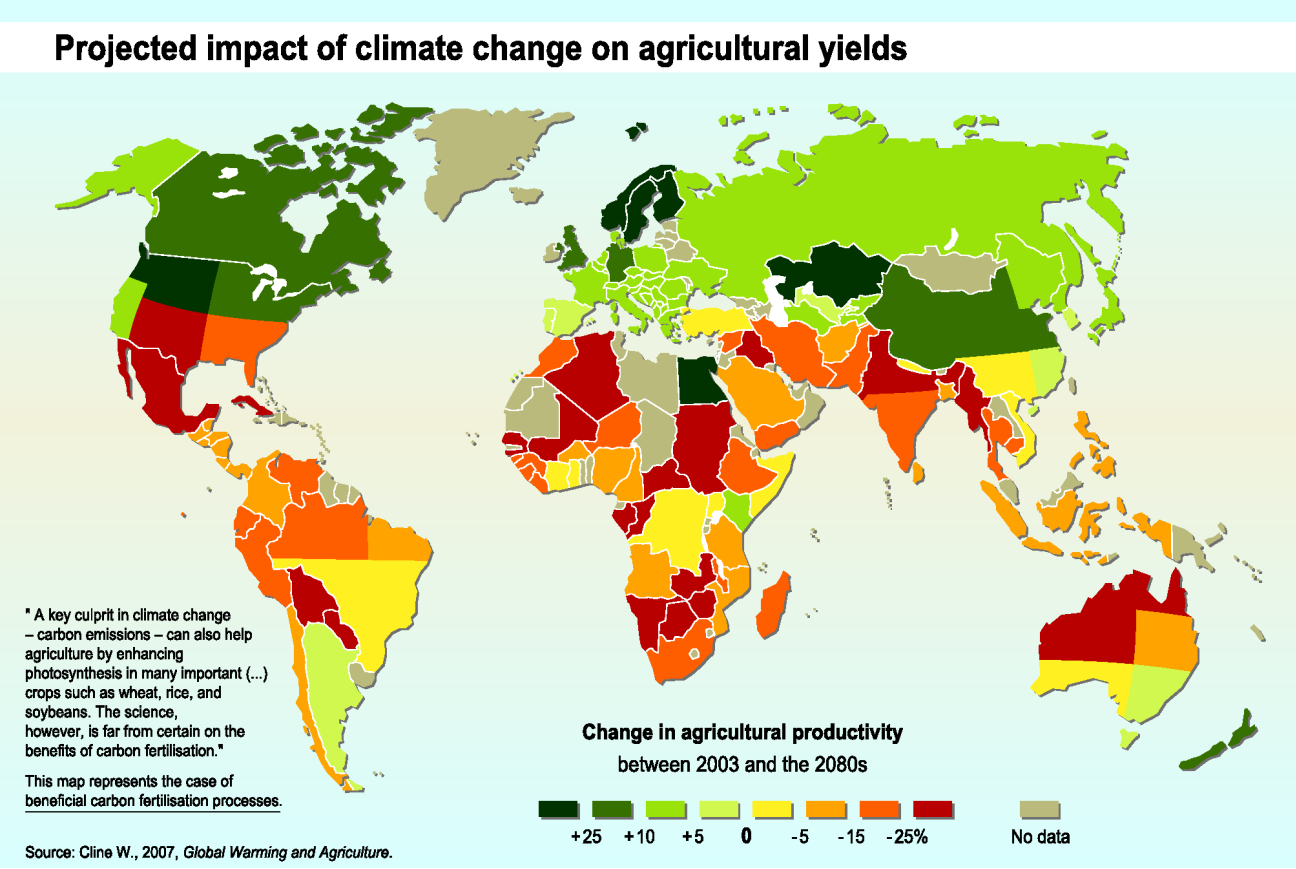
Technology and Social Change in History
Engineering Inequality
HSCI 222

Instructor: Daniel Williford, PhD / daniel.williford@wisc.edu/ Office Hours: W 12-2PM on Canvas
TA: Joshua Doyle-Raso / jdoyleraso@wisc.edu / Office Hours: M 12:30-1:30/ Th 12:30-1:30

Lecture: 11:00-11:50am MW (Remote Synchronous Instruction)

Discussion Sections:
R 5:40PM - 6:30PM, 1221 Mosse Humanities Building
R 9:55AM - 10:45AM, Online
R 2:25PM - 3:15PM, Online



In an era of global environmental crisis, human-caused changes to interlocking earth systems are producing starkly unequal effects. As climate change, pandemics, and economic collapse threaten to intensify both global and localized forms of inequality, arguments play out in media, the STEM community, and policy circles that single out new technologies as both a cause of and a potential solution to the

present crisis. The relationship between technology and society has always been marked by other broad-based historical phenomena from the rise of capitalism to European colonial expansion. This course offers an introduction to the History of Technology centered on the relationship between technology and various forms of social inequality.

How have gendered, racial, and class-based disparities shaped the history of technology? How can ideas about who counts as a "designer" be expanded to encompass forms of labor not typically considered technological? How have forms of engineered inequity intersected with state-building, colonial projects, environmental degradation, and revolutionary programs? How has technology been implicated in attempts to imagine a more just society?

This course is designed to introduce students to central themes and concepts in the History of Technology. Each week, students will be responsible for reading the assigned texts. The course is organized into four sections or modules that build on one another through case-studies. These are transnational in scope and move chronologically from the 17th century to the present.

Official Description HISCI 222: Topics in the history of technology of interest to students in engineering and physical sciences. Themes include the social basis of technical change, the impact of technology on everyday life, and ethical issues in technology in the last four centuries.

Requisites: Sophomore Standing, or one course in HISTORY or HIST SCI

Credit Policy: 3-credits. This class meets for three, 50-minute class periods each week over the fall semester and carries the expectation that students will work on course learning activities (reading, writing, problem sets, studying, etc) for about 2 hours out of the classroom for every class period. The syllabus includes additional information about meeting times and expectations for student work.

Course Outcomes

- Identify and summarize key concepts in the history of technology
- Utilize historical methods and techniques and apply these to analyze primary sources including print media, visual art, film, web-based content, and technical materials
- Apply concepts from the history of technology to relevant present-day issues in engineering and technology policy

- Produce original arguments that demonstrate critical thinking skills and draw on course concepts, arguments specifically about the role of technology—as a collection of material, social, and political practices—and technological change in the contemporary world

Grade Distribution and Assignments

A	AB	B	BC	C	D	F
93.0–100%	88.0–92.99%	83.0–87.99%	78.0–82.99%	78.0–82.99%	60.0–69.99%	0–59.99%

Participation: 20%
Participation grades will be earned based on active contributions to discussions and activities. Thoughtful, regular, and relevant participation during synchronous class discussions will help you earn full points. Contributions to asynchronous parts of the course (responding to other students' reading responses or blog posts) will also help you earn points.

Reading Responses/Skill-Based Assignments: 20%
Ten weeks out of the semester students will be required to post a written response to the readings for that week on the course website or a short skills-based writing activity. Responses will vary in length depending on the assignment but will be between approximately 250 words and 350 words. The responses should be analytical in nature (rather than just summaries) and should connect to the readings from that week. Skill-based assignments will help students develop their writing abilities and prepare them for the final paper. The prompt or question for each week will be posted by 5pm on Sunday and all responses should be posted by Wednesday morning before lecture. They will be posted in the public Discussions section of Canvas, and you are strongly encouraged to respond and reference other students' posts. All posts will be graded 0 (for incomplete), 1 (for a post that does not respond to or fulfil the prompt), or 2 (for a complete and thoughtful response).

Midterm Exam: 15%
Essay and short answer exam designed to assess comprehension of readings and lectures for the first half of the course. **10/14**

Questions will be posted to Canvas at 11:00 am the start of lecture and will be available until the end of lecture (11:50 am). Students who are unable to log on during this time should contact the instructor to arrange an alternate exam time.

Putting Theory to Work (Final) Paper: 25%
Building on themes and concepts introduced in this course, students will produce an essay on a contemporary issue involving technology. The paper should focus on a particular technical object, institution, practice, or event—situated in time and place. It should draw on both course readings and additional secondary material of your choosing while making use of the analytic and argumentative skills developed over the course of the semester. You will be required to find one source for the paper that you will analyze as a primary source. To help you develop your paper you will submit a one-page analysis of your primary source earlier in the semester that you may latter incorporate into the final paper

Thesis and Bibliography (1 page) due 11/9
Primary Source Analysis (1/page) due 11/23
Final Draft (8-10 pages) due Week 12/9

Final Exam: 20%
The Final Exam is comprised of two sections. Part 1: short answer questions focused on material from readings and lectures from the second part of the semester. Part 2: a synthetic essay question (choose between 3 given in advance) that will cover themes addressed in the course as a whole.

Course Requirements & Policies

Course Canvas Site: Please consult the HISCI 222 Canvas website frequently. **Our synchronous sessions will all take place in BBCollaborate Ultra and can be accessed via the BBCollaborate Ultra Tab in Canvas.** All announcements will be posted there, as will important handouts and links to other sites. **Blog posts and Reading Responses should be posted in the "Discussion" tab of the course website.**

Communication: You are encouraged to communicate your questions and concerns to the instructor, and it is strongly preferred **that you use the Canvas course site to communicate**. Given the extraordinarily difficult and unpredictable circumstances this semester responses might not always be rapid, but we will be doing our best to make sure all questions and concerns are attended to. Instructor

office hours will take place from 12-2pm on Wednesday and should be scheduled online beforehand in the Appointments section of the Canvas Calendar.

Josh prefers for initial communication to be done by email, and he will respond to emails Monday-Friday within 24 hours and emails Saturday-Sunday within 48 hours. If a student is unable to attend either Monday or Thursday office hours, please contact Josh to set up an alternative time to meet. He is happy to assist with questions about assignments and reading, though longer conversation length questions should take place during meetings and he cannot guarantee a response to questions about assignments within 24 hours of the assignment's due date

Attendance: **Attendance this semester is complicate matter.** While you are expected to attend all online, synchronous class meetings, there is an understanding that students are experiencing unprecedented constraints and difficulties. At the same time, your regular participation is essential for making instruction meaningful. If you are not able to attend class, please be in touch as soon as possible. If you become ill, please contact the instructor to arrange some form of accommodation.

Accommodations: The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty will work either directly with the student or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA.

Religious observances: The University of Wisconsin-Madison supports accommodation of religious observances that might conflict with the course schedule. Students must notify the instructor within the first two weeks of class of the specific days or dates on which they request relief. Make-ups may be scheduled before or after the regularly scheduled requirements. It is understood that instructors may set reasonable limits on the total number of days claimed.

Academic Integrity: All students are expected to adhere to the University of Wisconsin—Madison's core values regarding academic integrity. Students should utilize the Chicago Manual of Style Online for all issues of source citation, along with any specific guidelines provided in the course assignments. Clarifying the disciplinary standards of research ethics and source citation is part of the educational mission of this course, and students should consult the faculty instructor regarding any questions. Plagiarism or other academic misconduct may result in a zero on the assignment or exam, a lower grade in the course, or failure in the course. See the Dean of Students Office for more information about the academic misconduct process (http://students. wisc.edu/doso/acadintegrity.html). *When in doubt, be sure to cite carefully and completely all sources from which you obtain information*. This includes books, articles, documents, internet sites, encyclopedias, and periodicals. You must provide a citation if you exactly quote a source, paraphrase it, or extract information from it.

Privacy and Use of Audio/Video Recordings: Lecture materials and recordings for HISCI 222 are protected intellectual property at UW-Madison. Students in this course may use the materials and recordings for their personal use related to participation in this class. Students may also take notes solely for their personal use. If a lecture is not already recorded, you are not authorized to record my lectures without my permission unless you are considered by the university to be a qualified student with a disability requiring accommodation. [Regent Policy Document 4-1] Students may not copy or have lecture materials and recordings outside of class, including posting on internet sites or selling to commercial entities. Students are also prohibited from providing or selling their personal notes to anyone else or being paid for taking notes by any person or commercial firm without the instructor's express written permission. Unauthorized use of these copyrighted lecture materials and recordings constitutes copyright infringement and may be addressed under the university's policies, UWS Chapters 14 and 17, governing student academic and non-academic misconduct.

Diversity and Inclusion: Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals. The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world.

Student Health and Well-being: As a student you may experience a range of issues that can cause barriers to learning. These might include strained relationships, anxiety, high levels of stress, alcohol/drug problems, feeling down, or loss of motivation. University Health Services can help with these or other issues you may experience. Help is always available. You can learn about free, confidential mental health services available to you; call 608-265-6600 (option 2) or visit uhs.wisc.edu.

Grading Policies: Late assignments will be **docked half a letter** and another half for each 24 hour period after that. If you know you will have trouble meeting a deadline for any reason, please speak to the instructor in advance (or as soon as possible) to arrange an extension. **Given the unusual circumstance of this semester, you are strongly encouraged to request an extension when and if you need it!** To appeal a grade, you must submit a written explanation to the instructor explaining why you deserve a better grade. The instructor's decision, however, will be final, and may be to raise, lower, or keep the grade

Readings: Keeping up with daily reading assignments is an *essential* part of this course. All readings are subject to change, and students will be notified of any changes via email or the course website.

Connectivity: If you are having connectivity issues for online sessions please see: https://it.wisc.edu/news/home-internet-connection-doctor-service/

COVID Specific Policies

During the global COVID-10 pandemic, we must prioritize our collective health and safety to keep ourselves, our campus, and our community safe. As a university community, we must work together to prevent the spread of the virus and to promote the collective health and welfare of our campus and surrounding community.

UW-Madison Badger Pledge
UW-Madison Face Covering Guidelines
Students' Rules Rights, & Responsibilities

While on campus all employees and students are required to wear appropriate and properly fitting face coverings while present in any campus building unless working alone in a laboratory or office space.

Face Coverings During In-person Instruction Statement (COVID-19): Individuals are expected to wear a face covering while inside any university building. Face coverings must be worn correctly (i.e., covering both your mouth and nose) in the building if you are attending class in person. If any student is unable to wear a face-covering, an accommodation may be provided due to disability, medical condition, or other legitimate reason. Students with disabilities or medical conditions who are unable to wear a face covering should contact the McBurney Disability Resource Center or their Access Consultant if they are already affiliated. Students requesting an accommodation unrelated to disability or medical condition, should contact the Dean of Students Office.

Students who choose not to wear a face covering may not attend in-person classes, unless they are approved for an accommodation or exemption. All other students not wearing a face covering will be asked to put one on or leave the classroom. Students who refuse to wear face coverings appropriately or adhere to other stated requirements will be reported to the Office of Student Conduct and Community Standards and will not be allowed to return to the classroom until they agree to comply with the face covering policy. An instructor may cancel or suspend a course in-person meeting if a person is in the classroom without an approved face covering in position over their nose and mouth and refuses to immediately comply. **The History Department has directed instructors to halt the class and, if necessary, leave the classroom if anyone in the room is not wearing a properly fitted mask.**

Quarantine or Isolation Due to COVID-19: Students should continually monitor themselves for COVID-19 symptoms and get tested for the virus if they have symptoms or have been in close contact with someone with COVID-19. Students should reach out to instructors as soon as possible if they become ill or need to isolate or quarantine, in order to make alternate plans for how to proceed with the course. Students are strongly encouraged to communicate with their instructor concerning their illness and the anticipated extent of their absence from the course (either in-person or remote). The instructor will work with the student to provide alternative ways to complete the course work.

Course Schedule

Part I: Foundations

Week 1: What is a technology?

9/2: Course Introduction

Week 2: Foundations: Political Technologies

9/9: Reading: Langdon Winner, "Do Artifacts Have Politics?" in *The Whale and the Reactor: A Search for Limits in an Age of High Technology* (Chicago: University of Chicago Press, 1988), 19-39.

Week 3: Foundations: Users/Designers

9/14: Reading: Ronald Kline and Trevor Pinch, "Users as Agents of Technological Change: The Social Construction of the Automobile in the Rural United States," *Technology and Culture* 37, no. 4 (1996): 763–95.

Reading: "Tractor Manual," Ford Motor Company (1920).

9/16: Reading: Clapperton Chakanetsa Mavhunga, "Introduction," in *Transient Workspaces: Technologies of Everyday Innovation in Zimbabwe* (Cambridge, Mass.: MIT Press, 2014).

Week 4: Technologies and Social Order: Between Equality and Inequality

9/21: Reading: Noel Perrin, *Giving Up the Gun: Japan's Reversion to the Sword, 1543-1879* (Boston: D. R. Godine, 1979), ix-xii, 3-45.

9/23: Reading: Geneviève Bédoucha, "The Watch and the Waterclock," in *Technological Choices: Transformation in Material Cultures since the Neolithic*, ed. Pierre Lemonnier (London: Routledge, 1993), 77–107.

Part II: Technology and the Modern Project

Week 5: Engineering the State and Colonial Engineering

9/28: Reading: Chandra Mukerji, "The Unintended State," in *Material Powers: Cultural Studies, History and the Material Turn*, ed. Tony Bennett and Patrick Joyce (London; New York: Routledge, 2010), 81–101.

9/30: Reading: John Law, "Technology and Heterogeneous Engineering: The Case of Portuguese Expansion" in *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology,* edited by Trevor Pinch, 105-127 (MIT Press, 2012).

Reading: Collected Maps from the Academia das Ciências de Lisboa, Biblioteca Nacional, http://purl.pt/162/1/index.html.

Week 6: Revolutionary Engineering and Machine-breaking

10/5: Reading: Ken Alder, "Innovation and Amnesia: Engineering Rationality and the Fate of Interchangeable Parts Manufacturing in France," *Technology and Culture* 38, no. 2 (1997): 273–311.

Reading: William K. Storey, "Guns, Race, and Skill in Nineteenth-Century Southern Africa," *Technology and Culture* 45 (2004): 687-711.

10/7: Jeff Horn, "Machine-Breaking in England and France during the Age of Revolution," *Labour / Le Travail* 55 (2005): 143–66.

Reading: G. Beaumont, "Some Observations on the Conduct of the Luddites," [1812] in *The Luddites: Three Pamphlets, 1812-1839*, British Labour Struggles: Contemporary Pamphlets 1727-1850 (New York: Arno Press, 1972).

Week 7: Medical Technologies / Technologies of Racecraft

10/12: Reading: Lundy Braun, *Breathing Race into the Machine: The Surprising Career of the Spirometer from Plantation to Genetics*, (Minneapolis: University of Minnesota Press, 2014). Introduction (xiii-xxiv) and Chapter 2, "Black Lungs and White Lungs" (27-54).

Reading: CDC, "Coronavirus Disease 2019 (COVID-19)," Centers for Disease Control and Prevention, February 11, 2020, https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/racial-ethnic-minorities.html

10/14: Online Mid-Term Exam: Questions will be posted to Canvas at 11:00 am the start of lecture and will be available until the end of lecture (11:50 am). Students who are unable to log on during this time should contact the instructor to arrange an alternate exam time.

Part III: Who does technology work for?

Week 8: Colonial Techno-Giantism and Local Pharmacopeia

10/19: Reading: Meredith McKittrick, "An Empire of Rivers: The Scheme to Flood the Kalahari, 1919–1945," *Journal of Southern African Studies* 41, no. 3 (May 4, 2015): 485–504.

Reading: Jules Verne, *Invasion of the Sea* (Wesleyan University Press, 2007). [Saharan Sea]

10/21: Reading: Abena Dove Osseo-Asare, *Bitter Roots: The Search for Healing Plants in Africa* (Chicago: University of Chicago Press, 2014), Intro (pg. 1-7); Chapter 2 "Take Grains of Paradise for Love"

Week 9: Engineering Racial Inequality

10/26: Reading: Daniel B. Rood, *The Reinvention of Atlantic Slavery: Technology, Labor, Race, and Capitalism in the Greater Caribbean*, *The Reinvention of Atlantic Slavery* (New York: Oxford University Press, 2017), Ch. 4 "Wrought Iron-Politics," 94-120.

10/28: Reading: Amy E. Slaton, "Ambiguous Reform: Technical Workforce Planning and Ideologies of Class and Race in 1960s Chicago," *Engineering Studies* 2, no. 1 (April 2010): 5–28.

Reading: "Racial Diversity and Discrimination in the U.S. STEM Workforce," January 9, 2018, http://www.pewsocialtrends.org/2018/01/09/blacks-in-stem-jobs-are-especially-concerned-about-diversity-and-discrimination-in-the-workplace/.

Week 10: Gendering Technology

11/2: Reading: Ruth Schwartz Cowan, "Twentieth-Century Changes in Household Technology," in *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York: Basic Books, 1983), 69-101.

Reading: "Solving the Equation: The Variables for Women's Success in Engineering and Computing," *AAUW: Empowering Women Since 1881*, https://cra.org/crn/2015/04/solving_the_equation_the_variables_for_womens_success_in_engineering_a/

11/4: Reading: Kalindi Vora, "Limits of 'Labor': Accounting for Affect and the Biological in Transnational Surrogacy and Service Work," *South Atlantic Quarterly* 111, no. 4 (2012): 681–700.

Week 11: Technonationalism and Decolonizing Technology

11/9: Watching: Video, Isao Hashimoto, "1945-1948," https://www.youtube.com/watch?v=LLCF7vPanrY.

Putting Theory to Work Paper: Thesis and Bibliography Due

11/11: Gabrielle Hecht, *Being Nuclear: Africans and the Global Uranium Trade* (Cambridge, Mass.: MIT Press, 2012), Ch. 7.

Part IV: High-Tech Inequality

Week 12: Environmental Histories of Computing

11/16: Reading: Christophe Lécuyer, "From Clean Rooms to Dirty Water: Labor, Semiconductor Firms, and the Struggle over Pollution and Workplace Hazards in Silicon Valley," *Information & Culture: A Journal of History* 52, no. 3 (2017): 304–33.

11/18: Explore: OSWER US EPA, "Sustainable Management of Electronics," Collections and Lists, US EPA, August 12, 2015, https://www.epa.gov/smm-electronics.

Week 13: Algorithmic Governance

11/23: Reading: "The Digital Poorhouse, by Virginia Eubanks," Harper's Magazine, January 1, 2018, https://harpers.org/archive/2018/01/the-digital-poorhouse/.

Putting Theory to Work Paper: Primary Source Analysis

11/25: Reading: Ruha Benjamin, "Engineered Inequity," *Race After Technology: Abolitionist Tools for the New Jim Code,* 49-76 (Medford, Mass.: Polity, 2019).

Explore: https://whitecollar.thenewinquiry.com/

Week 14: Geoengineering

11/30: Reading: James R. Fleming, *Fixing the Sky: The Checkered History of Weather and Climate Control* (New York: Columbia University Press, 2010), Ch. 8.

12/2: Reading: "Geoengineer the Planet? More Scientists Now Say It Must Be an Option," Yale E360, https://e360.yale.edu/features/geoengineer-the-planet-more-scientists-now-say-it-must-be-an-option.

Week 15: Engineering other Possible Futures?

12/7: Reading: Steven J. Jackson, "Rethinking Repair," in Media Technologies: Essays on Communication, Materiality and Society, ed. Tarleton Gillespie, Pablo Boczkowski, and Kristen Foot (Cambridge, Mass.: MIT Press, 2014).

12/9: Reading: Ytasha Womack, *Afrofuturism the World of Black Sci-Fi and Fantasy Culture* (Chicago: Chicago Review Press, 2013), Ch. 12 "Future World."

Reading: Selections from Isabelle Stengers, *In Catastrophic Times: Resisting the Coming Barbarism* (Open Humanities Press, 2015).

Putting Theory to Work Paper: Final Due

Final Exam due by 7:05pm 12/14