2): 106-112.
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Scientific studies have focused on structured water. The process of structuring depends on surfaces such as nano- and hydrophobic surfaces, temperature changes, and the filtration process. The methods for researching structured water are the Fourier Transform Infrared spectral method (FT-IR), Nuclear Magnetic Resonance (NMR), X-ray and Density Functional Theory (DFT). When the water is frozen, the ordering of water clusters is hexagonal.
Structured water has applications in agriculture science, for domestic animals, and for drinking purposes with filtration and activation.

Actual article for structured water
Text: Structuring of the Hydrogen rich water (HRW) can explain this shift produced with the EVOdrop device compared to the control filtered tap water

Vassilev, N.; Ignatov, I.; Popova, T.P.; Huether, F.; Ignatov, A.I.; Iliev, M.T.; Marinov, Y. Nuclear Magnetic Resonance (NMR) and Density Functional Theory (DFT) Study of Water Clusters of Hydrogen-Rich Water (HRW). *Water* 2024, *16*, 3261.

Theoretical explanations of structure water
Gramatikov, P., Antonov, A., Gramatikova, M. Study of the properties and structure variations of water systems under the stimulus of outside influences. *Fresenius J. Anal. Chem.* **343**, 134 (1992).
Muller, N. Is there a region of highly structured water around a nonpolar solute molecule? *J* Solution Chem**.** 1988; 17: 661–672. https://link.springer.com/article/10.1007/BF00645977
Spagnoli, Ch., Loos, K., Ulman, A., Cowman, M. K. Imaging Structured Water and Bound Polysaccharide on Mica Surface at Ambient Temperature. J. Am. Chem. Soc. 2003, 125, 23, 7124–7128. https://pubs.acs.org/doi/abs/10.1021/ja029721j
Del Giudice, E., De Ninno, A., Fleischmann, M. Coherent Quantum Electrodynamics in Living Matter. Electromagnetic Biology and Medicine. 2005; 24(3):199-210. https://www.tandfonline.com/doi/abs/10.1080/15368370500379574
Tarov, V. V., Gun'ko, V. M., Bogatyrev, V. M. et al. Structured water in partially dehydrated yeast cells and at partially hydrophobized fumed silica surface. Journal of Colloid and Interface Science. 2005; 283 (2); 329-342. https://www.sciencedirect.com/science/article/abs/pii/S0021979704009750
Higgins, M. J., Polcik, M, Fukuma, T. et al. The authors described theoretical explanations of structured water. 2006; 91(7): 2532-2542. https://www.cell.com/fulltext/S0006-3495(06)71967-1
Tychinsky, V. High Electric Susceptibility is the Signature of Structured Water in Water-Containing Objects. Water Journal. 2011; 13. https://waterjournal.org/archives/tychinsky/
Segarra-Martí, J., Coto, P. B., Rubio, M. et al. Towards the understanding at the molecular level of the structured-water absorption and fluorescence spectra: a fingerprint of π-stacked water. Molecular Physics, 2013; 111(9–11): 1308–1315. https://www.tandfonline.com/doi/abs/10.1080/00268976.2013.794980
Elia, V., Yinnon, T. A., Napoli, E. et al. Chiral micron-sized H_2O aggregates in water: Circular dichroism of supramolecular H_2O architectures created by perturbing pure water. Water Journal. 2016; 13. https://waterjournal.org/archives/elia/
Structured water and medicine
Pouliquen, D., Gallois, Y. Physicochemical properties of structured water in human albumin and gammaglobulin solutions. Biochemie. 2001; 83(9): 891-898. https://www.sciencedirect.com/science/article/abs/pii/S030090840101330X

Sami, A., Kurmanji, M. T., Amin, K. et al. Role of Nanotechnology Structured Water to Achieve Controlled Blood Glucose Level in Type 2 Diabetic Patients: A Randomised Controlled Trial. Journal of Clinical and Diagnostic Research. 2019; 3(11).

Structure water with hexagonal clusters

Segarra-Martí, J., Roca-Sanjuán, D., Merchan, M. Can the Hexagonal Ice-like Model Render the Spectroscopic Fingerprints of Structured Water? Feedback from Quantum-Chemical Computations. Entropy. 2014; 16(7): 4101-4120. https://www.mdpi.com/1099-4300/16/7/4101
Goncharuk, V. (2014). Water Clusters. In: Drinking Water. Springer, Cham. https://link.springer.com/chapter/10.1007/978-3-319-04334-0_3#citeas
Ignatov, I., Mosin, O. V. Structural Models of Water and Ice Regarding the Energy of Hydrogen Bonding. Nanotechnology Research and Practice, 2015; 7(3): 96-118.
Neidle, S. Structured Waters Mediate Small Molecule Binding to G-Quadruplex Nucleic Acids. 2022; 15(1): 7. https://www.mdpi.com/1424-8247/15/1/7

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Peiper, H. Create a Miracle with Hexagonal Water: The Simple Solution for Vital Health and Longevity. Book. 2008.
Iliev, M. T., Huether, F., Ignatov, I., Gramatikov, P. S. Education of Students on Physics and Chemistry with Effects of Water Filtration. Modeling of Water Clusters and Hexagonal Structures. European Journal of Contemporary Education. 2023; 12(4): 1546-1560. https://ejce.cherkasgu.press/journals_n/1703843785

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V. Mazur, O. Tkachuk, H. Pantsyreva, O. Demchuk. Quality of pea seeds and agroecological condition of soil when using structured water. Scientific Horizons. 2021; 24 (7):53–60. http://ir.polissiauniver.edu.ua/handle/123456789/12971
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Structured water and animals

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Lindinger, M. I. Structured water: effects on animals. Journal of Animal Science, 2021; 99 (5): 1–11.

Structured water and domestic purposes

Toso, D., Re, T. Systemic Design Applied To Water Treatment For Domestic Purposes. WIT Transactions and the Built Environment. 2014; 139. https://www.witpress.com/elibrary/wit-transactions-on-the-built-environment/139/26226
Ptok, F. Alternative Irrigation Methods: Structured Water in the Context of a Growing Global Food Crisis due to Water Shortages. Undergraduate Honors Theses. Paper. 2014; 182.