“Code Biology Database – A List of Biological Codes”

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https://www.codebiology.org

Number	Code Name	Descriptive Name(s)	Full Citation(s), Hyperlinked to Source
1	Acoustic code	The Acoustic Codes	Farina, A. and N. Pieretti (2014). "Acoustic Codes in Action in a Soundscape Context." Biosemiotics 7(2): 321-328. Malavasi, R., K. Kull and A. Farina (2014). "The Acoustic Codes: How Animal Sign Processes Create Sound-Topes and Consortia via Conflict Avoidance." Biosemiotics 7(1): 89-95. Curé, C., N. Mathevon and T. Aubin (2016). "Mate vocal recognition in the Scopoli's shearwater Calonectris diomedea: do females and males share the same acoustic code?" Behav Processes 128: 96-102. Farina, A. (2018). "Ecoacoustic codes and ecological complexity." Biosystems 164: 147-154. Farina, A. (2019). "Acoustic codes from a rural sanctuary: How ecoacoustic events operate across a landscape scale." Biosystems 183: 103986. Farina, A., & Villa, A. E. P. (2023). On the semantics of ecoacoustic codes. Biosystems, 232, 105002.
2	Actin code	The Actin Code **SEE also Cytoskeleton Code**	Vedula, P. and A. Kashina (2018). "The makings of the 'actin code': regulation of actin's biological function at the amino acid and nucleotide level." J Cell Sci 131(9). A, M., Latario, C. J., Pickrell, L. E., & Higgs, H. N. (2020). Lysine acetylation of cytoskeletal proteins: Emergence of an actin code. Journal of Cell Biology, 219(12).
3	Adenylation code	The Adenylation Code	Stachelhaus, T., H. D. Mootz and M. A. Marahiel (1999). "The specificity-conferring code of adenylation domains in nonribosomal peptide synthetases." Chem Biol 6(8): 493-505. Davis, R. and Y. Shi (2014). "The polyadenylation code: a unified model for the regulation of mRNA alternative polyadenylation." J Zhejiang UnivSci B 15(5): 429-437. Zhang, F., Y. Wang, Q. Jiang, Q. Chen, L. Karthik, Y.-L. Zhao and Z. Li (2018). "Substrate selection of adenylation domains for nonribosomal peptide synthetase (NRPS) in bacillamide C biosynthesis by marine Bacillus atrophaeus C89." Journal of Industrial Microbiology & Biotechnology 45(5): 335-344.
4	Adhesion code	The Adhesion Code **SEE also Synaptic code(s)** **SEE also Cadherin code(s)**	Faria, M. (2018). “Aggregating, polarizing, networking – The evolution of cell adhesion codes.” Biosystems 164: 60-67. Tsai, T. Y., M. Sikora, P. Xia, T. Colak-Champollion, H. Knaut, C. P. Heisenberg and S. G. Megason (2020). "An adhesion code ensures robust pattern formation during tissue morphogenesis." Science 370(6512): 113-116.

5	Allosteric code	The Allosteric Code	Edelstein, S. J. (1996). "An allosteric theory for hemoglobin incorporating asymmetric states to test the putative molecular code for cooperativity." J Mol Biol 257(4): 737-744. Daugherty, M. A., M. A. Shea, J. A. Johnson, V. J. LiCata, G. J. Turner and G. K. Ackers (1991). "Identification of the intermediate allosteric species in human hemoglobin reveals a molecular code for cooperative switching." Proc Natl Acad Sci U S A 88(4): 1110-1114. Goldbeck, R. A., R. M. Esquerra, D. S. Kliger, J. M. Holt and G. K. Ackers (2004). "The molecular code for hemoglobin allostery revealed by linking the thermodynamics and kinetics of quaternary structural change. 2. Cooperative free energies of (alphaFeCObetaFe)2 and (alphaFebetaFeCO)2 T-state tetramers." Biochemistry 43(38): 12065-12080. Armour-Garb, I., I. S. M. Han, B. S. Cowan and K. M. Thayer (2022). "Variable Regions of p53 Isoforms Allosterically Hard Code DNA Interaction." J Phys Chem B.
6	Alzheimer´s code	The Alzheimer´s Disease Code	Fan, F., Zhao, N., & Guo, M. (2026). Lymphatic–venous anastomosis: Cracking the code of Alzheimer's disease treatment? Neural Regen Res, 21(6).
7	Angiotensin code	The Angiotensin Receptor Code	Sadybekov, A. and V. Katritch (2020). "Breaking the Enigma Code of Angiotensin II Type 2 Receptor Signaling." Structure 28(4): 390-392.
8	Annexin code	The Annexin Codes	Ganesan, T., Sinniah, A., Ramasamy, T. S., & Alshawsh, M. A. (2024). Cracking the code of Annexin A1-mediated chemoresistance. Biochem Biophys Res Commun, 725, 150202.
9	Antibiotic resistance code	The Antibiotic Resistance Codes	Lo, S. W., N. Kumar and N. E. Wheeler (2018). "Breaking the code of antibiotic resistance." Nat Rev Microbiol 16(5): 262. Al Fadhli, A. H., Mouftah, S. F., Jamal, W. Y., Rotimi, V. O., & Ghazawi, A. (2023). Cracking the Code: Unveiling the Diversity of Carbapenem-Resistant Klebsiella pneumoniae Clones in the Arabian Peninsula through Genomic Surveillance. Antibiotics, 12(7), 1081.
10	Antigen code	The Antigen Codes **SEE also Immune code**	Krasilnikov, I., Lehnherr-Ilyina, T., Djonovic, M., Artamonova, I., Nikitin, M., & Kislichkin, N. (2024). Cracking the antigenic code of mycobacteria: CFP-10/ESAT-6 tuberculosis skin test and misleading results. Journal of Clinical Tuberculosis and Other Mycobacterial Diseases, 36, 100436.
11	Apoptosis code	The Apoptosis Code	Basañez, G. and J. M. Hardwick (2008). "Unravelling the bcl-2 apoptosis code with a simple model system." PLoSBiol 6(6): e154. Füllgrabe, J., N. Hajji and B. Joseph (2010). "Cracking the death code: apoptosis-related histone modifications." Cell Death Differ 17(8): 1238-1243.

			Biermann, M., C. Maueröder, J. M. Brauner, R. Chaurio, C. Janko, M. Herrmann and L. E. Muñoz (2013). "Surface code--biophysical signals for apoptotic cell clearance." Phys Biol 10(6): 065007. Shih, H. C., M. El-Shazly, Y. S. Juan, C. Y. Chang, J. H. Su, Y. C. Chen, S. P. Shih, H. M. Chen, Y. C. Wu and M. C. Lu (2014). "Cracking the cytotoxicity code: apoptotic induction of 10-acetylirciformonin B is mediated through ROS generation and mitochondrial dysfunction." Mar Drugs 12(5): 3072-3090. Wook Choi, D. and C. Yong Choi (2014). "HIPK2 modification code for cell death and survival." Mol Cell Oncol 1(2): e955999. Cavallaro, S. (2015). Cracking the code of neuronal apoptosis and survival. Cell Death Dis, 6(11), e1963-e1963. Jiang, S., Y. Liu, B. Xu, Y. Zhang and M. Yang (2020). "Noncoding RNAs: New regulatory code in chondrocyte apoptosis and autophagy." Wiley Interdiscip Rev RNA 11(4): e1584. Rothlin, C. V. and S. Ghosh (2020). "Cracking the Cell Death Code." Cold Spring Harb Perspect Biol 12(5).
12	Archetype codes	The Archetype Codes	Bemowski, Karen (1995) Codes, cultural archetypes, and the collective cultural unconscious. Quality Progress; Milwaukee Vol 28, Issue 1, p33. Major, J. C. (2021). "Archetypes and code biology." Biosystems 208: 104501. Major, J. C. (2025). From code to archetype: Toward a unified theory of biological, neural, and artificial artifacts. Biosystems, 254, 105516. Major, João Carlos, (2025) Jung 4.0 - The Code Architecture of the Archetype: Reframing Analytical Psychology through Code Biology. Available at SSRN. Major, João Carlos, From Archetype-as-Code to the Code-Mediator-Artifact Framework: Empirical Extensions Across Biological, Neural, and Symbolic Systems (October 22, 2025). Available at SSRN. Sacco, Rob G., Marks-Tarlow, T., & Beitman, Bernard D. (2026). Archetypes as Codes: Jungian Psychology, Biological Organization, and the Fractal Logic of Synchronicity. International Journal of Jungian Studies, 1-21.
13	Area code	The Area / Cell Recognition Code	Hood, L., H. V. Huang and W. J. Dreyer (1977). "The area-code hypothesis: The immune system provides clues to understanding the genetic and molecular basis of cell recognition during development." Journal of Supramolecular Structure 7(3-4): 531-559.

			Springer, T. A. (1993). "Signals on endothelium for lymphocyte recirculation and leukocyte emigration: the area code paradigm." Harvey Lect 89: 53-103. Yoshihara, Y., & Mori, K. (1994). Telencephalin: a neuronal area code molecule? Neuroscience Research, 21(2), 119-124. Dreyer, W. J. (1998). "The area code hypothesis revisited: olfactory receptors and other related transmembrane receptors may function as the last digits in a cell surface code for assembling embryos." Proc Natl Acad Sci U S A 95(16): 9072-9077. Liu, C. Y. (2020). "β7 Gives Tregs a Gut Area Code." Cell Mol Gastroenterol Hepatol 9(3): 543-544.
14	Arrestin code	The Arrestin Receptor Code	Draper-Joyce, C. J. and A. Christopoulos (2018). "Strength in numbers-an arrestin interaction code." Nat Struct Mol Biol 25(6): 437-439.
15	Assembly code	The Assembly Code	Shelton, C. L., D. G. Conrady and A. B. Herr (2017). "Functional consequences of B-repeat sequence variation in the staphylococcal biofilm protein Aap: deciphering the assembly code." Biochem J 474(3): 427-443.
16	ATG8 code	The ATG8 Paralog Code	Choi, H., Lee, S. M., & Lee, J. A. (2026). Decoding the brain's ATG8 paralog code: LC3-GABARAP specialization at synapses and the astrocyte-neuron interface. Front Cell Dev Biol, 14, 1762891.
17	Auditory Code	The Auditory Codes	Middlebrooks, J. C. and E. I. Knudsen (1984). "A neural code for auditory space in the cat's superior colliculus." J Neurosci 4(10): 2621-2634. Schwarz, D. W. and R. W. Tomlinson (1987). "A complex tone code in the auditory cortex." J Otolaryngol 16(5): 316-321. Sterbing, S. J., U. Schmidt and R. Rübsamen (1994). "The postnatal development of frequency-place code and tuning characteristics in the auditory midbrain of the phyllostomid bat, Carollia perspicillata." Hear Res 76(1-2): 133-146. Thompson, V. A., & Paivio, A. (1994). Memory for pictures and sounds: independence of auditory and visual codes. Can J Exp Psychol, 48(3), 380-398. Schwarz, D. W., F. Tennigkeit, T. Adam, P. Finlayson and E. Puil (1998). "Membrane properties that shape the auditory code in three nuclei of the central nervous system." J Otolaryngol 27(6): 311-317. Lalwani, A. K. and C. M. Castelein (1999). "Cracking the auditory genetic code: nonsyndromic hereditary hearing impairment." Am J Otol 20(1): 115-132.

			March, L., A. Cienfuegos, L. Goldbloom, W. Ritter, N. Cowan and D. C. Javitt (1999). "Normal time course of auditory recognition in schizophrenia, despite impaired precision of the auditory sensory ("echoic") memory code." J Abnorm Psychol 108(1): 69-75. Kozloski, J. and J. D. Crawford (2000). "Transformations of an auditory temporal code in the medulla of a sound-producing fish." J Neurosci 20(6): 2400-2408. Tseng, C. J. and A. K. Lalwani (2000). "Cracking the auditory genetic code: part II. Syndromic hereditary hearing impairment." Am J Otol 21(3): 437-451. Bodnar, D. A., A. D. Holub, B. R. Land, J. Skovira and A. H. Bass (2001). "Temporal population code of concurrent vocal signals in the auditory midbrain." J Comp Physiol A Neuroethol Sens Neural Behav Physiol 187(11): 865-873. Juslin, P. N. and P. Laukka (2003). "Communication of emotions in vocal expression and music performance: different channels, same code?" Psychol Bull 129(5): 770-814. Polley, D. B., M. A. Heiser, D. T. Blake, C. E. Schreiner and M. M. Merzenich (2004). "Associative learning shapes the neural code for stimulus magnitude in primary auditory cortex." Proc Natl Acad Sci U S A 101(46): 16351-16356. Guttman, S. E., Gilroy, L. A., & Blake, R. (2005). Hearing What the Eyes See: Auditory Encoding of Visual Temporal Sequences. Psychological Science, 16(3), 228-235. Weisz, N., S. Müller, W. Schlee, K. Dohrmann, T. Hartmann and T. Elbert (2007). "The neural code of auditory phantom perception." J Neurosci 27(6): 1479-1484. Eyherabide, H. G., A. Rokem, A. V. Herz and I. Samengo (2008). "Burst firing is a neural code in an insect auditory system." Front Comput Neurosci 2: 3. Werner-Reiss, U. and J. M. Groh (2008). "A rate code for sound azimuth in monkey auditory cortex: implications for human neuroimaging studies." J Neurosci 28(14): 3747-3758. Salminen, N. H., P. J. May, P. Alku and H. Tiitinen (2009). "A population rate code of auditory space in the human cortex." PLoS One 4(10): e7600. Salminen, N. H., H. Tiitinen, S. Yrttiaho and P. J. May (2010). "The neural code for interaural time difference in human auditory cortex." J Acoust Soc Am 127(2): El60-65.

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18	Auxin code	The Auxin Metabolism Code	Campos, M. L. (2021). "Breaking the code of auxin metabolism: an additional role for DIOXYGENASE FOR AUXIN OXIDATION 1." Plant Physiol 187(1): 7-8. Martin-Arevalillo, R., & Vernoux, T. (2023). Decoding the Auxin Matrix: Auxin Biology Through the Eye of the Computer. Annu Rev Plant Biol, 74(Volume 74, 2023), 387-413. Martin-Arevalillo, R., Guillotin, B., Schön, J., Hugues, A., Gerentes, M.-F., Tang, K., . . . Vernoux, T. (2025). Synthetic deconvolution of an auxin-dependent transcriptional code. Cell, 188(11), 2872-2889.e2824.
19	Axon guidance code	The Axon Guidance Codes	Goodhill, G. J. (2003). "A theoretical model of axon guidance by the Robo code." Neural Comput 15(3): 549-564. Kinrade, E. F. and A. Hidalgo (2004). "Lateral neuron--glia interactions steer the response of axons to the Robo code." Neuron Glia Biol 1(2): 101-112. Shirasaki, R., J. W. Lewcock, K. Lettieri and S. L. Pfaff (2006). "FGF as a target-derived chemoattractant for developing motor axons genetically programmed by the LIM code." Neuron 50(6): 841-853. Chatterjee, M., Li, K., Chen, L., Maisano, X., Guo, Q., Gan, L., & Li, J. Y. H. (2012). Gbx2 regulates thalamocortical axon guidance by modifying the LIM and Robo codes. Development, 139(24), 4633-4643. Zarin, A. A., A. C. Daly, J. Hülsmeier, J. Asadzadeh and J. P. Labrador (2012). "A GATA/homeodomain transcriptional code regulates axon guidance through the Unc-5 receptor." Development 139(10): 1798-1805. Kohl, A., T. Marquardt, A. Klar and D. Sela-Donenfeld (2015). “Control of axon guidance and neurotransmitter phenotype of dB1 hindbrain interneurons by Lim-HD code.” J Neurosci 35(6): 2596-2611.
20	BAF code	The BRG1/BRM-associated factor (BAF) Code	de Rojas, I., Miera, M., Molero, A., Jinménez, C., Pérez, M. J., Moreno, L., & Segura, M. F. (2026). Cracking the BAF code: a new therapeutic strategy in neuroblastoma (was selected for Fire-session). EJC Paediatric Oncology, 7.
21	BAFF code	The B cell activating factor (BAFF) Immune Code	Mackay, F. and P. Schneider (2009). “Cracking the BAFF code.” Nat Rev Immunol 9(7): 491-502.
22	Bile code	The Bile Acid Code	Gadaleta, R. M., M. Cariello, L. Crudele and A. Moschetta (2022). "Bile Salt Hydrolase-Competent Probiotics in the Management of IBD: Unlocking the "Bile Acid Code"." Nutrients 14(15).

23	Binaural code	The Binaural Code	Encke, J. and M. Dietz (2022). "A hemispheric two-channel code accounts for binaural unmasking in humans." CommunBiol 5(1): 1122.
24	Biodiversity code	The Biodiversity Codes	Ab'Sáber, A. (2010). Evolving from a Forest Code to a Biodiversity Code [Do código florestal para o código da biodiversidade.]. Biota Neotropica, 10(4), 331–336. Nogués-Bravo, D., Rodríguez-Sánchez, F., Orsini, L., de Boer, E., Jansson, R., Morlon, H., . . . Jackson, S. T. (2018). Cracking the Code of Biodiversity Responses to Past Climate Change. Trends in Ecology & Evolution, 33(10), 765-776.
25	Bioelectric code	The Bioelectric Code	Tseng, A. and M. Levin (2013). "Cracking the bioelectric code: Probing endogenous ionic controls of pattern formation." Commun Integr Biol 6(1): e22595. Levin, M. and C. J. Martyniuk (2018). "The bioelectric code: An ancient computational medium for dynamic control of growth and form." Biosystems 164: 76-93. Silver, B. B. and C. M. Nelson (2018). "The Bioelectric Code: Reprogramming Cancer and Aging From the Interface of Mechanical and Chemical Microenvironments." Front Cell Dev Biol 6: 21.
26	Bioremediation code	The Bioremediation Codes	Fu, Y., Zhou, X., Shi, J., & Zhuang, H. (2026). Bacterial-algae biofilm formation deciphering phenolic wastewater degradation code: Revealing microbial community succession and tripartite synergistic networks. Journal of Water Process Engineering, 86, 109967.
27	Biosysnthetic code	The Biosynthetic Code	Xu, Z., M. Baunach, L. Ding, H. Peng, J. Franke and C. Hertweck (2014). "Biosynthetic code for divergolide assembly in a bacterial mangrove endophyte." Chembiochem 15(9): 1274-1279.
28	bHLH code	The bHLH Codes	Sallee, M. D., H. E. Littleford and I. Greenwald (2017). "A bHLH Code for Sexually Dimorphic Form and Function of the C. elegans Somatic Gonad." Curr Biol 27(12): 1853-1860.e1855. Puig-Barbe, A., Dettmann, S., Nirello, V. D., Moor, H., Azami, S., Edgar, B. A., . . . de Navascués, J. (2025). A bHLH interaction code controls bipotential differentiation and self-renewal in the Drosophila gut. Cell Rep, 44(3).
29	Blood-Brain Barrier code	The Blood-Brain Barrier Code	Nájera-Maldonado, L., Parra-González, M., Peralta-Cuevas, E., Gutierrez-Onofre, A. J., Garcia-Atutxa, I., & Villanueva-Flores, F. (2025). Cracking the Blood–Brain Barrier Code: Rational Nanomaterial Design for Next-Generation Neurological Therapies. Pharmaceutics, 17(9), 1169.
30	Body plan code	The (Epigenetic) Body Plan Code	Elder D (1979) An epigenetic code. Differentiation, 14, 119-122.

31	Brain code	The Universal Brain Code	Rosenberg, R. N. (2021). “The universal brain code a genetic mechanism for memory.” J Neurol Sci 429: 118073.
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