The Evolution of Creation Science, Part 2: Beneficial Mutations

Philip J. Senter and Jared J. Mackey

Philip J. Senter

Creation science (CS) is a discipline in which evidence is sought to support a literal interpretation of the opening chapters of Genesis. Its technical literature has existed since 1964, long enough to test for trends in positions on certain topics. Here, we present a study of CS literature from 1964 through 2015, focusing on trends regarding the topic of beneficial mutations. Acceptance of beneficial mutations was low among CS authors in the twentieth century but has risen sharply in the current century: the number of CS authors accepting beneficial mutations was approximately equal to the number of CS authors rejecting beneficial mutations in the period 2011–2015. The rise in acceptance is largely due to twenty-first-century creationist interpretations of transposons and similar phenomena as divinely programmed machinery for beneficial mutations that were allegedly loaded by God into the genomes of the originally created organisms.

According to the young-Earth creationist (YEC) worldview, the literal wording of the book of Genesis is an accurate record of past events. Proponents of the YEC view hold that the earth and all kinds of organisms were independently created about 6,000 years ago, as described by the literal wording of Genesis. Widespread popularity of the YEC view persists,[1] despite the mountain of physical evidence that the earth is billions of years old and that all organisms evolved from a common ancestor,[2] and despite abundant endorsement in the New Testament of a figurative rather than literal approach to Genesis and the rest of the Pentateuch.[3]

Creation science (CS) is a discipline in which practitioners seek extrabiblical support for the YEC view. In 1964, supporters of the YEC view launched *Creation Research Society Quarterly*, the earliest technical journal of CS. CS has since produced several such journals, a brief history of which we described in our first article in this series[4] and which will not be repeated here.[5] These journals are peer reviewed and only accept manuscripts that agree with a literal interpretation of Genesis. The YEC movement feeds information from CS journals into its popular, nontechnical publications, which refer to studies published in CS journals to lend the appearance of legitimacy from "science" to their claims.[6]

The literature from CS technical journals has now become vast enough and sufficiently long lived to test for the presence of temporal trends in positions on various topics. In our previous article, we reported an investigation into such trends in the topics of vestigial structures (as mainstream scientists understand them) and biological degeneration (as CS practitioners understand it).[7] Here, we

Philip J. Senter *is a professor in the Department of Biological Sciences, Fayetteville State University in Fayetteville, North Carolina.*

Jared J. Mackey *earned a Bachelor of Science degree from Fayetteville State University in Fayetteville, North Carolina, in 2013. He is currently in the process of earning a graduate degree in biological sciences at the University of North Carolina at Charlotte.*

report an investigation into temporal trends in the CS technical literature, regarding the topic of beneficial mutations.

A mutation is a change in the nucleotide sequence of DNA, and mainstream biologists recognize beneficial mutations as a major contributor to biological evolution.[8] Mutations are often harmful: for example, a mutation is harmful if it causes some physiological problem that is lethal at an early age. However, in many cases they are beneficial: for example, a mutation in a bacterial cell is beneficial to the bacterium if it grants the bacterium resistance to chemicals that would normally kill it (e.g., antibiotics). Many CS authors assert that beneficial mutations do not exist (tables 1, 2), thus making biological evolution impossible. Other CS authors accept the existence of beneficial mutations. Some of the latter have recently hypothesized that within the genome of each originally created organism, God placed DNA sequences that move within and/or between chromosomes, and that these mobile DNA sequences were meant to enable adaptation to environmental changes or to new environments into which organisms spread, "to genetically prepare each creature from the start of creation for future challenges."[9] For such mobile DNA sequences, hypothetically loaded by God into genomes at creation, CS authors have coined the terms AGEs (altruistic genetic elements)[10] and VIGEs (variation-inducing genetic elements).[11]

Mainstream scientists have found that mobile DNA sequences that generate mutations exist; such sequences include endogenous retroviruses (ERVs) and transposons. ERVs are DNA sequences derived from retroviruses, which sequences can be inherited by the host's offspring.[12] Transposons, some of which may be derived from ERVs,[13] are DNA sequences that can change locations within and between genomes. CS advocates of the VIGE concept consider ERVs and transposons to be examples of VIGEs.[14]

Materials and Methods

We sought to determine whether temporal trends exist in CS technical literature, in positions toward beneficial mutations. We used the methods described in our previous article, limiting the analysis to technical articles in CS literature and to conference abstracts in CS journals in which lengthy, referenced abstracts function as stand-alone articles. We searched through available PDF files of CS technical literature and searched visually through paper copies of journal volumes for which pdfs are not available.[15] For pdf searches, we used the search terms "mutation," "AGE" (case-sensitive), and "VIGE" (case-sensitive).

As in our previous article, we divided the duration of the CS movement into ten periods: 1964–1970 and nine subsequent periods of five years apiece, from 1971–1975 to 2011–2015. We then compared the number of articles and authors accepting or rejecting beneficial mutations through time. We considered an author to reject beneficial mutations if the author denied their existence or claimed that they occur rarely enough to be negligible in number or effect.

We calculated the percentage of twentieth-century articles and authors accepting or rejecting beneficial mutations, recording percentages with a precision of three significant digits; we repeated the procedure for twenty-first century articles and authors. We then ran two-tailed *z*-tests on these proportions, to test for significant differences in the proportions between the two centuries. The *z*-tests were run with alpha set at a stringent 0.01.

Table 1. Numbers and percentages of CS articles and authors rejecting or accepting beneficial mutations, through 2015.

	1964–1970	1971–1975	1976–1980	1981–1985	1986–1990	1991–1995	1996–2000	2001–2005	2006–2010	2011–2015
Articles rejecting	14	8	6	7	3	11	6	18	17	7
Authors rejecting	10	9	5	8	4	10	6	13	17	7
Articles accepting	2	1	0	0	0	2	2	8	25	16
Authors accepting	2	1	0	0	0	3	2	6	12	9
Percentage of articles accepting	12.5%	11.1%	0%	0%	0%	15.4%	25.0%	33.3%	59.5%	76.7%
Percentage of authors accepting	16.7%	10.0%	0%	0%	0%	23.1%	25.0%	31.6%	41.4%	56.3%

Table 2. CS articles in which beneficial mutations are rejected or accepted, through 2015, with indication of articles in which the authors accept AGEs or VIGEs.

Author and year	Position
Gish, 1964[1]	Reject
Lammerts, 1964[2]	Reject
Morris, 1964[3]	Reject
Tinkle, 1964[4]	Reject
Lammerts, 1965[5]	Reject
Klotz, 1966[6]	Accept
Shute, 1966[7]	Accept
Gish, 1967[8]	Reject
Lammerts, 1967[9]	Reject
Moore, 1967[10]	Reject
Tinkle, 1968[11]	Reject
Howe, 1969[12]	Reject
Klotz, 1969[13]	Reject
Lammerts, 1969[14]	Reject
Brauer, 1970[15]	Reject
Mosher & Tinkle, 1970[16]	Reject
Grebe, 1971[17]	Reject
Howe & Davis, 1971[18]	Reject
Lockwood, 1971[19]	Reject
Ouweneel, 1971[20]	Accept
Holroyd, 1972[21]	Reject
Moore, 1972[22]	Reject
Telfair, 1973[23]	Reject
Williams, 1973[24]	Reject
Gish, 1975[25]	Reject
Haines, 1976[26]	Reject
Tinkle, 1976[27]	Reject
Poettcker, 1977[28]	Reject
Tinkle, 1979[29]	Reject
Ancil, 1980[30]	Reject
Howe & Lammerts, 1980[31]	Reject
Cheek, 1981[32]	Reject
Melnick, 1981[33]	Reject
Jones, AJ, 1982[34]	Reject
Lammerts, 1982[35]	Reject
Moore, 1982[36]	Reject
Cribbs & Barrows, 1984[37]	Reject
Hamilton, 1985[38]	Reject
Leslie, 1986[39]	Reject
Lester & Bohlin, 1986[40]	Reject
Bergman, 1990[41]	Reject
Jones, JB, 1991[42]	Accept
Kouznetsov, 1991[43]	Reject
MacAoidh, 1991[44]	Reject
Wieland, 1991[45]	Accept
Bergman, 1992[46]	Reject
Lumsden, Anders, & Pettera, 1992[47]	Reject
Wile, 1992[48]	Reject
Gibson, 1993[49]	Reject
Gibson, 1994[50]	Reject
Lester, 1994[51]	Reject
Powell, 1994[52]	Reject
Wieland, 1994[53]	Reject
Bergman, 1995[54]	Reject
Bergman, 1996[55]	Reject
Wieland, 1996[56]	Reject
More, 1998[57]	Accept
Penrose, 1998[58]	Reject
Weeks, 1998[59]	Reject
Burgess, 1999[60]	Reject
Ivanov, 2000[61]	Reject
Walkup, 2000[62]	Accept (AGEs)
Bergman, 2001[63]	Accept
Bergman, 2001[64]	Reject
Mastropaolo, 2001[65]	Reject
Wood & Cavanaugh, 2001[66]	Accept (AGEs)
Batten, 2002[67]	Accept (AGEs)
Bergman, 2002[68]	Reject
Standish, 2002[69]	Reject
Wood, 2002[70]	Accept (AGEs)
Bergman, 2003[71]	Reject
Bergman, 2003[72]	Reject
Bergman, 2003[73]	Reject
Moeller, 2003[74]	Reject
Wood, 2003[75]	Accept (AGEs)
May, Thompson, & Harrub, 2004[76]	Reject
Thompson & Harrub, 2004[77]	Reject
Wilson, 2004[78]	Accept
Anderson, 2005[79]	Accept
Anderson, 2005[80]	Accept
Bergman, 2005[81]	Reject
Bergman, 2005[82]	Reject
Buggs, 2005[83]	Reject
Lightner, 2005[84]	Reject
Lightner, 2005[85]	Reject
ReMine, 2005[86]	Reject
Williams, 2005[87]	Reject
Wise, 2005[88]	Reject

Author and year	Position
Biswas, 2006[89]	Reject
Lamb, 2006[90]	Accept
Lightner, 2006[91]	Accept
Liu & Moran, 2006[92]	Reject
Liu & Moran, 2006[93]	Reject
Cavanaugh, 2007[94]	Accept
Kim, 2007[95]	Reject
Lightner, 2007[96]	Accept
Liu, 2007[97]	Reject
Standish, 2007[98]	Reject
Williams, 2007[99]	Reject
Anderson, 2008[100]	Accept
Anderson & Purdom, 2008[101]	Accept
Bergman, 2008[102]	Reject
Borger, 2008[103]	Accept (VIGEs)
Brand, 2008[104]	Reject
Lightner, 2008[105]	Accept
Lightner, 2008[106]	Accept
Matthews, 2008[107]	Reject
Purdom, 2008[108]	Accept
Purdom & Anderson, 2008[109]	Accept
Sanford, Baumgardner, Brewer, Gibson & ReMine, 2008[110]	Reject
Williams, 2008[111]	Accept
Williams, 2008[112]	Reject
Williams, 2008[113]	Reject
Bartlett, 2009[114]	Accept
Borger, 2009[115]	Accept (VIGEs)
Borger, 2009[116]	Accept (VIGEs)
Brown & Sanders, 2009[117]	Accept (AGEs)
Criswell, 2009[118]	Reject
Hennigan, 2009[119]	Accept
Larssen, 2009[120]	Reject

Author and year	Position
Lightner, 2009[121]	Accept
Lightner, 2009[122]	Accept
Lightner, 2009[123]	Accept
Purdom, 2009[124]	Accept
Shan, 2009[125]	Accept (AGEs, VIGEs)
Wise, 2009[126]	Reject
Bergman, 2010[127]	Reject
Borger, 2010[128]	Accept
Lightner, 2010[129]	Accept (VIGEs)
Lightner, 2010[130]	Accept
Carter, 2011[131]	Accept (VIGEs)
Doyle, 2011[132]	Reject
Lightner, 2011[133]	Accept
Lightner, 2011[134]	Accept
Soltys, 2011[135]	Reject
Gaskill & Thomas, 2012[136]	Accept (VIGEs)
Arneigh, 2013[137]	Reject
Jeanson, 2013[138]	Accept (AGEs)
Lightner, 2013[139]	Accept
Rupe & Sanford, 2013[140]	Reject
Terborg, 2013[141]	Accept (VIGEs)
Lightner, 2014[142]	Accept
Lightner, 2014[143]	Accept
Lightner, 2014[144]	Accept
Williams, 2014[145]	Reject
Williams, 2014[146]	Accept
Williams, 2014[147]	Accept (VIGEs)
Ingle, 2015[148]	Accept (AGEs)
Lightner, 2015[149]	Accept
Liu, 2015[150]	Reject
Truman, 2015[151]	Accept
Truman, 2015[152]	Accept
Williams, 2015[153]	Reject

[1]Duane T. Gish, "Critique of Biochemical Evolution," *CRSQ* 1 (1964): 10–12.
[2]Walter E. Lammerts, "Discoveries Since 1859 Which Invalidate the Evolution Theory," *CRSQ* 1 (1964): 47–55.
[3]Henry M. Morris, "The Power of Energy," *CRSA* 1 (1964): 18–23.
[4]William J. Tinkle, "The Paradox of a Century," *CRSQ* 1 (1964): 8–9.
[5]Walter E. Lammerts, "Planned Induction of Commercially Desirable Variation in Roses by Neutron Radiation," *CRSA* 2 (1965): 39–48.
[6]John W. Klotz, "The Mystery of the Red Beds," *CRSQ* 3 (1966): 12–16.
[7]Evan V. Shute, "Further Highly Specialized Adaptations," *CRSQ* 3 (1966): 10–17.
[8]Duane T. Gish, "DNA: Its History and Potential," *CRSA* 4 (1967): 13–17.
[9]Walter E. Lammerts, "Mutations Reveal the Glory of God's Handiwork," CRSA 4 (1967): 35–41.
[10]Ralph S. Moore, "A Study of Moss and Miniature Roses," *CRSQ* 3 (1967): 12–18.
[11]William J. Tinkle, "The Ancestry of Man," *CRSA* 5 (1968): 42–45.
[12]George F. Howe, "Creationistic Botany Today: A Progress Report," *CRSQ* 6 (1969): 85–95.
[13]John W. Klotz, "Chromosomal Changes—Mechanism for Evolution?," *CRSA* 6 (1969): 45–48, 54.
[14]Walter E. Lammerts, "Does the Science of Genetic and Molecular Biology Really Give Evidence for Evolution?," *CRSA* 6 (1969): 5–12, 26.
[15]Oscar L. Brauer, "Only God Could Have Made the Defense Systems of the Human Body," *CRSQ* 7 (1970): 152–54.
[16]C. H. Mosher and William J. Tinkle, "Natural Selection Inadequate," *CRSQ* 6 (1970): 182, 184.
[17]John J. Grebe, "Youth's Dilemma with Answers from Modern Biology," *CRSQ* 8 (1971): 60–62.
[18]George F. Howe and P. William Davis, "Natural Selection Reexamined," *CRSQ* 8 (1971): 30–43.
[19]G. C. Lockwood, "The Second Law of Thermodynamics and Evolution," CRSQ 8 (1971): 8, 23.
[20]Willem J. Ouweneel, "The Scientific Character of the Evolution Doctrine," CRSQ 8 (1971): 109–16.

[21]Howard B. Holroyd, "Darwinism is Physical and Mathematical Nonsense," *CRSQ* 9 (1972): 5–13.
[22]John N. Moore, "On Chromosomes, Mutations, and Phylogeny," *CRSQ* 9 (1972): 159–71.
[23]Raymond C. Telfair II, "Should Evolution Be Taught as Fact?," *CRSQ* 10 (1973): 53–61.
[24]Emmett L. Williams, "Thermodynamics: A Tool for Creationists," *CRSQ* 10 (1973): 38–44.
[25]Duane T. Gish, "A Decade of Creationist Research," *CRSQ* 12 (1975): 34–46.
[26]Roger W. Haines, "Macroevolution Questioned," *CRSQ* 13 (1976): 162–71.
[27]William J. Tinkle, "The Reign of Law," *CRSQ* 13 (1976): 44–46.
[28]Art F. Poettcker, "Seventeen Problems for Evolutionists," *CRSQ* 14 (1977): 113–23.
[29]William J. Tinkle, "What Can Mutation and Selection Accomplish?," *CRSQ* 16 (1979): 100–110.
[30]Ralph E. Ancil, "A Proposal for a New Creationist Discipline," *CRSQ* 17 (1980): 123–26.
[31]George F. Howe and Walter E. Lammerts, "Biogeography from a Creationist Perspective: II. The Origin and Distribution of Cultivated Plants," *CRSQ* 17 (1980): 4–18.
[32]Dennis W. Cheek, "The Creationist and Neo-Darwinian Views Concerning the Origin of the Order Primates Compared and Contrasted: A Preliminary Analysis," *CRSQ* 18 (1981): 93–110, 134.
[33]A. James Melnick, "'Punctuated Equilibrium' and the Macromicromutation Controversy," *CRSQ* 18 (1981): 22–25.
[34]A. J. Jones, "A Creationist Critique of Homology," *CRSQ* 19 (1982): 156–75.
[35]Walter E. Lammerts, "Does Chromosomal Reorganization Really Lead to the Origin of New Species?," *CRSQ* 19 (1982): 10–13.
[36]John N. Moore, "An Estimate of the Current Status of Evolutionary Thinking," *CRSQ* 18 (1982): 189–97.
[37]Carl Cribbs and Carl Barrows, "A Stochastic Modelling of Mutations in Bacteria," *ENTJ* 1 (1984): 169–72.
[38]H. S. Hamilton, "The Retina of the Eye—An Evolutionary Road Block," *CRSQ* 22 (1985): 59–64.
[39]John Leslie, "Mutations and Design in Cellular Metabolism," *ENTJ* 2 (1986): 17–52.
[40]Lane P. Lester and Raymond G. Bohlin, "After His Kind: The Biological Unit of Creation," in *Proceedings of the First International Conference on Creationism*, vol. 1, ed. Robert E. Walsh, Chris L. Brooks, and Richard S. Crowell (Pittsburgh, PA: Creation Science Fellowship, 1986), 5 pp.
[41]Jerry Bergman, "The Fall of the Natural Selection Theory," in *Proceedings of the Second International Conference on Creationism*, vol. 1, ed. Robert E. Walsh and Chris L. Brooks (Pittsburgh, PA: Creation Science Fellowship, 1990), 37–42.
[42]J. B. Jones, "The Limits to Variation," *CRSQ* 28 (1991): 100–2.
[43]Dmitri A. Kouznetsov, "Modern Concepts of Species: Do We Come Back to Fixism?," *CENTJ* 5, no. 2 (1991): 123–29.
[44]L. MacAoidh, "Historical Variation in the Human Creature," *CRSQ* 28 (1991): 35–37.
[45]Carl Wieland, "Variation, Information, and the Created Kind," *CENTJ* 5, no. 1 (1991): 42–47.
[46]Jerry Bergman, "Some Problems of Natural Selection Theory," *CRSQ* 29 (1992): 146–58.
[47]Richard D. Lumsden, Paul C. Anders, and Jeffrey R. Pettera, "Genetic Information and McCann's Dual Factor Paradigm for Development and Variation," *CRSQ* 29 (1992): 63–69.
[48]Jay L. Wile, "Beneficial Mutations?," *CENTJ* 6, no. 1 (1992): 6–9.
[49]L. J. Gibson, "Did Life Begin in an 'RNA World'?," *Origins* 20 (1993): 45–52.
[50]L. James Gibson, "Pseudogenes and Origins," *Origins* 21 (1994): 91–108.
[51]Lane P. Lester, "The History of Life," *CRSQ* 31 (1994): 95–97.
[52]C. Diane Powell, "Mechanisms for Gender Role Stasis," in *Proceedings of the Third International Conference on Creationism*, ed. Robert E. Walsh (Pittsburgh, PA: Creation Science Fellowship, 1994), 423–32.
[53]Carl Wieland, "Antibiotic Resistance in Bacteria," *CENTJ* 8, no. 1 (1994): 5–6.
[54]Jerry Bergman, "Mutations and Evolution," *CENTJ* 9, no. 2 (1995): 146–54.
[55]___, "The Enigma of Sex and Evolution," *CRSQ* 33 (1996): 217–23.
[56]C. Wieland, "At Last: A Good Mutation?," *CENTJ* 10, no. 3 (1996): 298.
[57]Ewan R. J. More, "The Created Kind—Noah's Doves, Ravens and Their Descendants," in *Proceedings of the Fourth International Conference on Creationism*, ed. Robert E. Walsh (Pittsburgh, PA: Creation Science Fellowship, 1998), 407–20.
[58]Eric Penrose, "Bacterial Resistance to Antibiotics—A Case of Unnatural Selection," *CRSQ* 35 (1998): 76–83.
[59]Noel Weeks, "Darwin and the Search for an Evolutionary Mechanism," *CENTJ* 12, no. 3 (1998): 305–11.
[60]Stuart Burgess, "Critical Characteristics and the Irreducible Knee Joint," *CENTJ* 13, no. 2 (1999): 112–17.
[61]Yuri N. Ivanov, "Laws of Fertility, Role of Natural Selection, and Destructiveness of Mutations," *CRSQ* 37 (2000): 153–58.
[62]Linda K. Walkup, "Junk DNA: Evolutionary Discards or God's Tools?," *CENTJ* 14, no. 2 (2000): 18–30.
[63]Jerry Bergman, "The Molecular Biology of Genetic Transposition," *CRSQ* 38 (2001): 139–50.
[64]___,"Why Dawkins' Weasel Demonstrates Mutations Cannot Produce a New Functional Gene," *TJ* 15, no. 2 (2001): 69–76.
[65]Joseph Mastropaolo, "Evolution Is Lethal Antiscience," *CSRQ* 38 (2001): 151–58.
[66]Todd C. Wood and David P. Cavanaugh, "A Baraminological Analysis of Subtribe Flaveriinae (Asteraceae: Helenieae) and the Origin of Biological Complexity," *Origins* 52 (2001): 7–27.
[67]Don Batten, "C4 Photosynthesis—Evolution or Design?," *TJ* 16, no. 2 (2002): 13–15.
[68]Jerry Bergman, "Why Mutations Are Lethal to Darwinism," *CRSQ* 38 (2002): 181–89.
[69]Timothy G. Standish, "Rushing to Judgment: Functionality in Noncoding or 'Junk' DNA," *Origins* 53 (2002): 7–30.
[70]Todd C. Wood, "The AGEing Process: Rapid Post-Flood Intrabaraminic Diversification Caused by Altruistic Genetic Elements (AGEs)," *Origins* 54 (2002): 5–34.
[71]Jerry Bergman, "Ancon Sheep: Just Another Loss Mutation," *TJ* 17, no. 1 (2003): 18–19.
[72]___, "Does the Acquisition of Antibiotic and Pesticide Resistance Provide Evidence for Evolution?," *TJ* 17, no. 1 (2003): 26–32.
[73]___, "The Century-and-a-Half Failure in the Quest for the Source of New Genetic Information," *TJ* 17, no. 2 (2003): 19–25.
[74]Don Moeller, "Dental Fossils and the Fossil Record," *TJ* 17, no. 2 (2003): 118–27.
[75]Todd C. Wood, "Perspectives on AGEing, a Young-Earth Creation Diversification Model," in *Proceedings of the Fifth International Conference on Creationism*, ed. Robert L. Ivey (Pittsburgh, PA: Creation Science Fellowship, 2003), 479–90.
[76]Branyon May, Bert Thompson, and Brad Harrub, "Hox Genes—Evolution's Hoax," *CRSQ* 41 (2004): 231–41.
[77]Bert Thompson and Brad Harrub, "Evolutionary Theories on Gender and Sexual Reproduction," *TJ* 18, no. 1 (2004): 97–104.
[78]Gordon Wilson, "The Origins of Natural Evil," *OPBSG* 4 (2004): 8.
[79]Kevin L. Anderson, "Is Bacterial Resistance to Antibiotics an Appropriate Example of Evolutionary Change?," *CRSQ* 41 (2005): 318–26.
[80]K. L. Anderson, "Genetic Analysis of Stress-Directed Adaptive Mutations in Bacteria," *OPBSG* 5 (2005): 11.
[81]Jerry Bergman, "The Mutation Repair Systems: A Major Problem for Macroevolution," *CRSQ* 41 (2005): 265–73.
[82]___, "Darwinism and the Deterioration of the Genome," *CRSQ* 42 (2005): 104–14.
[83]R. J. A. Buggs, "Diversification by Polyploidy," *OPBSG* 5 (2005): 12.
[84]Jean K. Lightner, "Mutations, Selection, and the Quest for Meatier Livestock," *TJ* 19, no. 2 (2005): 20.
[85]___, "Gain-of-Function Mutations: At a Loss to Explain Molecules-to-Man Evolution," *TJ* 19, no. 3 (2005): 7–8.
[86]Walter J. ReMine, "Cost Theory and the Cost of Substitution—A Clarification," *TJ* 19, no. 1 (2005): 113–25.
[87]Alex Williams, "Inheritance of Biological Information—Part III: Control of Information Transfer and Change," *TJ* 19, no. 3 (2005): 21–28.
[88]Kurt P. Wise, "The Flores Skeleton and Human Baraminology," *OPBSG* 6 (2005): 1–13.
[89]Chinmoy Biswas, "Founder Mutations: Evidence for Evolution?," *JC* 20, no. 2 (2006): 16–17.
[90]Andrew Lamb, "CCR5-delta32: A Very Beneficial Mutation," *JC* 20, no. 1 (2006): 15.

[91]Jean K. Lightner, "Identification of Species within the Sheep-Goat Kind (Tsoan Monobaramin)," *JC* 20, no. 3 (2006): 61–65.
[92]Yingguang Liu and Dan Moran, "Do New Functions Arise by Gene Duplication?," *JC* 20, no. 2 (2006): 82–89.
[93]Y. Liu and D. Moran, "Do New Molecular Functions Arise by Gene Duplication?," *OPBSG* 8 (2006): 12.
[94]D. P. Cavanaugh, "A Systems Biology Paradigm for Cellular Pathways and Organismic Populations: Insights from Principles of Systems Engineering," *OPBSG* 10 (2007): 11–12.
[95]Luke Kim, "Accumulation of Mutations: Cancer or Molecule-to-Man Evolution?," *JC* 21, no. 2 (2007): 77–81.
[96]Jean K. Lightner, "Identification of Species with the Cattle Monobaramin (Kind)," *JC* 21, no. 1 (2007): 119–22.
[97]Y. Liu, "Endogenous Retroviruses: Remnants of Germline Infection or Created in the Cell?," *OPBSG* 10 (2007): 19–20.
[98]Timothy G. Standish, "Genomes and Design," *Origins* 60 (2007): 61–64.
[99]Alex Williams, "Astonishing DNA Complexity Demolishes Neo-Darwinism," *JC* 21, no. 3 (2007): 111–17.
[100]Kevin Anderson, "Creationist Model of Bacterial Mutations," *ARJ* 1 (2008): 2.
[101]Kevin L. Anderson and Georgia Purdom, "A Creationist Perspective of Beneficial Mutations in Bacteria," in *Proceedings of the Sixth International Conference on Creationism*, ed. A. A. Snelling (Pittsburgh, PA: Creation Science Fellowship, 2008), 73–86.
[102]Jerry Bergman, "Progressive Evolution or Degeneration?," in *Proceedings of the Sixth International Conference on Creationism*, ed. Snelling, 99–110.
[103]Peter Borger, "Evidence for the Design of Life: Part 2—Baranomes," *JC* 22, no. 3 (2008): 68–76.
[104]Leonard Brand, "A Critique of Current Anti-ID Arguments and ID Responses," *Origins* 63 (2008): 5–33.
[105]Jean K. Lightner, "Genetics of Coat Color I: The Melanocortin 1 Receptor (MC1R)," *ARJ* 1 (2008): 109–16.
[106]____, "Patterns of Change over Time: Organophosphorus Resistance in the Australian Sheep Blowfly, *Lucilia cuprina*," *JC* 22, no. 1 (2008): 81–84.
[107]John D. Matthews, "The Origin of Oil—A Creationist Answer," *ARJ* 1 (2008): 145–68.
[108]Georgia Purdom, "Adaptive Mutation and the *E. coli ebg* Operon," *ARJ* 1 (2008): 5.
[109]Georgia Purdom and Kevin L. Anderson, "Analysis of Barry Hall's Research on the *E. coli ebg* Operon: Understanding the Implications for Bacterial Adaptation to Adverse Environments," in *Proceedings of the Sixth International Conference on Creationism*, ed. Snelling, 149–63.
[110]John Sanford, John Baumgardner, Wesley Brewer, Paul Gibson, and Walter ReMine, "Using Numerical Simulation to Test the Validity of Neo-Darwinian Theory," in *Proceedings of the Sixth International Conference on Creationism*, ed. Snelling, 165–75.
[111]Alex Williams, "Facilitated Variation: A New Paradigm Emerges in Biology," *JC* 22, no. 1 (2008): 85–92.
[112]____, "Mutations: Evolution's Engine Becomes Evolution's End!," *JC* 22, no. 2 (2008): 60–66.
[113]____, "How Life Works," *JC* 22, no. 2 (2008): 85–91.
[114]Jonathan L. Bartlett, "Towards a Creationary Classification of Mutations," *ARJ* 2 (2009): 169–74.
[115]Peter Borger, "The Design of Life: Part 3—An Introduction to Variation-Inducing Genetic Elements," *JC* 23, no. 1 (2009): 99–106.
[116]____, "The Design of Life: Part 4—Variation-Inducing Genetic Elements and Their Function," *JC* 23, no. 1 (2009): 107–14.
[117]R. Brown and R. W. Sanders, "Pentacyclic Triterpenes of Lantana: Co-occurrence of Liver Toxins and Liver Protectants," *OPBSG* (2009): 2.
[118]Daniel C. Criswell, "A Review of Mitoribosome Structure and Function Does Not Support the Serial Endosymbiotic Theory," *ARJ* 2 (2009): 107–15.
[119]Tom Hennigan, "Toward an Understanding of Arbuscular Mycorrhizal Symbioses within a Creation Model of Ecology: Implications for Godly Stewardship and Sustainable Agriculture," *ARJ* 2 (2009): 21–27.
[120]Per A. Larssen, "Mutation and Natural Selection: The Central Dogma of Neo-Darwinian Evolution," *CRSQ* 45 (2009): 271–81.
[121]Jean K. Lightner, "Genetics of Coat Color II: The Agouti Signaling Protein (ASIP) Gene," *ARJ* 2 (2009): 79–84.
[122]____, "Gene Duplications and Nonrandom Mutations in the Family Cercopithecidae: Evidence for Designed Mechanisms Driving Adaptive Genomic Mutations," *CRSQ* 46 (2009): 1–5.
[123]____, "Curious Patterns of Variation within the Anatidae Monobaramin and Implications for Baraminological Research," *OPBSG* 13 (2009): 5.
[124]Georgia Purdom, "The Role of Genomic Islands, Mutation, and Displacement in the Origin of Bacterial Pathogenicity," *ARJ* 2 (2009): 133–50.
[125]Evan L. Shan, "Transposon Amplification in Rapid Intrabaraminic Diversification," *JC* 23, no. 2 (2009): 110–17.
[126]K. Wise, "Creation Biology Suggestions from Evolutionary Genetics," *OPBSG* 13 (2009): 6–7.
[127]Jerry Bergman, "The Pleiotropy Problem for Evolution," *CRSQ* 46 (2010): 284–89.
[128]Peter Borger, "An Illusion of Common Descent," *JC* 24, no. 2 (2010): 122–27.
[129]Jean K. Lightner, "Comparative Cytogenetics and Chromosomal Arrangements," *JC* 24, no. 1 (2010): 6–8.
[130]____, "Gene Duplication, Protein Evolution and the Origin of Shrew Venom," *JC* 24, no. 2 (2010): 3–5.
[131]Robert W. Carter, "Can Mutations Create New Information?," *JC* 25, no. 2 (2011): 92–97.
[132]Shaun Doyle, "The Diminishing Return of Beneficial Mutations," *JC* 25, no. 3 (2011): 8–10.
[133]Jean K. Lightner, "PRDM9: A Link between Meiotic Recombination Hot Spots and the Origin of Species," *JC* 25, no. 2 (2011): 5–7.
[134]____, "Selection for a Behavior, and the Phenotypic Traits that Follow," *JC* 25, no. 3 (2011): 96–101.
[135]Mitchel Soltys, "Toward an Accurate Model of Variation in DNA," *ARJ* 4 (2011): 11–23.
[136]Phil Gaskill and Brian Thomas, "Recent Challenges to Natural Selection," *JC* 26, no. 3 (2012): 76–78.
[137]Mike R. Arneigh, "It's a Small World—MicroRNA Cuts Evolution Down to Size," *JC* 27, no. 2 (2013): 85–90.
[138]Nathaniel T. Jeanson, "Recent, Functionally Diverse Origin for Mitochondrial Genes from ~2700 Metazoan Species," *ARJ* 6 (2013): 467–501.
[139]Jean K. Lightner, "Meiotic Recombination—Designed for Inducing Genomic Change," *JC* 27, no. 1 (2013): 7–10.
[140]Christopher L. Rupe and John C. Sanford, "Using Numerical Simulation to Better Understand Fixation Rates, and Establishment of a New Principle: Haldane's Ratchet," in *Proceedings of the Seventh International Conference on Creationism*, ed. Mark Horstemeyer (Pittsburgh, PA: Creation Science Fellowship, 2013), 17 pp.
[141]Peer Terborg, "The 'VIGE-first Hypothesis'—How Easy It Is to Swap Cause and Effect," *JC* 27, no. 3 (2013): 105–12.
[142]Jean K. Lightner, "Adaptation of Endotherms to High Altitudes," *CRSQ* 50, no. 3 (2014): 132–40.
[143]____, "Bark Scorpion Toxin Loses Its Bite," *JC* 28, no. 1 (2014): 3–5.
[144]____, "Developmental System Plasticity—A Brief Initial Assessment of Extent, Design, and Purpose within the Creation Model," *JC* 28, no. 3 (2014): 67–72.
[145]Alex Williams, "Human Genome Decay and the Origin of Life," *JC* 28, no. 1 (2014): 91–97.
[146]____, "Beneficial Mutations: Real or Imaginary?—Part 1," *JC* 28, no. 1 (2014): 122–27.
[147]____, "Beneficial Mutations: Real or Imaginary?—Part 2," *JC* 28, no. 2 (2014): 75–82.
[148]Matthew E. Ingle, "Parasitology and Creation," *ARJ* 8 (2015): 65–75.
[149]Jean K. Lightner, "Natural Selection: Assessing the Role It Plays in Our World," *ARJ* 8 (2015): 111–19.
[150]Y. Liu, "Is HIV-1 Losing Fitness Due to Genetic Entropy?," *ARJ* 8 (2015): 339–51.
[151]Royal Truman, "Nylon-Eating Bacteria: Part 1—Discovery and Significance," *JC* 29, no. 1 (2015): 95–102.
[152]____, "Nylon-Eating Bacteria: Part 3—Current Theory on How the Modified Genes Arose," *JC* 29, no. 2 (2015): 106–9.
[153]Alex Williams, "Healthy Genomes Require Recent Creation," *JC* 29, no. 2 (2015): 70–77.

Results

We found 153 CS articles, by 124 authors, in which the authors took positions on beneficial mutations (tables 1, 2). Rejection of beneficial mutations strongly exceeded acceptance through the twentieth century. In the twenty-first century, a sharp rise in acceptance occurred, with the number of authors accepting beneficial mutations approximately equaling the number of authors rejecting it in the period 2011–2015 (fig. 1 & table 1).

The two-tailed *z*-tests found a significant difference between the two centuries in the proportions of articles and authors accepting and rejecting the existence of beneficial mutations. The rise in acceptance of beneficial mutations among CS authors in the twenty-first century is therefore statistically significant.

Discussion

CS authors have long recognized that genetic changes are called mutations, that genetic changes have caused each baramin ("created kind" of organism) to diversify into different species, that these diverse species are adapted to their environments, and that adaptation to one's environment is beneficial. It follows from those premises that beneficial mutations have occurred. Nevertheless, through the twentieth century, most CS authors rejected beneficial mutations (table 2), a self-contradictory position.

The current century has witnessed a dramatic rise in CS acceptance of beneficial mutations (fig. 1; table 2), correcting the self-contradiction. Such acceptance is more realistic than rejection is, because mainstream biologists have documented a plethora of examples of beneficial mutations in recent decades. Examples

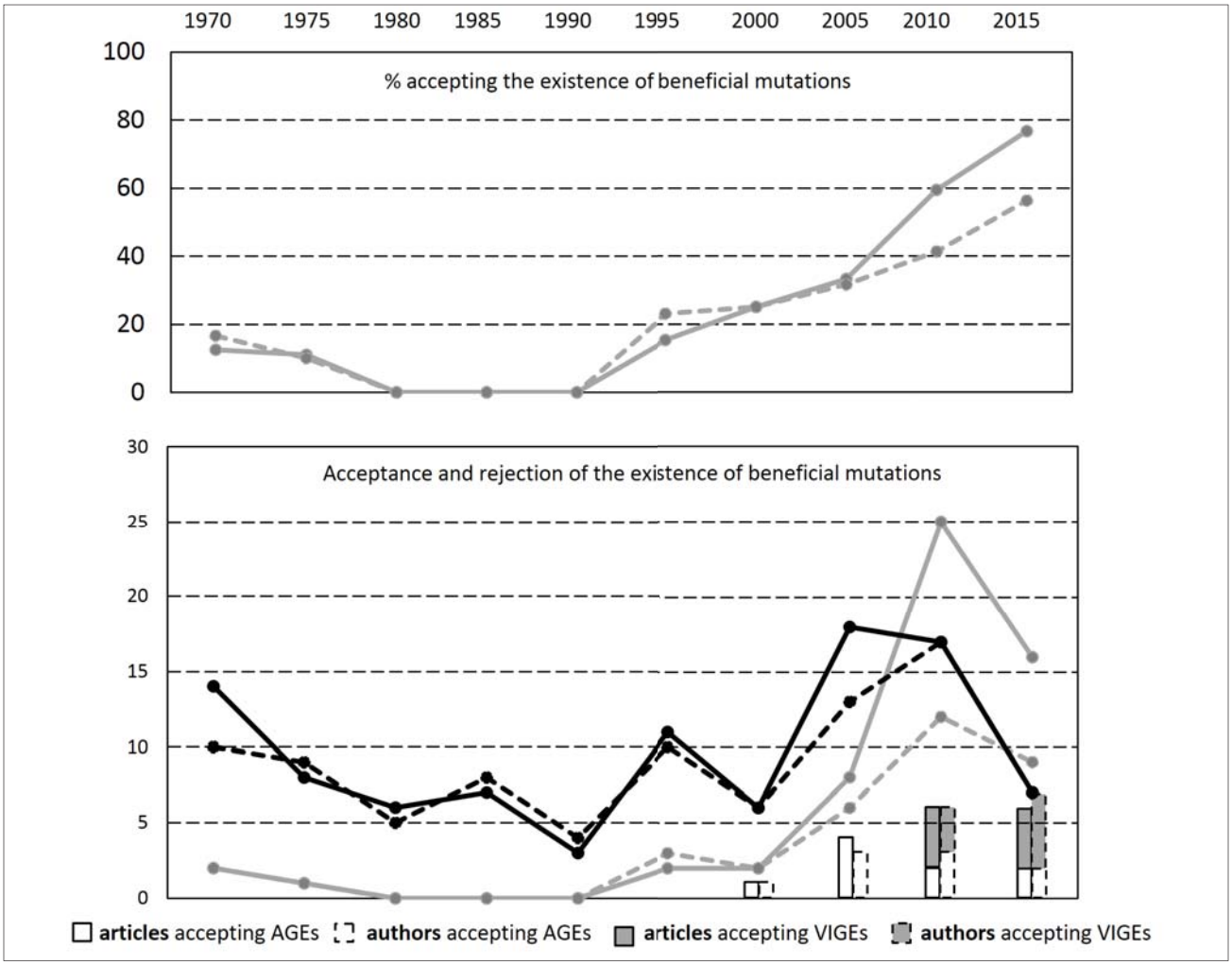

Figure 1. Temporal trends in the technical literature of creation science through 2015, regarding positions on beneficial mutations. Solid lines indicate articles, and dashed lines indicate authors; where no dashed line is visible, the number of authors equals the number of articles. Gray indicates acceptance, and black indicates rejection.

include beneficial mutations in viruses,[16] bacteria,[17] fungi,[18] eukaryotic algae,[19] plants,[20] invertebrates,[21] and vertebrates,[22] including humans.[23]

Nearly all CS authors rejecting beneficial mutations justified that position by stating that known mutations were harmful or neutral in effect. Some added that the appearance of beneficial mutations is illusory. For example, noting that geographic differences in human phenotypes make it appear that beneficial mutations have generated adaptation to local environments, one author explained it away by positing that the genetic changes happened first and then the humans moved into geographic areas where they were most comfortable.[24] Some CS authors insisted that pleiotropy (a phenomenon in which a gene has multiple effects on phenotype) would cause any mutation that had a beneficial effect to have multiple harmful effects, so that its net effect would necessarily be harmful.[25] For example, some argued that mutations in bacteria that make them antibiotic-resistant are harmful to the bacteria in some other way.[26]

Mainstream biological research has now falsified the argument that pleiotropy necessarily makes all mutations harmful. Examples of beneficial mutations without pleiotropic cost have been documented,[27] as have examples of pleiotropic mutations with multiple beneficial effects.[28] Furthermore, mainstream biologists have now documented cases in which the duplication of pleiotropic genes is followed by sub-functionalization,[29] a phenomenon in which each copy of the gene undergoes subsequent mutations that divide the gene's former functions between the copies, so that each copy now has but a single effect. Theoretically, this should allow the copies that have a harmful effect to be removed from the genome by subsequent deletion mutations or recombination. Mainstream biologists have also documented cases of neofunctionalization, in which duplicate genes undergo subsequent mutations and evolve new, beneficial functions.[30] The documentation of these phenomena falsifies the assertion of some CS authors that gene duplication cannot produce beneficial effects.[31]

Some CS authors argued that beneficial mutations do not get fixed in the genomes of organisms, because beneficial mutations are too rare[32] or would get weeded out before they can get fixed.[33] However, mainstream biologists have now documented numerous cases in which beneficial mutations have become fixed in genomes.[34] Additionally, mainstream biologists have also documented cases in which beneficial mutations occur sufficiently often to negate the effects of previous, harmful mutations.[35]

The recent rise in CS authors' acceptance of beneficial mutations is largely due to the emergence of the CS concepts of AGEs or VIGEs as generators of beneficial genetic changes. CS authors now use those concepts as convenient explanations for several phenomena. Some use AGEs or VIGEs to explain genetic variation[36] and its role in intrabaraminic diversification,[37] or to explain the rapidity with which such diversification must have taken place in only 6,000 years to generate the vast number of species recognized within some baramins.[38]

According to the CS paradigm, harmful mutations are a result of the Fall of humankind in the Garden of Eden, which introduced death and degeneration to the physical world.[39] Some CS authors hypothesize that mutations in AGEs or VIGEs after the Fall explain certain biological phenomena. One author hypothesized that the pathogenicity of viruses and bacteria (hypothetically designed as useful endosymbionts) is possibly due to mutations in their AGEs.[40] Another hypothesized that today's multicellular parasites are the mutant descendants of yesterday's beneficial endosymbionts:

> Raccoon roundworm, the rat tapeworm, and many other highly prevalent parasites provide support for the hypothesis that symbiotic animals were created to make horizontal transfer of AGEs possible and efficient.[41]

Some CS authors explain genetic diseases as the results of mutations of VIGEs.[42] Some propose that transposons and endogenous retroviruses are mutant descendants of VIGEs[43] or that RNA viruses arose by exogenization of endogenous retroviruses that are mutant descendants of VIGEs.[44] These creative applications of the AGE and VIGE concepts demonstrate the versatility and potential explanatory power of these concepts within the CS paradigm.

Interestingly, the emergence of the AGE and VIGE concepts, popular though they are among CS authors, does not seem to have persuaded many CS authors rejecting beneficial mutations to change their minds and accept beneficial mutations. Rather, the twenty-first-century rise in acceptance of beneficial mutations among CS authors is not due to the

changing of minds but is instead due to an influx of new authors who had already accepted beneficial mutations when they began writing about them, as shown in table 2. Jean Lightner, a rejecter[45]-turned-accepter,[46] is an exception.

The recent swing in CS literature from denial of beneficial mutations to acceptance of mobile genetic elements as generators of beneficial mutations, approaches concordance with mainstream biology. Mainstream studies confirm that, although in some cases transposons have harmful effects,[47] in other cases they have beneficial effects, and numerous examples of beneficial mutations resulting from transposon activity have now been recorded.[48] By considering transposons to be the molecular descendants of a mechanism that was meant to induce beneficial mutations, advocates of the VIGE concept have therefore come remarkably close to acceptance of the position of mainstream biologists.

One CS author proffered a unique explanation for the arguably beneficial advent of defense structures and attack structures (which would have been unnecessary in peaceful Eden) in organisms, without reference to AGEs or VIGEs. According to his explanation, each organism may have been created with two sets of genes: "one gene set for benign morphology and behavior (sinless contingency) and one for malignant morphology and behavior (Fall contingency) with only the benign gene sets expressed prior to the Fall."[49] As an alternate explanation, he proposed that God may instead have created organisms with malignant gene sets expressed as a preparation in case the Fall occurred but having no use prior to the Fall.

The explosion in documentation of beneficial mutations by mainstream scientists is mostly a phenomenon of the most recent three decades. Therefore, for much of the twentieth century, CS authors who rejected beneficial mutations had a point. At the time, little observational evidence for beneficial mutations had been collected. However, now that myriad beneficial mutations have been documented,[50] there is no longer any excuse to deny them. ✠

Notes

[1]Allan Mazur, "Believers and Disbelievers in Evolution," *Politics and the Life Sciences* 23, no. 2 (2005): 55–61; Jon D. Miller, Eugenie C. Scott, and Shinji Okamoto, "Public Acceptance of Evolution," *Science* 313, no. 5788 (2006): 765–66.

[2]Donald Prothero, *Evolution: What the Fossils Say and Why It Matters* (New York: Columbia University Press, 2007); Felix Gradstein, James Ogg, and Alan Smith, *A Geologic Time Scale 2004* (Cambridge, UK: Cambridge University Press, 2005).

[3]See Phil Senter, "Christianity's Earliest-Recorded Heresy, and Its Relevance to Christian Acceptance of Scientific Findings," *Thinking about Religion* 12 (2016), http://organizations.uncfsu.edu/ncrsa/journal/v12/SenterP_Peritomes.htm. This article expounds upon Jesus's non-endorsement of a literal reading of the Pentateuch; St. Paul's criticism of literalists, his advocacy of figurative interpretation, and his characterization of the Pentateuch narratives as "myths"; and endorsement of nonliteral interpretations by other early Church Fathers. See also Phil Senter, "Cognitive Styles Used in Evidence Citation by Ancient Christian Authors: The Psychology of a Major Ancient Controversy over the Historicity of the Pentateuch, and Its Implications for Science Education Today," *Open Library of Humanities* 3, no. 1 (2017): 1–50. This article includes a large collection of evidence that the New Testament's authors and other early Christian authors cited against the historicity of the Pentateuch. For New Testament endorsement of figurative interpretations of the Pentateuch, see Rom. 3:28–31; 1 Cor. 10:4; Gal. 3:7, 3:29, 4:24; Eph. 5:31–33; Col. 2:21–22; Heb. 10:4; and other passages discussed in the two articles mentioned above. Along similar lines, Jesus condemned anyone who broke the least of the Pentateuch's commandments (Matt. 5:17–19), yet he regularly broke them in their literal sense (Matt. 5:38, 12:1–8, 19:3–9; Mark 2:23–26, 7:14–19, 10:2–12; Luke 6:1–4, 16:18; John 5:1–11, 8:1–11); this apparent contradiction is resolved if he advocated following them in their figurative rather than literal sense. Moreover, he viewed the Torah as, at least in part, a set of veiled Messianic prophecies (Luke 24:27, 24:44; John 5:46).

[4]Philip J. Senter and Jared J. Mackey, "The Evolution of Creation Science, Part 1: Vestigial Structures and Biological Degeneration," *Perspectives on Science and Christian Faith* 69, no. 1 (2017): 27–41.

[5]But it will be useful to list here the abbreviations used in subsequent endnotes for the names of the CS journals: *ARJ* (*Answers Research Journal*), *CENTJ* (*Creation Ex Nihilo Technical Journal*), *CRSA* (*Creation Research Society Annual*), *CRSQ* (*Creation Research Society Quarterly*), *ENTJ* (*Ex Nihilo Technical Journal*), *JC* (*Journal of Creation*), *JCTS* (*Journal of Creation Theology and Science, Series B: Life Sciences*), and *OPBSG* (*Occasional Papers of the Baraminology Study Group*). The names of the CS journals *Origins* and *TJ* are not abbreviated in these endnotes, nor are the titles of the *Proceedings* volumes of the International Conference on Creation series. The current journal *JC* was previously *ENTJ*, then *CENTJ*, then *TJ*, before being named *Journal of Creation*. Likewise, the current journal *JCTS* was previously *OPBSG*.

[6]For example, Don Batten and Jonathan Sarfati, *15 Reasons to Take Genesis as History* (Brisbane, Australia: Creation Ministries International, 2006); Ken Ham, ed., *The New Answers Book 3* (Green Forest, AR: Master Books, 2009); Michael J. Oard, *Dinosaur Challenges and Mysteries* (Atlanta, GA: Creation Ministries International, 2011); Ken Ham, ed., *The New Answers Book 4* (Green Forest, AR: Master Books, 2013).

[7]Senter and Mackey, "The Evolution of Creation Science, Part 1."

[8]Brian K. Hall and Benedikt Hallgrimsson, *Strickberger's Evolution*, 4th ed. (Burlington, MA: Jones and Bartlett, 2008), 175; Neil A. Campbell, Jane B. Reece, Martha R. Taylor, Eric J. Simon, and Jean J. Dickey, *Biology: Concepts and Connections*, 6th ed. (San Francisco, CA: Pearson, 2009), 265; Carl T. Bergstrom and Lee A. Dugatkin, *Evolution*, 2nd ed. (New York: W. W. Norton, 2016), 6, 208, 199.

[9]Nathaniel T. Jeanson, "Recent, Functionally Diverse Origin for Mitochondrial Genes from ~2700 Metazoan Species," *ARJ* 6 (2013): 467–501.

[10]Todd C. Wood and David P. Cavanaugh, "A Baraminological Analysis of Subtribe Flaveriinae (Asteraceae: Helenieae) and the Origin of Biological Complexity," *Origins* 52 (2001): 7–27.

[11]Peter Borger, "Evidence for the Design of Life: Part 2—Baranomes," *JC* 22, no. 3 (2008): 68–76.

[12]P. N. Nelson et al., "Human Endogenous Retroviruses: Transposable Elements with Potential?," *Clinical and Experimental Immunology* 138, no. 1 (2004): 1–9.

[13]Bergstrom and Dugatkin, *Evolution*, 384–87.

[14]Borger, "Evidence for the Design of Life: Part 2."

[15]These are listed in Senter and Mackey, "The Evolution of Creation Science, Part 1," 31–33.

[16]H. A. Wichman et al., "Different Trajectories of Parallel Evolution during Viral Adaptation," *Science* 285, no. 5426 (1999): 422–24; Odin K. Silander, Olivier Tenaillon, and Lin Chao, "Understanding the Evolutionary Fate of Finite Populations: The Dynamics of Mutational Effects," *PLoS Biology* 5, no. 4:e94 (2007): 922–31; María Arribas, Laura Cabanillas, and Ester Lázaro, "Identification of Mutations Conferring 5-Azacytidine Resistance in Bacteriophage Qβ," *Virology* 417, no. 2 (2011): 343–52; Lindsey W. McGee et al., "Payoffs, Not Tradeoffs, in the Adaptation of a Virus to Ostensibly Conflicting Selective Pressures," *PLoS Genetics* 10, no. 10: e1004611 (2014): 1–12.

[17]Dimitri Papadopoulos et al., "Genomic Evolution during a 10,000-Generation Experiment with Bacteria," *Proceedings of the National Academy of Sciences of the USA* 96 (1999): 3807–12; Marianne Imhof and Christian Schloötterer, "Fitness Effects of Advantageous Mutations in Evolving *Escherichia coli* Populations," *Proceedings of the National Academy of Sciences of the USA* 98 (2001): 1113–17; Elizabeth A. Ostrowski, Daniel E. Rozen, and Richard E. Lensky, "Pleiotropic Effects of Beneficial Mutations in *Escherichia coli*," *Evolution* 59, no. 11 (2005): 2343–52; David A. Baltrus, Karen Guillemin, and Patrick C. Phillips, "Natural Transformation Increases the Rate of Adaptation in the Human Pathogen *Helicobacter pylori*," *Evolution* 62, no. 1 (2007): 39–49; Lilia Perfeito, Lisete Fernandes, Catarina Mota, and Isabel Gordo, "Adaptive Mutations in Bacteria: High Rate and Small Effects," *Science* 317, no. 5839 (2007): 813–15; Tim F. Cooper, "Recombination Speeds Adaptation by Reducing Competition between Beneficial Mutations in Populations of *Escherichia coli*," *PLoS Biology* 5, no. 9:e225 (2007): 1899–905; Michael J. McDonald, Tim F. Cooper, Hubertus J. E. Beaumont, and Paul B. Rainey, "The Distribution of Fitness Effects of New Beneficial Mutations in *Pseudomonas fluorescens*," *Biology Letters* 7, no. 1 (2011): 98–100; Kathleen E. Stevens and Michael E. Sebert, "Frequent Beneficial Mutations during Single-Colony Serial Transfer of *Streptococcus pneumoniae*," *PLoS Genetics* 7, no. 8:e1002232 (2011): 1–11; Wei Zhang et al., "Estimation of the Rate and Effect of New Beneficial Mutations in Asexual Populations," *Theoretical Population Biology* 81, no. 2 (2012): 168–78; Kazufumi Hosoda et al., "Adaptation of a Cyanobacterium to a Biochemically Rich Environment in Experimental Evolution as an Initial Step toward a Chloroplast-Like State," *PLoS ONE* 9, no. 5:e98337 (2014): 1–6; Hsin-Hung Chou, Nigel F. Delaney, Jeremy A. Draghi, and Christopher J. Marx, "Mapping the Fitness Landscape of Gene Expression Uncovers the Cause of Antagonism and Sign Epistasis between Adaptive Mutations," *PLoS Genetics* 10, no. 2:e1004149 (2014): 1–11; João Barroso-Batista et al., "The First Steps of Adaptation of *Escherichia coli* to the Gut Are Dominated by Soft Sweeps," *PLoS Genetics* 10, no. 3:e1004182 (2014): 1–12.

[18]Sarah B. Joseph and David W. Hall, "Spontaneous Mutations in Diploid *Saccharomyces cerevisiae*: More Beneficial Than Expected," *Genetics* 168, no 4 (2004): 1817–25; Matthew R. Goddard, H. Charles J. Godfray, and Austin Burt, "Sex Increases the Efficacy of Natural Selection in Experimental Yeast Populations," *Nature* 434 (2005): 636–40; Ayellet V. Segrè, Andrew W. Murray, and Jun-Yi Liu, "High-Resolution Mutation Mapping Reveals Parallel Experimental Evolution in Yeast," *PLoS Biology* 4, no. 8:e256 (2006): 1372–85; Sijmen Schoustra, Thomas Bataillon, Danna R. Gifford, and Rees Kassen, "The Properties of Adaptive Walks in Evolving Populations of Fungus," *PLoS Biology* 7, no. 11:e1000250 (2009): 1–10; Sibao Wang, Tammatha R. O'Brien, Monica Pava-Ripoli, and Raymond J. St. Leger, "Local Adaptation of an Introduced Transgenic Insect Fungal Pathogen Due to New Beneficial Mutations," *Proceedings of the National Academy of Sciences of the USA* 108, no. 51 (2011): 20449–54; Sijmen E. Schoustra et al., "Multivariate Phenotypic Divergence Due to the Fixation of Beneficial Mutations in Experimentally Evolved Lineages of a Filamentous Fungus," *PLoS ONE* 7, no. 11:e50305 (2012): 1–7; Celia Payen et al., "High-Throughput Identification of Adaptive Mutations in Experimentally Evolved Yeast Populations," *PLoS Genetics* 12, no. 10:e1006339 (2016): 1–24.

[19]Sinéad Collins and Juliette de Meaux, "Adaptation to Different Rates of Environmental Change in Chlamydomonas," *Evolution* 63, no. 11 (2009): 2952–65.

[20]Angela M. Hancock et al., "Adaptation to Climate Change across the *Arabidopsis thaliana* Genome," *Science* 334, no. 6052 (2011): 83–86; A. Fournier-Level et al., "A Map of Local Adaptation in *Arabidopsis thaliana*," *Science* 334, no. 6052 (2011): 86–89.

[21]R. D. Newcomb et al., "A Single Amino Acid Substitution Converts a Carboxylesterase to an Organophosphorus Hydrolase and Confers Insecticide Resistance on a Blowfly," *Proceedings of the National Academy of Sciences of the USA* 94, no. 14 (1997): 7464–68; Todd A. Schlenke, David J. Begun, and Margaret G. Kidwell, "Strong Selective Sweep Associated with a Transposon Insertion in *Drosophila simulans*," *Proceedings of the National Academy of Sciences of the USA* 101, no. 6 (2004): 1626–31; Doris Bachtrog, Jeffrey D. Jensen, and Zhi Zhang, "Accelerated Adaptive Evolution on a Newly Formed X Chromosome," *PLoS Biology* 7, no. 4:e1000082 (2009): 712–19.

[22]Chris R. Feldman, Edmund D. Brodie Jr., Edmund D. Brodie III, and Michael E. Pfrender, "The Evolutionary Origins of Beneficial Alleles during the Repeated Adaptation of Garter Snakes to Deadly Prey," *Proceedings of the National Academy of Sciences of the USA* 106, no. 32 (2009): 13415–20; Vera S. Domingues et al., "Evidence of Adaptation from Ancestral Variation in Young Populations of Beach Mice," *Evolution* 66, no. 10 (2012): 3209–23.

[23]Michael Dean et al., "Genetic Restriction of HIV-1 Infection and Progression to AIDS by a Deletion Allele of the CKR5 Structural Gene," *Science* 273, no. 5283 (1996):

1856–62; Patricia Long, "A Town with a Golden Gene," *Health* 8, no. 1 (1994): 60–66; Kun Tang, Kevin R. Thornton, and Mark Stoneking, "A New Approach for Using Genome Scans to Detect Recent Positive Selection in the Human Genome," *PLoS Biology* 5, no. 7:e171 (2007): 1587–602; Scott H. Williamson et al., "Localizing Recent Adaptive Evolution in the Human Genome," *PLoS Genetics* 3, no. 6:e90 (2007): 901–15.

[24]Kurt P. Wise, "The Flores Skeleton and Human Baraminology," *OPBSG* 6 (2005): 1–13.

[25]George F. Howe and Walter E. Lammerts, "Biogeography from a Creationist Perspective: II. The Origin and Distribution of Cultivated Plants," *CRSQ* 17 (1980): 4–18; Alex Williams, "Mutations: Evolution's Engine Becomes Evolution's End!," *JC* 22, no. 2 (2008): 60–66; Jerry Bergman, "The Pleiotropy Problem for Evolution," *CRSQ* 46 (2010): 284–89; Alex Williams, "Healthy Genomes Require Recent Creation," *JC* 29, no. 2 (2015): 70–77.

[26]Carl Wieland, "Antibiotic Resistance in Bacteria," *CENTJ* 8, no. 1 (1994): 5–6; Eric Penrose, "Bacterial Resistance to Antibiotics—A Case of Un-natural Selection," *CRSQ* 35 (1998): 76–83; Jerry Bergman, "Does the Acquisition of Antibiotic and Pesticide Resistance Provide Evidence for Evolution?," *TJ* 17, no. 1 (2003): 26–32; Daniel C. Criswell, "A Review of Mitoribosome Structure and Function Does Not Support the Serial Endosymbiotic Theory," *ARJ* 2 (2009): 107–15.

[27]Pierrick Labbé et al., "Forty Years of Erratic Pesticide Resistance Evolution in the Mosquito *Culex pipiens*," *PLoS Genetics* 3, no. 11:e205 (2007): 2190–99; McGee et al., "Payoffs, Not Tradeoffs."

[28]Ostrowski et al., "Pleitropic Effects of Beneficial Mutations in *Escherichia coli*."

[29]Cheng Zou, Melissa D. Lehti-Shiu, Michael Thomashow, and Shin-Han Shiu, "Evolution of Stress-Related Gene Expression in Duplicate Genes of *Arabidopsis thaliana*," *PLoS Genetics* 5, no. 7:e1000581 (2009): 1–13; Matthew T. Rutter, Katilyn V. Cross, and Patrick A. Van Woert, "Birth, Death, and Subfunctionalization in the *Arabidopsis* Genome," *Trends in Plant Science* 17, no. 4 (2012): 204–12.

[30]Zou et al, "Evolution of Stress-Related Gene Expression"; Macarena Toll-Riera, Alvaro San Millan, Andreas Wagner, and R. Craig MacLean, "The Genomic Basis of Evolutionary Innovation in *Pseudomonas aeruginosa*," *PLoS Genetics* 12, no. 5:e51006005 (2016): 1–21.

[31]Lane P. Lester and Raymond G. Bohlin, "After His Kind: The Biological Unit of Creation," in *Proceedings of the First International Conference on Creationism*, vol. 1, ed. Robert E. Walsh, Chris L. Brooks, and Richard S. Crowell (Pittsburgh, PA: Creation Science Fellowship, 1986), 5 pp.; L. James Gibson, "Pseudogenes and Origins," *Origins* 21, no. 2 (1994): 91–108; Yingguang Liu and Dan Moran, "Do New Functions Arise by Gene Duplication?," *JC* 20, no. 2 (2006): 82–89; Y. Liu and D. Moran, "Do New Molecular Functions Arise by Gene Duplication?," *OPBSG* 8 (2006): 12; Timothy G. Standish, "Genomes and Design," *Origins* 60 (2007): 61–64; Mike R. Arneigh, "It's a Small World—MicroRNA Cuts Evolution Down to Size," *JC* 27, no. 2 (2013): 85–90.

[32]Per A. Larssen, "Mutation and Natural Selection: The Central Dogma of Neo-Darwinian Evolution," *CRSQ* 45 (2009): 271–81; Christopher L. Rupe and John C. Sanford, "Using Numerical Simulation to Better Understand Fixation Rates, and Establishment of a New Principle: Haldane's Ratchet," in *Proceedings of the Seventh International Conference on Creationism*, ed. Mark Horstemeyer (Pittsburgh, PA: Creation Science Fellowship, 2013), 17 pp.

[33]Jerry Bergman, "The Mutation Repair Systems: A Major Problem for Macroevolution," *CRSQ* 41 (2005): 265–73.

[34]Joseph and Hall, "Spontaneous Mutations in Diploid *Saccharomyces cerevisiae*"; Tang et al., "A New Approach for Using Genome Scans"; Stevens and Sebert, "Frequent Beneficial Mutations"; Arribas et al., "Identification of Mutations"; Schoustra et al., "Multivariate Phenotypic Divergence"; McGee et al., "Payoffs, Not Tradeoffs."

[35]Stevens and Sebert, "Frequent Beneficial Mutations."

[36]Borger, "Evidence for the Design of Life: Part 2"; ___, "The Design of Life: Part 3—An Introduction to Variation-Inducing Genetic Elements," *JC* 23, no. 1 (2009): 99–106; ___, "The Design of Life: Part 4—Variation-Inducing Genetic Elements and Their Function," *JC* 23, no. 1 (2009): 107–14; Jean K. Lightner, "Comparative Cytogenetics and Chromosomal Arrangements," *JC* 24, no. 1 (2010): 6–8; Peer Terborg, "The 'VIGE-first Hypothesis'—How Easy It Is to Swap Cause and Effect," *JC* 27, no. 3 (2013): 105–12; Alex Williams, "Beneficial Mutations: Real or Imaginary?—Part 2," *JC* 28, no. 2 (2014): 75–82.

[37]Linda K. Walkup, "Junk DNA: Evolutionary Discards or God's Tools?," *CENTJ* 14, no. 2 (2000): 18–30; Don Batter, "C4 Photosynthesis—Evolution or Design?," *TJ* 16, no. 2 (2002): 13–15; Evan L. Shan, "Transposon Amplification in Rapid Intrabaraminic Diversification," *JC* 23, no. 2 (2009): 110–17.

[38]Todd C. Wood, "The AGEing Process: Rapid Post-Flood Intrabaraminic Diversification Caused by Altruistic Genetic Elements (AGEs)," *Origins* 54 (2002): 5–34.

[39]Senter and Mackey, "The Evolution of Creation Science, Part 1."

[40]Wood, "The AGEing Process."

[41]Matthew E. Ingle, "Parasitology and Creation," *ARJ* 8 (2015): 65–75.

[42]Borger, "The Design of Life: Part 4."

[43]___, "Evidence for the Design of Life: Part 2"; ___, "The Design of Life: Part 3."

[44]Terborg, "The 'VIGE-first Hypothesis.'"

[45]Jean K. Lightner, "Mutations, Selection, and the Quest for Meatier Livestock," *TJ* 19, no. 2 (2005): 20; ___, "Gain-of-Function Mutations: At a Loss to Explain Molecules-to-Man Evolution," *TJ* 19, no. 3 (2005): 7–8.

[46]___, "Identification of Species within the Sheep-Goat Kind (Tsoan Monobaramin)," *JC* 20, no. 3 (2006): 61–65; ___, "Identification of Species with the Cattle Monobaramin (Kind)," *JC* 21, no. 1 (2007): 119–22; ___, "Genetics of Coat Color I: The Melanocortin 1 Receptor (MC1R)," *ARJ* 1 (2008): 109–16.

[47]Margaret G. Kidwell and Damon R. Lisch, "Perspective: Transposable Elements, Parasitic DNA, and Genome Evolution," *Evolution* 55, no. 1 (2001): 1–24.

[48]Anne Simon Moffat," Transposons Help Sculpt a Dynamic Genome," *Science* 289, no. 5484 (2000): 1455–57; Schlenke et al., "Strong Selective Sweep"; Christian Parisod et al., "Impact of Transposable Elements on the Organization and Function of Allopolyploid Genes," *New Phytologist* 186, no. 1 (2010): 37–45.

[49]Gordon Wilson, "The Origins of Natural Evil," *OPBSG* 4 (2004): 8.

[50]See endnotes 16–23.

ASA Members: Submit comments and questions on this article at www.asa3.org→FORUMS→PSCF DISCUSSION.