

ECONOMICS 7250  
Spring 2021

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CLASS MEETING TIME and PLACE: 10:45–12:05am TTh but switched by request of the students to 10:35–11:55am; on Zoom (connect via the Canvas page for this course).

TEXTBOOK:

Herman E. Daly and Kenneth Townsend, *Valuing the Earth: Economics, Ecology, Ethics*. MIT Press, 1993.

GRADING: The final exam will be comprehensive, and will be worth 75 points. The other 25 points of your grade will be determined by presentations on portions of books written or edited by Herman Daly.

POLICIES: (1) Incompletes will be given only for reasons of illness or a family emergency. You must supply evidence for the reason. (2) I will approve withdrawals at any time, subject to University regulations. (3) If you have a learning disability or for other reasons require special assistance in this course or during examinations, please notify me during the first week of class. (4) Cheating on exams and other forms of academic dishonesty may lead to expulsion from the class, failure of the class, or more severe penalties.

TENTATIVE SCHEDULE: (\* = see readings list, next two pages)

1/19: Biological Mechanics & Optimal Control Theory  
1/21, 1/26, 1/28, 2/2, 2/4, 2/9, 2/11: Fisheries (private-property)  
2/16, 2/18: Fisheries (open-access)  
2/23: Timber  
2/25, 3/2, 3/4, 3/9, 3/11: Exhaustible Resources  
3/16: Resources & Growth (Sustainability)\*  
3/18, 3/23, 3/25, 3/30: Entropy and Thermodynamics\*  
4/1, 4/6, 4/8, 4/13, 4/15: Daly & Ethics\*  
4/20: Methodology\*  
Friday 4/30: Final Exam, 10:30–12:30pm

1. Readings for the “Resources and Growth (Sustainability)” topic:

(a) Required Readings

- i. Lozada (1995), “Resource Depletion, National Income Accounting, and the Value of Optimal Dynamic Programs,” *Resource and Energy Economics* 17: 137–154.
- ii. V. Kerry Smith, ed., *Scarcity and Growth Reconsidered*, HC103.7 .S25. Pages 37 and 40–47, 61–62 by Stiglitz; pages 95–102 by Georgescu-Roegen.
- iii. Hanley, Shogren, and White, Ch. 2, “The Economics of Sustainable Development.”

(b) Unrequired Readings

- i. Stefano Bartolini and Luigi Bonatti (2002), “Environmental and Social Degradation as the Engine of Economic Growth,” *Ecological Economics* 43/1 (November): 1-16.
- ii. Wolfgang Buchholz, Swapan Dasgupta, and Tapan Mitra, (2005), “Intertemporal Equity and Hartwick’s Rule in an Exhaustible Resource Model,” *Scandinavian Journal of Economics* 107/3: 547–561.

2. Readings for the “Entropy and Thermodynamics” topic:

(a) Required Readings

- i. Herman E. Daly and Kenneth N. Townsend (1993), all of Part I.
- ii. Lozada, “Entropy and the Economic Process.” In Cutler J. Cleveland and Robert U. Ayres, eds., *Encyclopedia of Energy*, 2004, Volume 2, 471–478. Amsterdam: Elsevier. Held by the libraries of BYU and USU.
- iii. Lozada, “The Hotelling Rule for Entropy-Constrained Growth,” *Ecological Economics*, 2017.

(b) Unrequired Readings

- i. Frank L. Lambert, on new explanations of entropy in college chemistry textbooks: [www.entropysite.com](http://www.entropysite.com) and [www.entropysite.com/entropy\\_is\\_simple/index.html](http://www.entropysite.com/entropy_is_simple/index.html).
- ii. Erwin Schrödinger, Chapter 6 of *What is Life? The Physical Aspect of the Living Cell and Matter* (revised edition), QH331 .S3557.
- iii. Linus Pauling, “Schrödinger’s Contribution to Chemistry and Biology,” in C.W. Kilmister, ed., *Schrödinger: Centenary Celebration of a Polymath*, QC16.S265 S36 1987.
- iv. Max F. Perutz, “Erwin Schrödinger’s *What is Life?* and Molecular Biology,” in C.W. Kilmister, ed., *Schrödinger: Centenary Celebration of a Polymath*, QC16.S265 S36 1987.

- v. E. Gnaiger, “Negative Entropy for Living Systems: Controversy Between Nobel Laureates Schrödinger, Pauling and Perutz,” in E. Gnaiger, Frank N. Gellerich, and Markus Wyss, eds., *What Is Controlling Life? 50 Years After Erwin Schrödinger’s What is Life?* Innsbruck, Austria: Innsbruck University Press, 1994, ISBN 3901249176.

### 3. Readings for the “Daly & Ethics” topic:

#### (a) Required Readings

Herman E. Daly and Kenneth N. Townsend (1993), *Valuing the Earth: Economics, Ecology, Ethics*. Pages 11–47, Chapters 8, 9, 11, 12, and 16, and pages 324–363.

#### (b) Unrequired Readings

Herman E. Daly and John Cobb, Jr., *For the Common Good: Redirecting the Economy toward Community, the Environment, and a Sustainable Future*, 2nd edition, HD75.6 .D35 1994.

### 4. Readings for the “Methodology” topic:

#### (a) Required Readings:

- i. Nicholas Georgescu-Roegen (1972), *The Entropy Law and the Economic Process*, HB171 .G43. Pages xiii, 1–21, 330–345.

#### (b) Unrequired Readings

- i. Beard and Lozada (1999), *Economics, Entropy, and the Environment: The Extraordinary Economics of Nicholas Georgescu-Roegen*, HB119.G43 B4 1999. Pages 20–44.
- ii. Peter S. Albin, *Barriers and bounds to rationality : essays on economic complexity and dynamics in interactive systems*, HB135 .A555 1998.
- iii. Peter L. Bernstein, “The Great Gift of Uncertainty,” *Journal of Portfolio Management*, Summer 1996, Vol. 22 Issue 4.
- iv. M.C. Findlay, E.E. Williams, and J.R. Thompson, “Why We All Held Our Breath When the Market Reopened,” *Journal of Portfolio Management*, Spring 2003, Vol. 29 Issue 3, p91–100.
- v. Berc Rustem and Kumaraswamy Velupillai, “Rationality, Computability, and Complexity,” *Journal of Economic Dynamics and Control*, Volume 14, Issue 2, May 1990, Pages 419-432.
- vi. Alfred L. Norman and David W. Shimer, “Risk, Uncertainty, and Complexity,” *Journal of Economic Dynamics and Control*, Volume 18, Issue 1, January 1994, Pages 231–249.

## OTHER BOOKS OF INTEREST:

### 1. General Texts:

- (a) Nick Hanley, Jason F. Shogren, and Ben White, *Environmental Economics in Theory and Practice, Second Edition*. Palgrave Macmillan, 2007.
- (b) R. Quentin Grafton, Wiktor Adamowicz, Diane Dupont, Harry Nelson, Robert J. Hill, and Steven Renzetti, *The Economics of The Environment and Natural Resources*. Blackwell Publishing, 2004.
- (c) Jon Conrad and Colin W. Clark, *Natural Resource Economics: Notes and Problems*, HC 59. C693 1987
- (d) Partha S. Dasgupta and Geoffrey M. Heal, *Economic Theory and Exhaustible Resources*, HC 55. D37
- (e) John M. Hartwick and Nancy D. Olewiler, *The Economics of Natural Resource Use*, 2nd edition, Addison Wesley, 1998.
- (f) Geoffrey M. Heal, ed., *The Economics of Exhaustible Resources*, HC 13.2 E27 1993
- (g) Allen V. Kneese and James L. Sweeney, *Handbook of Natural Resource and Energy Economics*, HB 135. H357 volume 6 parts 1–3
- (h) Philip Neher, *Natural Resource Economics: Conservation and Exploitation*, HC 59. N382
- (i) David W. Pearce and R. Kerry Turner, *Economics of Natural Resources and the Environment*, HC 79. E5 P37 1990

### 2. Renewable Resources:

Colin W. Clark, *Mathematical Bioeconomics: the Optimal Management of Renewable Resources*, Second Edition. QH 705. C4 1990. ISBN-10: 0471508837, ISBN-13: 978-0471508830, also ISBN-10: 0471751529, ISBN-13: 978-0471751526. Also by the same author: *Mathematical Bioeconomics: The Mathematics of Conservation*, Third Edition. ISBN-10: 0470372990, ISBN-13: 978-0470372999.

### 3. Optimal Control Theory:

- (a) Atle Seierstad and Knut Sydsæter, *Optimal Control Theory with Economic Applications*, North-Holland, 1987.
- (b) Michael R. Caputo, *Foundations of dynamic economic analysis : optimal control theory and applications*, HB135 .C27 2005.
- (c) Alpha C. Chang, *Elements of Dynamic Optimization*, HB143.7 .C45 1992.
- (d) Morton I. Kamien and Nancy L. Schwartz, *Dynamic Optimization: The Calculus of Variations and Optimal Control in Economics and Management*, QA402.5 .K32.

- (e) Daniel Léonard and Ngo Van Long, *Optimal Control Theory and Static Optimization in Economics*, HB143.7 .L46 1992.
  - (f) Wei-Bin Zhang, *Differential Equations, Bifurcations, and Chaos in Economics*, HB135 .Z536 2005.
  - (g) Pierre N.V. Tu, *Dynamical Systems: An Introduction with Applications in Economics and Biology (2nd Edition)*, QA614.8 .T8 1992.
4. Ecological Economics
- (a) Nicholas Georgescu-Roegen, *The Entropy Law and the Economic Process*, HB 171. G43
  - (b) T. Randolph Beard and Gabriel A. Lozada, *Economics, Entropy, and the Environment: The Extraordinary Economics of Nicholas Georgescu-Roegen*, HB119.G43 B4 1999.
  - (c) Herman E. Daly, *Ecological Economics and Sustainable Development: Selected Essays of Herman Daly*, HD75.6 .V36 1993.
  - (d) Herman E. Daly, *Ecological economics and the ecology of economics : essays in criticism*, HC79.E5 D3243 1999.
  - (e) Malte Faber, Horst Niemes, and Gunter Stephan, *Entropy, Environment, and Resources: An Essay in Physico-Economics*, 2nd edition, HC79.E5 F2313 1995.
  - (f) Heinz D. Kurz and Neri Salvadori, "Fund-flow versus Flow-flow in Production Theory: Reflections on Georgescu-Roegen's Contribution," *Journal of Economic Behavior and Organization*, 2002, vol. 1496 pp. 1–19.
  - (g) Jeffrey S. Wicken, *Evolution, Thermodynamics, and Information: Extending the Darwinian Program*, QH371 .W53 1987.
  - (h) Dugdale, J. S. (1996), *Entropy and its Physical Meaning*. Bristol, Pennsylvania: Taylor & Francis Inc.
  - (i) Geoffrey M. Heal, *Valuing the Future: Economic Theory and Sustainability*, HD75.6 .H416 1998.
  - (j) Julian L. Simon, *The Ultimate Resource 2*, HB871 .S573 1996.
5. Current Debates:
- (a) Running out of Resources
    - i. Kenneth S. Deffeyes, *Hubbert's Peak : The Impending World Oil Shortage*, TN870. D37 2001.
    - ii. Paul Roberts, *The End of Oil : On the Edge of a Perilous New World*, HD9650.6 .R63 2004.
    - iii. Thomas Graedel (Yale University), End of Metals, on "All Things Considered" program on National Public Radio, January 16, 2006. See <http://www.npr.org/templates/story/story.php?storyId=5159755>.

- (b) Are new energy sources actually net consumers of fossil fuels?
- i. David Pimentel and Tad W. Patzek, numerous stories on the Internet concerning biofuels, including <http://www.news.cornell.edu/stories/July05/ethanol.toocostly.ssl.html>.
  - ii. Nicholas Georgescu-Roegen, "Energy Analysis and Economic Valuation," *Southern Economic Journal*, April 1979: 1023–58.
- (c) Miscellaneous
- i. Paul Hawken, Amory Lovins, and L. Hunter Lovins, *Natural Capitalism: Creating the Next Industrial Revolution*, HC106.82 H39 1999.
  - ii. Partha Dasgupta, "The Population Problem: Theory and Evidence," *Journal of Economic Literature*, December 1995, 32:4.
  - iii. Paul R. Ehrlich and Anne H. Ehrlich, *The Population Explosion*, HB871 .E33 1990. (See also *The Population Bomb*, 1968.)
  - iv. World Commission on Environment and Development, *Our Common Future*, HD75.6 .O97 1987. (Coined "sustainability.")
  - v. Gerald O. Barney and U.S. Council on Environmental Quality, *The Global 2000 Report to the President: Entering the Twenty-First Century*. Marriott Library Government Documents call no. PREX 14.2: G51/2000. (Commissioned by Jimmy Carter.)
  - vi. Donella Meadows, Jørgen Randers, and Dennis Meadows, *Limits to Growth: the 30-Year Update*, HD75.6 .M437 2004.
  - vii. H.S.D. Cole et al., *Models of Doom: A Critique of The Limits to Growth*, HC59. M59 1973.
  - viii. Jean Drèze and Amartya Sen, *Hunger and Public Action*, HD9018.D44 D74 1989.
  - ix. Andrew Schotter, *Free Market Economics*, HB95 .S36 1990.
  - x. Thomas Michael Power, *Lost Landscapes and Failed Economies: the Search for a Value of Place*, HD9506 .U62 P69 1996.
  - xi. Thomas M. Bonnicksen, *America's Ancient Forests: From the Ice Age to the Age of Discovery*, QH104 .B635 2000.

Course Description: Economic implications of mathematical ecology; dynamic equilibria of fishing and timber industries; depletion of nonrenewable resources; intergenerational and intragenerational equity; species' extinction; entropy and thermodynamics; the future of economic growth; limitations of neoclassical methodology applied to dynamic systems.

Other policies:

1. The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Union Building, 801-581-5020 (V/TDD), <https://disability.utah.edu/>. CDS will work with you and me to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.
2. Personal concerns such as stress, anxiety, relationship difficulties, depression, or cross-cultural differences can interfere with a student's ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness, 426 SSB, at [www.wellness.utah.edu](http://www.wellness.utah.edu) or 801-581-7776.
3. Addressing Sexual Misconduct: if you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, at [www.wellness.utah.edu](http://www.wellness.utah.edu) or 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).

*This syllabus is meant to serve as an outline and guide for our course. Please note that I may modify it with reasonable notice to you. I may also modify the Course Schedule to accommodate the needs of our class. Any changes will be announced in class.*