BOSTON COLLEGE
SCHOOL OF THEOLOGY AND MINISTRY
Academic Year 2016-2017

Human Genetics and Biotechnologies: Challenges for Science and Religion

Spring 2017 - Credit Hours: 3

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Office Hours:
Wednesday: 10:30 AM-12:00 noon
or by e-mail appointment

In dialogue with scientists, philosophers, and theologians, the course: examines current developments in developing scientific disciplines; studies the challenges and implications for medicine, society, and religion that concern these developments; and explores ways to address these challenges and implications that are scientifically relevant and religiously inspired in the context of the new evangelization. In its three parts, the course examines, first, human genetics by focusing on: genetic information, testing, screening, therapy, pharmacogenomics, and enhancement. Second, the course studies new biotechnologies that rely on genetics (i.e., synthetic biology and regenerative medicine). Third, the course discusses current biotechnological developments in neuroscience, oncofertility, nanotechnology, cybertechnology, robotics, artificial intelligence, and astrobiology.

Learning goals/objectives
By the end of the course, the students will be able to:
1) acquire scientific literacy to discuss current biotechnological developments;
2) identify and analyze challenges and implications for medicine, society, and religion raised by contemporary biotechnological developments;
3) engage in dialogue with scientists working in these areas of biotechnological research;
4) address challenges and implications by relying on contributions from science and religion;
5) integrate these challenges and implications in an articulated pastoral approach to evangelization.

Reading materials
The readings include **a selection of readings for each session**. They are available online (pdf) in the course's Canvas, i.e., the interactive web site accessible through Agora portal (or http://cms.bc.edu). The books indicated in the Syllabus are available at the *School of Theology and Ministry Library Course Reserve*. Extra readings are provided to facilitate your further research.

Responsibilities
The course requires that the students attend the sessions, do all the assigned readings in preparation for each session, participate actively in class discussions, and submit the papers on time. If unable to attend a session, please **e-mail me by noon** the day before, explaining why.
Regular and punctual attendance is required. Students are allowed two unexcused absences. Three or more unexcused absences will result in the loss of the grade awarded for the student's attendance. Absences may be excused with either: (1) advance permission from the instructor or (2) documentation after the absence, such as a doctor's note.
Preparedness consists of familiarity with the readings. Participation implies engagement in class discussion on the readings assigned for each session.
Take notes as you do your reading. Think about the issues raised, the information that the Authors are conveying, the questions and concerns that you have. You should contribute thoughtful ideas, opinions, and questions to our discussions.

On the readings assigned for each session:
- identify the Authors' major theses;

- highlight the Authors' strengths and limits;
- write at least three personal questions to contribute to our class discussion.

Requirements and evaluation criteria
The course requirements are:

1) **one page-long summary-synthesis and three questions on the readings assigned for Session 2**. Please write a short personal reasoned summary, integrated by your critical reflection and by three conclusive questions on the readings assigned for the session. Upload your page on the appropriate Canvas section at the latest on the day before class, before 12:00 noon **(5 points, 5%)**;
2) **one page-long summary-synthesis and three questions on the readings assigned for Session 5**. Please write a short personal reasoned summary, integrated by your critical reflection and by three conclusive questions on the readings assigned for the session. Upload your page on the appropriate Canvas section at the latest on the day before class, at 12:00 noon **(5 points, 5%)**;
3) **one short reflection paper,** 500 words long **(20 points, 20%)**. In the short reflection paper, you will reflect on the readings and discussions of sessions 7, 8, and 9. The following question might help you: "What are the challenges that these scientific developments raise for religious discourse and practice?" This short paper is due the day before Session 10, no later than 12:00 noon. Upload your reflection paper on the appropriate Canvas section.
4) **the student's attendance (10 points, 10%)**;
5) **the student's participation in class discussions (10 points, 10%);**
6) the final exam **(50 points, 50%)** will be replaced by one of two <u>alternative</u> options:

   (a) a **final 20-page research paper**, due on Wednesday, May 10, 2017 at 12:00 noon. The **20-page research paper** will study a specific topic chosen among the topics addressed during the course, by focusing on one or more specific aspects. Research need not to be extensive, but should be adequate to allow you to address the topic of interest with some degree of mastery and insight. Each student will discuss the topic with me. To decide your topic: e-mail to me the title, the material that you will use, and how you plan to develop the topic by **Friday, March 17, 2017 (before 12:00 noon)**.

   (b) **two 10-page synthesis papers:** the first is due on Friday, March 17, 2017, at 12:00 noon and the second is due on Wednesday, May 10, 2017, at 12:00 noon **(50 points, 50%).** Each of the two synthesis papers will provide a critical synthesis of the topics studied (i.e., readings, lectures, and class discussions). In particular, the first synthesis paper will concern the sessions that preceded the deadline (i.e., the first half of the semester); the second synthesis paper will concern all the other sessions (i.e., the second half of the semester).

<u>Paper/s delivery</u>
In both cases (i.e., one research paper or two synthesis papers), upload the <u>electronic copy</u> of the paper on Canvas, in the appropriate section, before the deadline/s.

Course overview
Part I: HUMAN GENETICS
- Session 1: Genetic information and research
- Session 2: Genetic testing and screening
- Session 3: Genetic therapy
- Session 4: Pharmacogenomics
- Session 5: Genetic enhancement

Part II: FROM GENETICS TO NEW BIOTECHNOLOGIES
- Session 6: Synthetic biology
- Session 7: Regenerative medicine

Part III: CURRENT BIOTECHNOLOGICAL DEVELOPMENTS
Session 8: Neuroscience
Session 9: Oncofertility
Session 10: Nanotechnology
Session 11: Cybertechnology
Session 12: Robotics and artificial intelligence
Session 13: Transhumanism
Session 14: Astrobiology

Readings assigned for each session

Part I: HUMAN GENETICS

Session 1: **Genetic information and research**

1) S. Mnookin, "One of a Kind," *New Yorker*, 21 July 2014, 32-38.
2) G. Gillett and A.J. Tamatea. "The Warrior Gene: Epigenetic Considerations," *New Genetics and Society* 31, no. 1 (2012) 41-53.
3) M.T. White, "Making Sense of Genetic Uncertainty: The Role of Religion and Spirituality," *American Journal of Medical Genetics Part C: Seminars in Medical Genetics* 151C, no. 1 (2009) 68-76.
4) L.R. Churchill, "Religion, Spirituality, and Genetics: Mapping the Terrain for Research Purposes," *American Journal of Medical Genetics Part C: Seminars in Medical Genetics* 151C, no. 1 (2009) 6-12.
5) N.S. Downing and J. S. Ross, "Innovation, Risk, and Patient Empowerment: The FDA-Mandated Withdrawal of 23andMe's Personal Genome Service," *JAMA* 311, no. 8 (2014) 793-794.
6) L. Orlando and E. Willerslev, "Evolution. An Epigenetic Window into the Past?," *Science* 345, no. 6196 (2014) 511-512.

<u>*Extra readings*</u>

1) Congregation for the Doctrine of the Faith, *Dignitas personae* (2008) nn. 24-27: available at: http://www.vatican.va/roman_curia/congregations/cfaith/documents/rc_con_cfaith_doc_20081208_dignitas-personae_en.html
2) Benedict XVI, *Address to the XVth Assembly of the Pontifical Academy for Life* (02/21/2009) available at: http://www.vatican.va/holy_father/benedict_xvi/speeches/2009/february/documents/hf_ben-xvi_spe_20090221_accademia-vita_en.html
3) M.J. Iozzio, "Genetic Anomaly or Genetic Diversity: Thinking in the Key of Disability on the Human Genome," *Theological Studies* 66, no. 4 (2005) 862-881.

Session 2: **Genetic testing and screening**

1) A. Boesky, *What We Have: A Memoir* (New York: Gotham Books, 2010): "What We Knew" 23-35; "What We Know (Now)" 295-314.
2) C. Dunsford, *Spelling Love with an X: A Mother, A Son, and the Gene that Binds Them* (Boston: Beacon Press, 2007): ch. 1 "Anticipation: Once upon a Time," 3-16; ch. 2 "Hairpin Turns: Doctors and Divorce," 17-25; ch. 3 "Linkage: Family Ties," 26-34.
3) R. Daley, et al., "Non-Invasive Prenatal Diagnosis: Progress and Potential," *Archives of Disease in Childhood. Fetal and Neonatal Edition* 99, no. 5 (2014) F426-430.
4) P. Twiss, et al., "Non-Invasive Prenatal Testing for Down Syndrome," *Seminars in Fetal and Neonatal Medicine* 19, no. 1 (2014) 9-14.
5) W.D. Winkelman, et al., "Public Perspectives on the Use of Preimplantation Genetic Diagnosis," *Journal of Assisted Reproduction and Genetics* 32, no. 5 (2015) 665-675.
6) B. Doolin and J. Motion, "Christian Lay Understandings of Preimplantation Genetic Diagnosis," *Public Understanding of Science* 19, no. 6 (2010) 669-685.

Extra readings

1) Gail Geller, et al., "The Role and Impact of Personal Faith and Religion among Genetic Service Providers," *American Journal of Medical Genetics Part C: Seminars in Medical Genetics* 151C, no. 1 (2009) 31-40.

Session 3: **Genetic therapy**

1) T. Wirth, et al., "History of Gene Therapy," *Gene* 525, no. 2 (2013) 162-169.
2) M. Kiuru and R. G. Crystal, "Progress and Prospects: Gene Therapy for Performance and Appearance Enhancement," *Gene Therapy* 15, no. 5 (2008) 329-337.
3) M.K. Brenner, et al., "Is Cancer Gene Therapy an Empty Suit?," *Lancet Oncology* 14, no. 11 (2013) e447-456.
4) G.F. Weber, "Gene Therapy–Why Can It Fail?," *Medical Hypotheses* 80, no. 5 (2013) 613-616.
5) K.F. Buckland and H.B. Gaspar, "Gene and Cell Therapy for Children–New Medicines, New Challenges?," *Advanced Drug Delivery Reviews* 73 (2014) 162-169.
6) J.H. Doroshow and S. Kummar, "Translational Research in Oncology–10 Years of Progress and Future Prospects," *Nature Reviews Clinical Oncology* 11, no. 11 (2014) 649-662.
7) D. Ibraheem, et al., "Gene Therapy and DNA Delivery Systems," *International Journal of Pharmaceutics* 459, no. 1-2 (2014) 70-83.

Session 4: **Pharmacogenomics**

1) D.S. Jones, "How Personalized Medicine Became Genetic, and Racial: Werner Kalow and the Formations of Pharmacogenetics," *Journal of the History of Medicine and Allied Sciences* 68, no. 1 (2013) 1-48.
2) K.S. Hughes and J.C. Cusack, "Genetics, Genomics, and Pharmacogenomics," *Annals of Surgical Oncology* (2015) [1-4].
3) A.K. Daly, "Is There a Need to Teach Pharmacogenetics?," *Clinical Pharmacology & Therapeutics* 95, no. 3 (2014) 245-247.
4) J. Brunstein, "Personalized Medicine, Pharmacogenomics, and Companion Diagnostics. Current and Future Applications of Molecular Diagnostics Will Influence These Emerging Fields," *Medical Laboratory Observer* 47, no. 2 (2015) 22-23.
5) S.G. Johnson, "Leading Clinical Pharmacogenomics Implementation: Advancing Pharmacy Practice," *American Journal of Health-System Pharmacy* 72, no. 15 (2015) 1324-1328.

Session 5: **Genetic enhancement**

1) J. Habermas, *The Future of Human Nature* (Cambridge, UK: Polity, 2003) 53-74; 101-115.
2) R. Cole-Turner, "Extreme Longevity Research: A Progressive Protestant Perspective," in *Religion and the Implications of Radical Life Extension*, eds. D.F. Maher and C.R. Mercer (New York: Palgrave Macmillan, 2009) 51-61.
3) K. FitzGerald, "Medical Enhancement: A Destination of Technological, Not Human, Betterment," in *Medical Enhancement and Posthumanity*, eds. B. Gordijn and R. Chadwick (New York: Springer Dordrecht, 2008) 39-53.
4) M.J. Mehlman, "Genetic Enhancement in Sport: Just Another Form of Doping?," *Recent Patents on DNA & Gene Sequences* 6, no. 3 (2012) 240-246.

Part II: FROM GENETICS TO NEW BIOTECHNOLOGIES

Session 6: **Synthetic biology**

1) M. Specter, "A Life of Its Own: Where Will Synthetic Biology Lead Us?" *New Yorker*, 28 September 2009, 56-65.
2) Z. Abil, et al., "Synthetic Biology for Therapeutic Applications," *Molecular Pharmaceutics* 12, no. 2 (2015) 322-331.
3) R. Breitling and E. Takano, "Synthetic Biology Advances for Pharmaceutical Production," *Current Opinion in Biotechnology* 35C (2015) 46-51.
4) A.E Escalante, et al., "Ecological Perspectives on Synthetic Biology: Insights from Microbial Population Biology," *Frontiers in Microbiology* 6, art. 143 (2015) [10 pages].

5) X. Hu and R. Rousseau, "From a Word to a World: The Current Situation in the Interdisciplinary Field of Synthetic Biology," *PeerJ* 3 (2015) e728 [16 pages].
6) H. Konig, et al., "Responsibility and Intellectual Property in Synthetic Biology: A Proposal for Using Responsible Research and Innovation as a Basic Framework for Intellectual Property Decisions in Synthetic Biology," *EMBO Reports* (2015) [5 pages].
7) B. Zakeri and P.A. Carr, "The Limits of Synthetic Biology," *Trends in Biotechnology* 33, no. 2 (2015) 57-58.
8) R. Cole-Turner, "Synthetic Biology: Theological Questions about Biological Engineering," in *Without Nature? A New Condition for Theology*, eds. D. Albertson and C. King (New York: Fordham University Press, 2010) 136-151 (endnotes: 403-406).
9) N. Dragojlovic and E. Einsiedel, "Playing God or Just Unnatural? Religious Beliefs and Approval of Synthetic Biology," *Public Understanding of Science* 22, no. 7 (2013) 869-885.

Extra readings

1) A. Deplazes, "Piecing Together a Puzzle: An Exposition of Synthetic Biology," *EMBO Reports* 10, no. 5 (2009) 428-432.
2) E. Pennisi, "Genetic Engineering: Two Steps Forward for Synthetic Biology," *Science* 325, no. 5943 (2009) 928-929.
3) C.W. Schmidt, "Synthetic Biology: Environmental Health Implications of a New Field," *Environmental Health Perspectives* 118, no. 3 (2010) 118-123.
4) J.J. Collins, "Synthetic Biology: Bits and Pieces Come to Life," *Nature* 483, no. 7387 (2012) S8-10.
5) J. Conant, "Weird Science: The Promise and Peril of Synthetic Biology," *Earth Island Journal* 27, no. 3 (2012) 18-23.
6) R. Kitney and P. Freemont. "Synthetic Biology - the State of Play," *FEBS Letters* 586, no. 15 (2012) 2029-2036.
7) P. Oldham, et al. "Synthetic Biology: Mapping the Scientific Landscape," *PLoS One* 7, no. 4 (2012) e34368. [16 pages].

Session 7: **Regenerative medicine**

1) S.-Z. Lin, "Era of Stem Cell Therapy for Regenerative Medicine and Cancers: An Introduction for the Special Issue of Pan Pacific Symposium on Stem Cells and Cancer Research," *Cell Transplantation* 24, no. 3 (2015) 311-312.
2) Y. Liu and D.-A. Wang, "Viral Vector-Mediated Transgenic Cell Therapy in Regenerative Medicine: Safety of the Process," *Expert Opinion on Biological Therapy* 15, no. 4 (2015) 559-567.
3) C. Qi, et al., "Biomaterials as Carrier, Barrier and Reactor for Cell-Based Regenerative Medicine," *Protein & Cell* 6, no. 9 (2015) 638-653.
4) I. Wilmut, "From Germ Cell Preservation to Regenerative Medicine: An Exciting Research Career in Biotechnology," *Annual Review of Animal Biosciences* 2 (2014) 1-21.
5) M.Z. Ratajczak, et al., "New Advances in Stem Cell Research: Practical Implications for Regenerative Medicine," *Polskie Archiwum Medycyny Wewnętrznej* 124, no. 7-8 (2014) 417-426.
6) A. Rosemann, "Why Regenerative Stem Cell Medicine Progresses Slower Than Expected," *Journal of Cellular Biochemistry* 115, no. 12 (2014) 2073-2076.

Extra readings

1) H. Fountain, "A First: Organs Tailor-Made with Body's Own Cells," *New York Times*, September 15, 2012.
2) H. Fountain, "Human Muscle, Regrown on Animal Scaffolding," *New York Times*, September 16, 2012.
3) H. Fountain, "One Day, Growing Spare Parts inside the Body," *New York Times*, September 17, 2012.
4) F. Berthiaume, et al. "Tissue Engineering and Regenerative Medicine: History, Progress, and Challenges," *Annual Revue of Chemical and Biomolecular Engineering* 2 (2011) 403-430.

5) E.J. Culme-Seymour, et al. "A Decade of Cell Therapy Clinical Trials (2000-2010)," *Regenerative Medicine* 7, no. 4 (2012) 455-462.
6) C. Mason, et al. "Cell Therapy Industry: Billion Dollar Global Business with Unlimited Potential," *Regenerative Medicine* 6, no. 3 (2011) 265-272.
7) D.J. Polak, "Regenerative Medicine. Opportunities and Challenges: A Brief Overview," *Journal of the Royal Society Interface* 7 Suppl 6 (2010) S777-781.
8) C. Power and J.E.J. Rasko. "Promises and Challenges of Stem Cell Research for Regenerative Medicine," *Annals of Internal Medicine* 155, no. 10 (2011) 706-713.
9) F.M. Shaikh, et al. "Regenerative Medicine, Tissue Engineering and Vascular Surgery: Twenty First Century Clinical Challenges," *Irish Journal of Medical Science* 179, no. 1 (2010) 1-2.

Part III: CURRENT BIOTECHNOLOGICAL DEVELOPMENTS

Session 8: **Neuroscience**

1) L.A. Jorgenson, et al., "The BRAIN Initiative: Developing Technology to Catalyse Neuroscience Discovery," *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences* 370, no. 1668 (2015) [12 pages].
2) M. Altinay, et al., "A Comprehensive Review of the Use of Deep Brain Stimulation (DBS) in Treatment of Psychiatric and Headache Disorders," *Headache* 55, no. 2 (2015) 345-350.
3) National Institutes of Health, *BRAIN 2025: A Scientific Vision: Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Working Group Report to the Advisory Committee to the Director, NIH* (Bethesda, MD: National Institutes of Health, 2014) 11-19 and 76-127.
4) Y. Frégnac and G. Laurent, "Neuroscience: Where Is the Brain in the Human Brain Project?," *Nature* 513, no. 7516 (2014) 27-29.
5) J.J. Fins and Z.E. Shapiro, "Deep Brain Stimulation, Brain Maps and Personalized Medicine: Lessons from the Human Genome Project," *Brain Topography* 27, no. 1 (2014) 55-62.

Extra readings

1) J.D. Van Horn and K.A. Pelphrey, "Neuroimaging of the Developing Brain," *Brain Imaging and Behavior* 9, no. 1 (2015) 1-4.
2) C. Esopenko and B. Levine, "Aging, Neurodegenerative Disease, and Traumatic Brain Injury: The Role of Neuroimaging," *Journal of Neurotrauma* 32, no. 4 (2015) 209-220.

Session 9: **Oncofertility**

1) S. Lange, et al., "Oncofertility: An Emerging Discipline in Obstetrics and Gynecology," *Obstetrical & Gynecological Survey* 68, no. 8 (2013) 582-593.
2) R. Moffat and U. Güth, "Preserving Fertility in Patients Undergoing Treatment for Breast Cancer: Current Perspectives," *Breast Cancer: Targets and Therapy* 6 (2014) 93-101.
3) S. Yee, et al., "Addressing Oncofertility Needs: Views of Female Cancer Patients in Fertility Preservation," *Journal of Psychosocial Oncology* 30, no. 3 (2012) 331-346.
4) L.W. Trost and R.E. Brannigan. "Oncofertility and the Male Cancer Patient," *Current Treatment Options in Oncology* 13, no. 2 (2012) 146-160.
5) K.E. Dillon and C.R. Gracia, "Pediatric and Young Adult Patients and Oncofertility," *Current Treatment Options in Oncology* 13, no. 2 (2012) 161-173.
6) S.A. Wallace, et al., "Fertility Preservation in the Transgender Patient: Expanding Oncofertility Care Beyond Cancer," *Gynecological Endocrinology* 30, no. 12 (2014) 868-871.

Extra readings

1) T.K. Woodruff, "The Emergence of a New Discipline: Oncofertility," in *Oncofertility: Fertility Preservation for Cancer Survivors*, ed. T.K. Woodruff and K.A. Snyder (New York: Springer, 2007) 3–11.
2) J. Donnez, et al. "Live Birth after Allografting of Ovarian Cortex between Genetically Non-Identical Sisters," *Human Reproduction* 26, no. 6 (2011) 1384-1388.
3) J. Donnez, et al. "Restoration of Ovarian Function after Allografting of Ovarian Cortex between Genetically Non-Identical Sisters," *Human Reproduction* 25, no. 10 (2010) 2489-2495.

4) P. Lauritzen, "Technology and Wholeness: Oncofertility and Catholic Tradition," *Cancer Treatment Research* 156 (2010) 295-306.
5) S.L. Gardino, et al. "Using Decision Trees to Enhance Interdisciplinary Team Work: The Case of Oncofertility," *Journal of Assisted Reproduction and Genetics* 27, no. 5 (2010) 227-231.

Session 10: **Nanotechnology**

1) C.L. Peterson, "Nanotechnology: From Feynman to the Grand Challenge of Molecular Manufacuring," *IEEE Technology and Society Magazine* 23, no. 4 (2004) 9-15.
2) J. van den Hoven and P.E. Vermaas, "Nano-Technology and Privacy: On Continuous: Surveillance Outside the Panopticon," *Journal of Medicine and Philosophy* 32 (2007) 283–297.
3) S.R. Davies, et al., "'All Things Weird and Scary': Nanotechnology, Theology and Cultural Resources," *Culture and Religion* 10, no. 2 (2009) 201-220.
4) N. Pidgeon, et al., "Nanotechnology Risk Perceptions and Communication: Emerging Technologies, Emerging Challenges," *Risk Analysis* 31, no. 11 (2011) 1694-1700.
5) L.A. Reisch, et al., "'Better Safe Than Sorry': Consumer Perceptions of and Deliberations on Nanotechnologies," *International Journal of Consumer Studies* 35, no. 6 (2011) 644-654.
6) J. Conti, et al. "Vulnerability and Social Justice as Factors in Emergent US Nanotechnology Risk Perceptions," *Risk Analysis* 31, no. 11 (2011) 1734-1748.
7) R. Milford and J.M. Wetmore, "A New Model for Public Engagement: The Dialogue on Nanotechnology and Religion," in *Nanotechnology, the Brain, and the Future*, ed. S.A. Hays (Dordrecht and New York: Springer, 2013) 97-111.

Session 11: **Cybertechnology**

1) A. Miah, et al., *The Medicalization of Cyberspace* (London: Routledge, 2008) pp. 126.

Extra readings

1) D.J. Haraway, "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century," in *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York: Routledge, 1991) 149-181.
2) V. Schlör, "Cyborgs: Feminist Approaches to the Cyberworld," *Concilium* 1 (2005) 60-67.
3) M. Coeckelbergh, "The Spirit in the Network: Models for Spirituality in a Technological Culture," *Zygon* 45 (2010) 957–978.

Session 12: **Robotics and artificial intelligence**

1) R. Sparrow, "Killer Robots," *Journal of Applied Philosophy* 24, no. 1 (2007) 62-77.
2) M. Schulzke, "Robots as Weapons in Just Wars," *Philosophy & Technology* 24 (2011) 293-306.
3) M. Schulzke, "Autonomous Weapons and Distributed Responsibility," *Philosophy & Technology* (2012) [online: 17 pages].
4) R.M. Geraci, "Robotics and Religion," in *Encyclopedia of Sciences and Religions*, eds. A.L.C. Runehov and L. Oviedo (Dordrecht and New York: Springer, 2013) 2067-72.
5) R.M. Geraci, "Robots and the Sacred in Science and Science Fiction: Theological Implications of Artificial Intelligence," *Zygon* 42, no. 4 (2007) 961-980.
6) R.M. Geraci, "The Popular Appeal of Apocalyptic AI," *Zygon* 45, no. 4 (2010) 1003-1020.

Extra reading

1) L. Tamatea, "If Robots R–Us, Who Am I: Online 'Christian' Responses to Artificial Intelligence," *Culture and Religion* 9, no. 2 (2008) 141-160.

Session 13: **Transhumanism**

1) J.J. Hughes, "The Politics of Transhumanism and the Techno-Millennial Imagination, 1626-2030," *Zygon* 47, no. 4 (2012) 757-776.
2) H. Tirosh-Samuelson, "Transhumanism as a Secularist Faith," *Zygon* 47, no. 4 (2012) 710-734.
3) T.J. Trothen, "Transhumanism and Religion: Glimpsing the Future of Human Enhancement," in *Religion and Transhumanism: The Unknown Future of Human Enhancement*, eds. C.R. Mercer and T.J. Trothen (Santa Barbara: Praeger, 2014) 385-399.

4) J.H. Evans, "Faith in Science in Global Perspective: Implications for Transhumanism," *Public Understanding of Science* 23, no. 7 (2014) 814-832.
5) J. Hughes, "Contradictions from the Enlightenment Roots of Transhumanism," *Journal of Medicine and Philosophy* 35, no. 6 (2010) 622-640.

Extra readings

1) R.M. Geraci, "There and Back Again: Transhumanist Evangelism in Science Fiction and Popular Science," *Implicit Religion* 14.2 (2011) 141-172.
2) R.M. Geraci, "Video Games and the Transhuman Inclination," *Zygon* 47, no. 4 (2012) 735-756.

Session 14: **Astrobiology**

1) G. Wolf-Chase, "Astronomy: From Star Gazing to Astrobiology," in *The Routledge Companion to Religion and Science*, eds. J.W. Haag, G.R. Peterson, and M.L. Spezio, (London and New York: Routledge, 2012) 103-112.
2) S.J. Dick, "The Societal Impact of Extraterrestrial Life: The Relevance of History and the Social Sciences," in *The Routledge Companion to Religion and Science*, eds. J.W. Haag, G.R. Peterson, and M.L. Spezio, (London and New York: Routledge, 2012) 227-257.
3) C.M. Bertka, "Christianity's Response to the Discovery of Extraterrestrial Intelligent Life: Insights from Science and Religion and the Sociology of Religion," in *Astrobiology, History, and Society Life Beyond Earth and the Impact of Discovery*, ed. D.A. Vakoch, (Berlin and New York: Springer, 2013) 329-340.

For Students with Disabilities

If you have a disability and will be requesting accommodations for this course, please register with either Kathy Duggan (Kathleen.duggan@bc.edu) Associate Director, Academic Support Services, the Connors Family Learning Center (learning disabilities and ADHD) or Paulette Durrett (paulette.durrett@bc.edu), Assistant Dean for Students with Disabilities (all other disabilities). Advance notice and appropriate documentation are required for accommodations.

Academic Integrity Policy

Plagiarism is the act of taking the words, ideas, data, illustrations, or statements of another person or source, and presenting them as one's own. Penalties at Boston College range from a grade penalty to dismissal from the University. To avoid plagiarism, any use of another's words or ideas must be fully cited. If in the original wording, quotation marks or blocked, indented quotations must be used. For more information regarding plagiarism and other violations of academic integrity, please consult the STM website at http://www.bc.edu/content/bc/schools/stm/acadprog/acadpol.html

The Writing Companions Corner

The Writing Companions Corner (WCC) offers students assistance at all stages of the writing process on their papers for this class—from the articulation of a thesis statement and developing an outline to the writing itself, editing and revision. Emphasis is on helping students build and hone skills so that they are transferrable to other papers and projects. Proofreading services are not offered through the Writing Companions Corner. For more information and/or to sign up for an appointment, consult the TML website and or STM News when classes are in session.

Grading Policy for Graduate Students

This policy is based on the Academic Policies of Boston College for Graduate Courses. All grading for graduate students in this course is reflective of these descriptions.

A	work is exceptional in every respect. There is an active and sophisticated engagement with all aspect of the course, demonstrated through careful analysis or creative treatment of the ideas covered. Both class participation and written work indicate outstanding mastery of content, originality of thought clearly expressed, and clarity in connecting course concepts with ministerial and theological interests.
A-	work is superior and above the average graduate level expectations. This involves mastery of the course content, recognition of the "big picture" within which course material is situated, and capacity to make cogent links with one's ministerial and theological position. This level is reflected in the ability to express one's thoughts effectively in writing and to contribute significantly to class conversation.
B+	work is more than satisfactory at the graduate level. This involves mastery of the course content and the ability to draw connections across course topics and with appropriate theological and ministerial topics. Contribution to class conversation gives evidence of both active listening and thoughtful participation. Written work is clear, focused and well organized.
B	work is clearly satisfactory at the graduate level. There is consistent engagement with, and a basic mastery of, the course material with a good command of the various topics.
B-	work is barely acceptable at the graduate level. This reflects a basic command of the course material, an adequate articulation of the connections across content areas, and a basic recognition of the implications for pastoral work.

C work is marginally acceptable at the graduate level. This is a basic mastery of most of the course materials but not all. It represents that you have slipped below an acceptable level of work in one or two areas.
F work is unsatisfactory and fails to meet the requirements of the course.

Grading Policy for Undergraduate Students
This policy is based on the Academic Policies of Boston College Undergraduate Courses. All grading for undergraduate students in this course is reflective of these descriptions.

A An outstanding performance with very strong evidence of:
- an insightful and comprehensive grasp of the subject matter;
- a clear ability to make sound and original critical evaluation of the material given;
- outstanding capacity for original creative and/or logical thought;
- an excellent ability to organize, to analyze, to synthesize, to integrate ideas, and to express thoughts both in speech and in writing.

A- Very good performance with strong evidence of:
- a comprehensive grasp of the subject matter;
- an ability to make sound critical evaluation of the material given;
- a good capacity for original, creative, and/or logical thinking;
- a very good ability to organize, to analyze, to synthesize, to integrate ideas, and to express thoughts both in speech and in writing.

B+ Above average performance with evidence of:
- a substantial knowledge of the subject matter;
- a good understanding of the relevant issues and a good familiarity with the relevant literature and techniques;
- some capacity for original, creative, and/or logical thinking;
- an above-average ability to organize, to analyze and to examine the subject material in a critical and constructive manner, and
- to express thoughts both in speech and in writing.

B A generally satisfactory and intellectually adequate performance with evidence of:
- an acceptable basic grasp of the subject material;
- a fair understanding of the relevant issues;
- a general familiarity with the relevant literature and techniques;
- an ability to develop solutions to moderately difficult problems related to the subject material;
- a moderate ability to examine the material in a critical and analytical manner, and to express thoughts in writing.

B- A barely acceptable performance with evidence of:
- a familiarity with the subject material;
- some evidence that analytical skills have been developed;
- some understanding of relevant issues;
- some familiarity with the relevant literature and techniques;
- partially successful attempts to solve moderately difficult problems related to the subject material and to examine the material in a critical and analytical manner;
- basic competence in writing.

C work is marginally acceptable at the undergraduate level. This is a basic mastery of most of the course materials but not all. It represents that you have slipped below an acceptable level of work in one or two areas.
F work is unsatisfactory and fails to meet the requirements of the course.