THE SLEEPING BRAIN

Class Times: MTWR 10:00-11:55am & 1:00pm-3:25pm in *Carnegie 339 (with lab in Carnegie 325)*
Office Hour: W 4-5pm or by appointment

Instructor

Dr. Justin Hulbert
pronouns: he/his/him
office: Carnegie Science 530
e-mail: jhulbert@bates.edu

Course Materials

Moorcroft (2013). *Understanding Sleep and Dreaming (2nd ed.).* Boston, MA: Springer. ISBN 978-1-4614-6466-2. *Bates currently provides free access.*

Additional materials will be posted on **Lyceum**.

Prerequisite(s)

NRSC/PSYC 160 or PSYC 215

Assessments

- Lab Protocol*: **20%**
- Poster Presentation*: **20%**
- Leading Journal Club*: **20%**
- Final Reflection: **20%**
- Engagement: **15%**
- CITI Training: **5%**

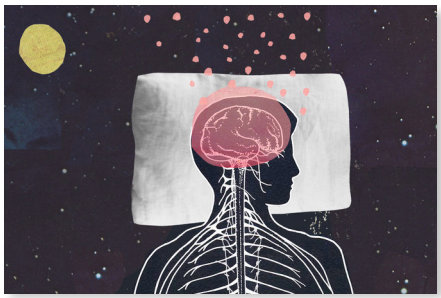
**indicates group project*

Course Overview

Why do we sleep, and can we manipulate it to improve our health and cognition? This course explores the neuroscience of sleep, drawing on research from chronobiology and psychology to answer fundamental questions about sleep's role in health, memory, and well-being. Students will gain hands-on experience running a sleep lab, learning to record and analyze polysomnographic data to detect sleep stages. By designing and running a small-group, feasibility-oriented targeted memory reactivation study inspired by the empirical literature, students will test how sleep can be harnessed to influence memory. Through journal club discussions, lab work, and experiment design, this course offers a unique blend of theory and practice for those curious about the science of sleep—and eager to get credit for napping.

Joint Responsibilities

Achieving the broad aims of this course requires commitments from all of us. Below you will find an outline of some of those



Learning Objectives

By the end of this course, you will be able to:

- Understand the scientific foundations of sleep.
- Apply polysomnographic techniques to analyze sleep data.
- Critically evaluate research on sleep and memory consolidation.
- Design and implement a targeted memory reactivation (TMR) feasibility test.
- Analyze the ethical and practical implications of sleep manipulation techniques.

responsibilities. Did I leave something out? Let me know—we can discuss additional responsibilities/group norms as a class.

- **Your instructor agrees to…**
    a) Make himself available outside of class during posted office hours (and by appointment, as necessary) to answer questions, provide extra help, and discuss matters related to the course of study.
    b) Respond in a timely fashion (typically by the end of the next school day) to email queries. Note that you should not expect responses to emails sent after working hours until the following school day. In the event that more time is required to fully address the student query, the instructor will acknowledge receipt of the email and provide the student with an estimated response time or suggest meeting in person.
    c) Facilitate a thoughtful, considerate, and engaging learning environment.
    d) Make available on Lyceum a skeleton of lecture slides, suitable for downloading/printing prior to class. Note that these skeletons are intended to supplement note-taking (e.g., by providing important/complicated figures) but are not a replacement for attending class.
    e) Provide adequate time to complete assignments, minimize changes to the published schedule/assignments, and immediately notify students about any such changes.
    f) Provide comprehensive and fair assessments of materials presented or assigned. Assignments, with a level of feedback commensurate with the nature and aims of the task, will be returned to students in a timely fashion.
    g) Create and welcome opportunities for students to provide feedback on the course/teaching throughout the semester.
- **You are responsible for…**
    a) Showing up to class regularly, on time, and

Best Practices

You are encouraged to:

- Let me know if I can clarify a concept or slow down.
- Ask questions during class so that everyone benefits.
- Complete assignments on time.
- Study to understand, not simply to memorize.
- Attend office hours.

To make the most of office hours, it is recommended that you:

- Avoid waiting until the last minute (e.g., before an exam/due date) to attend. Seeking help well in advance of deadlines will leave you plenty of time to act on advice discussed.
- Email the instructor in advance or bring with you a concise list of topics/questions you wish to discuss, if possible. Itemizing in this way helps ensure all your questions are addressed and saves you time in the long run. That said, *dropping by for a spontaneous, broader chat is also most welcome*.

prepared, as detailed in the below Attendance policy.

b) Checking your **Bates email** and **Lyceum** regularly for important announcements about the course, including alterations due to weather emergencies and other unforeseen events.

c) Giving your participation, readings, and assignments the time and effort they deserve. There is no substitute for a deep and focused consideration of the material, spaced out over time and considered actively.

d) Substantively participating in class discussions and other relevant activities. This could, for instance, involve asking/answering questions related to the offered course materials. Note that a top-notch level of participation does not necessitate responding to every question raised in class or online; active or passive efforts to welcome contributions from everyone in the class are also looked upon favorably. Though you are welcome to challenge your fellow students' or your instructor's thoughts and conclusions, please do so in a fashion that is respectful. Challenge ideas, not the person raising them. More information can be found in the sections on Class Engagement and Diversity and Inclusion, below.

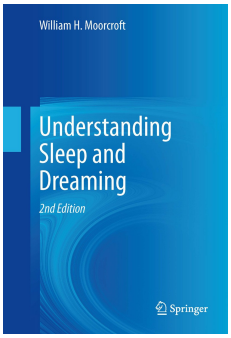
e) Submitting assignments on time, digitally via Lyceum. Extensions may be granted for extenuating personal circumstances or illness. Please reach out as soon as you think you may need an extension so we can work out an arrangement. Otherwise, any late assignment will immediately be subject to a 10% penalty, with an additional 10% penalty leveled against that assignment's score for every 24 hours it remains late. *No late work will be accepted after 4:00pm on the last day of Short Term* (but please turn things in on time).

f) Using electronic devices wisely and respectfully. See

section on In-Class Electronic Device Policy, below.

g) Upholding academic integrity. See the sections on Academic Integrity and Use of Artificial Intelligence (AI), below.

Textbook



- William H. Moorcroft's book *Understanding Sleep and Dreaming, 2nd Edition* will serve as the required text for this course and provide a foundation for our exploration of—you guessed it—sleep and dreaming. Good news: Bates currently provides the book to you at no extra cost though Springer Nature Link. Just point your browsers to https://link.springer.com/book/10.1007/978-1-4614-6467-9 and download the .pdf or .epub (you must be on campus/using a campus IP address to download this resource for free). Otherwise, you're welcome to purchase the online 30-day rental from the bookstore for ~$30, unless you want to keep a physical copy for ever and always.
    - The "Additional Resources" section later in the syllabus lists free supplemental materials, including texts on the science of sleep to support your learning journey.

Assessments

- **Lab Protocol** (*20% of your course grade*) Over the course of the term, you (together with a small number of other students) will design, adapt, and run a small-scale feasibility test of a targeted memory reactivation (TMR) study inspired by an existing empirical article. Your group will take primary responsibility for developing the procedures needed to carry out that study in our lab, including the behavioral task, participant instructions, sleep-monitoring plan, cueing structure, and any necessary coding or equipment setup. Each group will recruit and run one participant using its protocol, recognizing that in sleep research things do not always go according to plan: your participant may not sleep, technical issues may arise, or the study may need to be adapted in real time. That's OK! The goal is not to produce generalizable findings from a single case, but to gain first-hand experience designing, implementing, and evaluating a sleep study in practice.
    - In addition to actually running your study, a major deliverable produced by your group will be a clearly written and precisely detailed protocol document. This protocol should serve as a comprehensive guide enabling someone else (e.g., a future student, research assistant, or even your future self) to understand exactly how your group implemented its TMR study. Effective protocols will include step-by-step procedures, annotated examples or screenshots where useful, copies of key materials or scripts, troubleshooting notes, data-handling details, and a brief explanation of how your design relates to the original target article. Because each group's project will differ

somewhat, your goal is not to produce a single class manual for one shared experiment, but rather a polished and replicable record of your group's study that could guide future iterations or refinements.

- You'll be graded on the clarity, accuracy, thoroughness, and replicability of your protocol, as well as on your effectiveness in working collaboratively to refine and polish the final product. Strong protocols will make it easy for a knowledgeable reader to understand what you planned, what you actually did, and how they might reproduce or improve upon your design.

- ***Poster Presentation*** (*20% of course grade*) offers you (together with your group partners) an opportunity to distill your project into a clear, engaging, and informative visual summary of your group's feasibility test. You'll design and present a digital poster (no printing required) that clearly conveys the essential elements of our TMR experiment: a concise overview of the background and research question (including key citations), our methods, our preliminary descriptive results (including at least one clear descriptive graph or table, noting that the N=1 sample size will limit your ability to perform inferential statistics), limitations, and future directions.
    - During class, we'll discuss effective poster design principles and provide opportunities to workshop your drafts. For additional inspiration and practical tips, explore the "Poster Tips" section on our Lyceum page. Keep in mind that research posters are not exhaustive—they're carefully curated to showcase the highlights and key messages. Part of this assignment involves learning to judge which details are essential and which can be omitted. This skill takes practice, and that's exactly why we're doing it!
- **Leading Journal Club** *(20% of course grade)* affords you an excellent opportunity to practice summarizing and critically evaluating cutting-edge empirical research related to targeted memory reactivation (TMR). To this end, you (together with 1–2 other students) will lead one journal club session during the course. You'll begin by selecting a *peer-reviewed empirical article* that either served as your group's replication target or is closely connected to it and then prepare a 15–20 minute slideshow presentation designed to introduce your classmates to the paper. Your presentation should explain the research question, provide relevant background, walk us through the methods, highlight the key results (especially the main figure(s) or table(s)), and outline the authors' conclusions. You'll also offer your own thoughtful critique, noting both strengths and potential limitations as related to your group project (and beyond). Since your classmates will not necessarily have read the article in advance, aim to make your talk clear, accessible, and engaging—assume a curious audience, not an expert one.
    - After your presentation, you'll lead a discussion of the paper's implications, design, and broader connections for the remainder of the morning meeting time (roughly another 20-30 minutes). You can structure this time however you like (e.g., guided questions, mini-activities, small-group debates), but you should aim to spark an inclusive,

thoughtful conversation that encourages everyone to participate. For example, you could ask students to unpack what's going on in a figure, outline a follow-up experiment to address a methodological limitation, search the literature for related articles, sketch a method figure. Basically, put yourselves in the role of instructor whose aim it is to facilitate the class's understanding of the content and its implications.

    - This mirrors how journal clubs operate in real-world research environments (whether in academic labs or industry teams) and is especially valuable preparation if you're considering careers involving teaching, graduate school, or collaborative research. You'll find helpful planning guides, presentation checklists, and discussion tips in the "Journal Club Tips" in a folder by that name on Lyceum.

- **Final Reflection** *(20% of your course grade)* gives you an opportunity to individually and thoughtfully reflect on both the scientific process and the broader implications of the work you encountered in this course. While much of the course involved collaboration, this assignment allows you to showcase your own understanding, perspective, and judgment. Your reflection should be clearly organized and should draw both on your group's TMR feasibility study and on what you learned by observing and comparing it with the studies conducted by other groups in the class.
    - A central part of the reflection should focus on your group's study in relation to the others. What similarities and differences stood out across groups' target domains, design choices, implementation, and practical challenges? What did you learn from comparing your group's study with those of your classmates? What went well in your own study, what difficulties arose, how did your group respond, and what might you or your group have done differently to improve the design, implementation, teamwork, or interpretability of the project? Strong reflections will be honest and thoughtful about the realities of conducting sleep research under real constraints, rather than overstating what can be concluded from a small-scale feasibility study.
    - Your reflection must also include a discussion of the promise and/or peril of TMR in "real life." As part of this discussion, you must present at least one novel application of TMR, even if it builds on an idea encountered during the course. This application could relate to education, mental health, therapy, performance enhancement, ethics, policy, technology, or another domain. Clearly explain the application, discuss its potential benefits and risks, and support your discussion with relevant research sources. Your reflection must use an established citation format, such as APA, to document all references.
    - The traditional format for this assignment is approximately 4–5 pages, double-spaced, in 11- or 12-point font with reasonable margins. If you choose a non-written format, such as a short video, podcast episode, animation, or interactive website, aim for the equivalent of roughly 8–10 minutes of polished, carefully edited content. Regardless of format, your

submission should be well structured, thoughtful, and thoroughly revised. If you are considering a non-traditional format, please confirm your idea with me in advance. When submitting a digital project via link, ensure that the content is finalized by the deadline and remains unchanged until graded.

- **Engagement** (*15% of your final grade*) is critical for the success of this course—not only in class discussions, but also in the collaborative work of building and running a real experiment. Neuroscience is best learned by doing: asking questions, proposing ideas, tackling challenges together, and contributing meaningfully to shared goals. Your engagement grade reflects not just how often you speak in class, but how thoughtfully and consistently you contribute to your group's progress—whether during discussions, hands-on lab work, experimental design, data collection, or troubleshooting in real time. It includes your level of preparation, your willingness to help your group move forward, and your overall presence—both intellectually and interpersonally. Near the end of the course, you will be invited to evaluate your own engagement, as well as that of your group members. These evaluations will be thoughtfully considered when assigning your final engagement grade.
    - You should aim to participate fully in every class meeting by showing up ready to engage with the material and support your classmates. That might mean asking a clarifying question, helping your group debug a problem, suggesting a new angle for the study, or staying focused during sleep scoring. Your contributions matter. By leaning in, you'll not only deepen your own understanding—you'll also help create a more collaborative, dynamic, and rewarding experience for everyone involved.
- **CITI Training** (*5% of course grade*) prepares you to conduct research with human subjects in this course and future endeavors. You will be required to complete the CITI Program's Biomedical Human Subjects training. This online training, required by Bates College's Institutional Review Board (IRB), introduces key ethical principles and guidelines for conducting responsible human-subjects research. The training takes approximately 4–5 hours to complete, but you can complete it in smaller segments at your convenience.
    - To access the training, follow the detailed instructions here: https://www.bates.edu/institutional-review-board/training-requirements-for-all-human-subjects-researchers/
    - Upon completion, you will receive a certificate verifying your training. Submit this certificate via Lyceum (note you do NOT have to submit your certificate to the IRB; your instructor will handle that, as necessary). If you have previously completed CITI training and your certificate (either Biomedical or Social/Behavioral) remains valid (unexpired), you may submit your existing certificate without retaking the training. Although the CITI modules include quizzes, for purposes of your course grade, you will receive full credit based solely on timely and complete submission of your certificate.

Grading Scale

A+	≥97%
A	93-96.99%
A-	90-92.99%
B+	87-89.99%
B	83-86.99%
B-	80-82.99%
C+	77-79.99%
C	73-76.99%
C-	70-72.99%
D+	67-69.99%
D	63-66.99%
D-	60-62.99%
F	<60%

You can easily calculate your current grade by inserting the assignments/exams, grades received, and weights (given above, in percentages) by hand or using this handy calculator: https://www.rapidtables.com/calc/grade/grade-calculator.html. Note that any extra credit should be added on *after* that calculation is performed.

Attendance

Given the intensive nature of Short Term, where we meet for extended periods over just 3.5 weeks, ***your attendance and preparation are essential*** for both your learning and the success of our collective work. Each day's activities—whether lecture, lab work, or discussion—build directly toward our goals. Missing class can disrupt not only your understanding but also group progress, especially during lab sessions where hands-on experimentation and data collection occur.

You are therefore expected to attend all class sessions—fully prepared, having completed any assigned readings or tasks. Active participation is crucial: the more engaged you are (by thinking deeply about the issues raised, making connections to broader themes, and contributing thoughtfully during discussions and labs), the more you will gain from the course (and the stronger your engagement score will be). Likewise, arriving to class on time is essential. Consistent tardiness can disrupt the group's workflow and detract from everyone's learning experience—especially during lab activities that involve setting up and working with sensitive equipment. Frequent or unexcused tardiness/absences/early departures may negatively affect your engagement score.

That said, I recognize that extenuating circumstances—such as illness, a serious family emergency, or other unavoidable issues—may sometimes arise. If such a situation prevents you from attending, please:

- Notify me as soon as possible.

- Provide official documentation from Health Services, Counseling and Psychological Services, or the Office of Student Support and Community Standards if you will miss more than one class in a row.

Because lab sessions are critical and not easily replicated, missing lab time may significantly impact your ability to complete assignments and fully participate in group projects. If you miss a lab, you will be expected to:

- Coordinate with your group to minimize disruptions.
- Work with me to determine a plan for making up missed content or data collection, where possible.

Bottom line: We only have a short time together—every session counts. Your commitment to being present, prepared, and engaged each day will ensure a successful and rewarding Short Term experience for you and your peers.

For more information on Bates College's attendance policies, please consult: Bates College Course Attendance Policy (https://www.bates.edu/dof/course-attendance-policy-guideline-for-absences/).

Religious Holiday Observance

Bates recognizes the right of students to fulfill their religious obligations and practices. In recognition of Bates' commitment to a diverse and inclusive student body and the variety of religions observed and practiced by our students, I have consulted the Multifaith Calendars posted online by the Office of the Multifaith Chaplain when developing this syllabus so that conflicts between in class examinations and major religious holidays may be avoided. Given the range of faiths embraced by members of our community, however, it may not be possible to avoid all conflicts between scheduled examinations and religious holidays. *Please let me know within the first three weeks of the semester if there is a conflict between a scheduled examination, paper, or project due date and a significant religious holiday you observe*. The Office of Accessible Education will continue to be available to proctor makeup exams for students who miss an exam due to observance of a significant religious holiday.

Unforeseen Events

Should an unforeseen event (e.g., a weather emergency) force us to cancel class or alter the venue, I will inform you via the class email list as soon as possible. Please check your Bates email regularly, as important class-related communications will come through this channel.

Accessibility

Bates College is committed to creating a learning environment that meets the needs of its diverse student body. If you anticipate or experience any barriers to learning in this course, please feel welcome to discuss your concerns with me.

If you have a disability, or think you may have a disability, you may also want to meet with the Director of Accessible Education, to begin this conversation or request an official accommodation. You can find more information about the Office of Accessible Education and Student Support (AESS), including contact information, here: https://www.bates.edu/accessible-education/. Note that processing time for new accommodation requests is generally 2 weeks according to the AESS website. And, once approved, some types of accommodations may take several weeks to fulfill, so it is important to make the request as soon as possible. Once approved through the Office of Accessible Education, AESS will email me an official Letter of Accommodations (copying you). Although accommodations may be approved at any point in the semester, they are *not* retroactive.

Diversity and Inclusion

It is essential that our classroom be a place in which people feel comfortable expressing their thoughts, feelings, and opinions without fear of unduly critical or judgmental responses. Everyone in the classroom (students and instructors, alike) are expected to be respectful of the widely varied experiences and backgrounds represented by the classroom members as a group. Disrespect or discrimination on any basis will not be tolerated. Whether inside or outside the classroom, if you encounter sexual harassment, sexual violence, or discrimination based on race, color, religion, age, national origin, ancestry, sex, sexual orientation, gender identity/expression, or disability, you are encouraged to report it to Gwen Lexow, Director of Title IX and Civil Rights Compliance at Bates, at glexow@bates.edu or 207- 786-6445. Additionally, please remember that Bates faculty are concerned about your well-being and development, and we are available to discuss any concerns you have. Students should be aware that faculty are legally obligated to share disclosures of sexual violence, sexual harassment, relationship violence, and stalking with the college's Title IX Officer to help ensure that your safety and welfare are being addressed.

In-Class Electronic Device Policy

Although there are many benefits to taking handwritten notes and potential distractions associated with the use of devices like laptops, tablets, and phones in class (e.g., Mueller & Oppenheimer, 2014; Fried, 2008), you may still opt to use a laptop or tablet in this class *as long as it contributes to learning*. If it is seen to invite distraction to you or others, however, you may be asked to refrain from using it in class. There will be some class sessions where we will use technology together, and in those instances, all students should make arrangements to bring a laptop or tablet to class (smartphones may not be suitable for some of these in-class activities). If you do not have access to such a device or have any questions or concerns, please email me so that we may find a suitable workaround. For example, the library has several Chromebooks available to check out to Bates students for 1-week loan (with a 1-week renewal). And students who don't own a

laptop have the option of checking out a long-term loaner (either laptop or Chromebook) from the IT Service Desk.

Academic Integrity

Academic integrity isn't just a policy—it's about building trust and fairness in our learning community. All members of the Bates community benefit from an environment of trust, honesty, fairness, respect, and responsibility. You are expected to present your own work and acknowledge the work of others in order to preserve the integrity of scholarship. Your academic work is governed by The Bates College Statement on Academic Integrity (https://www.bates.edu/student-conduct-community-standards/student-conduct/academic-integrity-policy/) and by any additional standards I set in this syllabus or in individual assignments.

Academic integrity includes:

- Following quiz/exam/assignment rules
- Using only permitted materials during an quiz/exam/assignment
- Viewing quiz/exam materials only when permitted by your instructor
- Keeping what you know about a quiz/exam to yourself
- Incorporating proper citation of all sources of information
- Submitting your own original work
- Not submitting work produced for another course—even if it is entirely your own—without prior, explicit permission from the instructor

Academic misconduct includes, but is not limited to, the following:

- Disclosing quiz/exam content during or after you have taken an quiz/exam
- Accessing quiz/exam materials without permission
- Copying/purchasing any material from another student, or from another source including generative Artificial Intelligence, that is submitted for grading as your own
- Plagiarism, including use of Internet material without proper citation
- Using cell phones or other electronics to obtain outside information during a quiz/exam or assignment without explicit permission from the instructor
- Submitting your own work in one class that was completed for another class (self-plagiarism) without prior permission from the instructor

Violations of academic integrity are serious and can result in severe consequences at both the course and College levels. Depending on the circumstances of the violation, I will assign a failing grade for the assignment and/or the course, require work to be redone, and/or impose other consequences; in addition, I will refer the matter to the Dean of Students for possible institutional action. The Bates College Statement on Academic Integrity and procedures for suspected violations can be found here: http://www.bates.edu/student-affairs/student-conduct/academic-integrity-policy/.

Use of Artificial Intelligence (AI)

Generative artificial intelligence (AI) tools (e.g., ChatGPT, Copilot, Claude) can be powerful aids for brainstorming, fact-checking, and learning. However, AI must be used thoughtfully and responsibly in this course. You are expected to:

- Use AI as a learning partner, not a shortcut: AI can help clarify concepts or spark ideas, but it should not replace your own critical thinking, writing, or data analysis.
- Maintain academic integrity: Submitting AI-generated work as if it were your own original writing or analysis is *not* allowed. AI tools can make mistakes, fabricate references, and lack critical nuance. You are responsible for verifying all information.
- Be transparent: If you use AI to help generate ideas, outlines, or drafts, you must acknowledge it (e.g., "I used ChatGPT to brainstorm topic ideas for this assignment").

You may use AI for:

- Brainstorming and refining your ideas
- Fine tuning your research questions
- Generating literature-search terms and finding information on your topic
- Drafting an outline to organize your thoughts
- Checking grammar and style
- Generate practice quiz questions or concept checks
- To help generate starter code, explain code, and assist with debugging or revision

The use of generative AI tools is *not* permitted in this course for the following activities:

- On timed quizzes/exams for any purpose
- Submitting AI-written responses or analyses as your own (even if you introduce superficial changes to the writing)
- Using AI to generate citations or references without verifying their accuracy
- Relying on AI to replace your own critical thinking or engagement with the material

Remember that you remain fully responsible for verifying that the code works as intended, that any cited sources are real and relevant, and that the final design decisions reflect your own understanding. If you are unclear whether some type of use would/would not be permitted for this class, just ask your instructor in advance.

Student Services

- **The Student Academic Support Center (SASC)** provides peer-led support for introductory and intermediate level courses in mathematics, statistics, programming, natural sciences, life sciences, and quantitative social sciences. Additionally, SASC provides support for students using a variety of quantitative skills required for courses across the curriculum. The Student

Academic Support Center also provides a variety of workshops in quantitative skills, time management, note-taking, and study skills. Course-Attached Tutors (CATs) are embedded in courses with the highest demand for tutoring. CATs provide assistance outside of class in the form of weekly help sessions and private appointments. SASC is located in the Peer Learning Commons (PLC) on the Ground Floor of Ladd Library. Students are invited to stop by, without an appointment, to the drop-in hours in Ladd to meet with a tutor, study independently, meet up with classmates, or to discuss learning strategies. Students who wish to set up an individual appointment can discuss options with a Resource Representative at the PLC check-in desk. For more information go to www.bates.edu/sasc or email sasc@bates.edu.

- **The Student Writing & Language Center (SWLC)** empowers Bates students in becoming more effective writers, speakers, language-users, and language-learners. Tutors provide a supportive environment for you to understand and generate ideas for your writing assignments in any subject or course; to draft, revise, and edit your writing for any purpose, context, or audience; to practice and get feedback on your oral presentations; and to study or practice writing and communicating. SWLC tutors are Bates students just like you, trained to listen to and guide you in using writing and language to achieve your personal and academic goals. Drop in to the SWLC anytime we're open to meet with a writing or language tutor. They're located in the Peer Learning Commons on the Ground Floor of Ladd Library. You can also search for subject-specific support hours or make appointments with a tutor using the Penji app: https://web.penjiapp.com/. For more information about the SWLC please visit www.bates.edu/swlc or email swlc@bates.edu.
- **Bates Counseling and Psychological Services (CAPS)** offers assistance and referral to address students' personal, social, career, and study skills needs. CAPS is located on the second floor of the Health Services Building (31 Campus Ave). You can contact them at 207-786-6200 for assistance M-F from 9:00 to 5:00 (out of hours emergency assistance can be obtained via Campus Security at 207-786-6254 or by calling 988). For additional information, see: https://www.bates.edu/counseling-psychological-services/. Services for students include:
    - Crisis and same-day emergency mental health consultations
    - Confidential assessment, counseling services (individual and small group), and referrals

Course Planning

Short Term at Bates is a unique opportunity to immerse yourself in a single subject in a way that isn't possible during a typical semester. In The Sleeping Brain, we'll take full advantage of this focused time—balancing fun, flexibility, and hands-on learning with a commitment to meaningful engagement.
While our time together will be engaging and interactive, it's essential to recognize that Short Term courses at Bates require a minimum of 90 hours of total work over the 3.5-week term. This includes both scheduled class/lab sessions (17.33 hours per week) and at least 8.67 hours per week outside of class for reading, assignments, studying, and lab preparation. Some weeks, the balance between class time and independent

work may shift, depending on our tasks. For example, periods leading up to experiment implementation or major deadlines may require more independent work time and correspondingly less class time. However, by pacing your work and staying engaged each week, you'll find the workload manageable and rewarding. The material we'll cover—including peer-reviewed journal articles, polysomnographic data analysis, and experimental design—may be new and challenging. If you find yourself reading things multiple times or taking longer to grasp certain topics, that's a good sign! It means you're engaging deeply with the material. However, if you're struggling to keep up or would like to dive deeper into specific topics, I encourage you to reach out. I'm always happy to discuss strategies, recommend additional resources, or help tailor your experience to your personal academic goals. Short Term is a time to challenge yourself in a supportive environment. Plan ahead, stay curious, and be ready to explore the fascinating science of sleep—yes, you'll even get credit for napping!

Additional Resources

There are treasure troves of information about neuroscience, psychology, and related disciplines sprinkled around the interwebs—much of it can be accessed for free. If you find yourself struggling to understand a concept, I'd encourage you to search around, carefully evaluate the quality of the sources, and share useful finds with the rest of the class. Below are some resources I have identified:

- APA formatting and general reference:
    - Purdue Online Writing Lab (OWL): https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_formatting_and_style_guide
        - I posted some additional reference materials inside the "APA Style/Scientific Paper Writing Tips" submodule inside of the "Course Introduction" of Lyceum.
    - Middlebury Library: https://middlebury.libguides.com/citation/apa7
    - ECU Library: https://libguides.ecu.edu/c.php?g=982594&p=7463742
    - Video Tutorials: https://apastyle.apa.org/instructional-aids/tutorials-webinars
    - APA Dictionary of Psychology: https://dictionary.apa.org
- Searchable article databases (and tutorials):
    - Neuroscience: https://libguides.bates.edu/neuroscience
    - Psychology: https://libguides.bates.edu/psychology
    - Psychology Resources: https://www.bates.edu/psychology/resources-for-students/technical-resources/
    - APA Database Tutorials: https://www.apa.org/pubs/databases/training/tutorials
    - Google Scholar: https://scholar.google.com
- Free textbooks & related resources:
    - Sleep:
        - The Neuroscience of Sleep and Dreams (McNamara): https://www.cambridge.org/core/books/neuroscience-of-sleep-and-dreams/

B4E0F0EC7C52BF82B205E83E9CC30A59 (currently provided free through Bates College)
    - Science of Sleep (Shook): https://open.umn.edu/opentextbooks/textbooks/the-science-of-sleep
    - The Brain Top to Bottom—Sleep and Dreams (McGill University): https://thebrain.mcgill.ca/flash/a/a_11/a_11_p/a_11_p_cyc/a_11_p_cyc.html
- General Neuroscience/Biological Psychology/Medical Psychology:
    - Introduction to Neuroscience (Hedges): https://openbooks.lib.msu.edu/introneuroscience1/
    - Introduction to Neuroscience (Hutchins): https://uen.pressbooks.pub/introneuro/ (this book has many excellent figures)
    - Interdisciplinary Explorations of Neuroscience (May): https://opentextbooks.rug.nl/interdisciplinaryexplorationsofneuroscience/
    - Open Neuroscience Initiative (Lim): https://drive.google.com/file/d/1n08qgzhG5-RgkoqL_Aa4y1UBSycUcy5g/view
    - Neuroscience Online: https://nba.uth.tmc.edu/neuroscience/toc.htm
    - Neuroanatomy Online: https://nba.uth.tmc.edu/neuroanatomy/index.html
    - Neuroscience (Ju): https://med.libretexts.org/Bookshelves/Pharmacology_and_Neuroscience/Neuroscience_(Ju)
    - Foundations of Neuroscience (Henley): https://med.libretexts.org/Bookshelves/Pharmacology_and_Neuroscience/Foundations_of_Neuroscience_(Henley)
    - Psychology as a Biological Science (Lindberg): https://nobaproject.com/textbooks/psychology-as-a-biological-science
    - Biological Psychology (Hove & Martinez): https://open.umn.edu/opentextbooks/textbooks/biological-psychology
    - Introduction to Biological Psychology (Hall): https://socialsci.libretexts.org/Bookshelves/Psychology/Biological_Psychology/Introduction_to_Biological_Psychology_(Hall_Ed.)
    - Biological Psychology (Keys): https://socialsci.libretexts.org/Courses/Sacramento_City_College/Psyc_310:_Biological_Psychology_(Keys)
    - The Nervous System in Action (Mann): https://michaeldmann.net/The%20Nervous%20System%20In%20Action.html
    - Neuroscience for Pre-Clinical Students (https://open.umn.edu/opentextbooks/textbooks/neuroscience-for-pre-clinical-students)
    - Computational Cog Neuro (O'Reilly et al.): https://compcogneuro.org/
    - Science of Sleep (Shook): https://open.umn.edu/opentextbooks/textbooks/the-science-of-sleep
    - Society for Neuroscience's Brain Facts: https://www.brainfacts.org/

- Research methods:
    - Crump et al.: https://crumplab.github.io/ResearchMethods/index.html
    - Cuttler et al.: https://open.umn.edu/opentextbooks/textbooks/75
    - University of Minnesota: https://open.lib.umn.edu/psychologyresearchmethods/
    - Bhattacherjee: https://scholarcommons.usf.edu/oa_textbooks/3/
- Statistics:
    - De Anza: https://openstax.org/details/introductory-statistics
    - Saylor: https://saylordotorg.github.io/text_introductory-statistics/index.html
    - Brown University Statistics Visualizations: https://seeing-theory.brown.edu
    - VassarStats: http://vassarstats.net
    - Effect Size Calculator: https://katherinemwood.shinyapps.io/lakens_effect_sizes/
    - Jamovi Open Stats: https://www.jamovi.org
    - Power analysis guide using G*Power: https://www.psychologie.hhu.de/fileadmin/redaktion/Fakultaeten/Mathematisch-Naturwissenschaftliche_Fakultaet/Psychologie/AAP/gpower/GPowerManual.pdf
    - Help choosing an appropriate statistical test:
        - http://www.statsflowchart.co.uk
        - https://stats.idre.ucla.edu/other/mult-pkg/whatstat/
        - https://www.statstutor.ac.uk/resources/uploaded/tutorsquickguidetostatistics.pdf
- Cognitive neuroscience methods/tools:
    - Functional Neuroimaging: https://imaging.mrc-cbu.cam.ac.uk/imaging/CbuImaging
    - FSL fMRI Analysis (free, multi-platform software and tutorials):
        - https://fsl.fmrib.ox.ac.uk/fsl/fslwiki
        - https://open.win.ox.ac.uk/pages/fslcourse/website/online_materials.html
    - Brain viewers:
        - Allen Brain Atlas: http://human.brain-map.org/mri_viewer
        - Gallant Lab: https://gallantlab.org/brain-viewers/
        - Neurosynth: https://neurosynth.org/
    - EEG/ERPs:
        - Event-related potentials (ERPs): https://erpinfo.org
        - Applied event-related potential data analysis: https://doi.org/10.18115/D5QG92
        - Training videos and manuals for our EGI GES 400 EEG system: https://www.egi.com/knowledge-center
    - Neurofeedback: Open-source Python/Matlab framework (OpenNFT): http://opennft.org/
- Stimuli/stimulus selection for experiments:

    - Tarr Lab: tarrlab.org
    - Vision Stimulus Sets: https://visionlab.is/stimuli-objects/
    - Chicago Face Database: https://www.chicagofaces.org/
    - Sounds: https://freesound.org/
    - Standardized Naturalistic Sounds: https://www.biorxiv.org/content/10.64898/2026.04.16.718910v1.full
    - Kahana Lab: http://memory.psych.upenn.edu/Word_Pools
    - Latent Semantic Analysis (LSA): http://lsa.colorado.edu
    - MRC Psycholinguistic Database: https://websites.psychology.uwa.edu.au/school/mrcdatabase/uwa_mrc.htm
    - University of South Florida free association norms: http://w3.usf.edu/FreeAssociation/
- Experiment software/code:
    - PsychoPy: https://www.psychopy.org (while this is free, in order to run a web-based experiment, you would need to host it somewhere like Pavlovia, which does come at a cost)
        - There are lots of useful (free) resources for learning PsychoPy, with many listed on the various pages of the PsychoPy website. If you are the type of person who prefers a printed (or e-book) manual, I'd recommend this book: https://collegepublishing.sagepub.com/products/building-experiments-in-psychopy-2-273700
    - PsyToolkit: https://www.psytoolkit.org (this is free, including for online data collection)
    - Discover Computer Science Videos: https://occtive.github.io/www/
- Videos:
    - 2-Minute Neuroscience: https://www.youtube.com/channel/UCUgZq9PkDp1xaEivtcfJPSg
    - Nancy's Brain Talks: https://nancysbraintalks.mit.edu/
    - TED Studies: https://www.ted.com/read/ted-studies/neuroscience
    - Khan Academy: https://www.khanacademy.org/test-prep/mcat/behavior#concept-intro
    - HarvardX Neuroscience: https://vimeo.com/mcb80x
- Effective studying:
    - https://www.samford.edu/departments/academic-success-center/how-to-study

About the Instructor

Well, hello there! I'm excited to be your instructor for this course. In case you're wondering who's lecturing excitedly about action potentials and cats multiple times a week, here's a bit about me (I'll save you the trouble of Googling since your coursework will likely keep you busy enough). I joined Bates College in 2024 after spending nine years at Bard College, where I served as chair of the Psychology Program (I'm now chair of the Neuroscience Program). My background is in psychology, with a focus on the cognitive neuroscience

of human memory—especially the fascinating (and often misunderstood) process of forgetting. I earned my bachelor's degree from the University of Pennsylvania in 2005 on full scholarship, completing two theses: one on memory consolidation during sleep and another on how children learn mentalizing verbs like "to think." While at Penn, I also worked as a wedding videographer and held several research positions, including clinical research at the Children's Hospital of Philadelphia. My path through graduate school was quite the adventure—both literally and figuratively (ask me about it sometime!). I received my Ph.D. from the University of Cambridge, where I was affiliated with St John's College and the Medical Research Council's Cognition and Brain Sciences Unit. Afterward, I returned to New Jersey (where I grew up) for a postdoc at the Princeton Neuroscience Institute (I didn't actually grow up *in* the Institute) before joining the faculty at Bard. It was in Princeton that I found my two cats, Mandy and Jerri (sisters from the same litter). They quickly became my inspirations, portable space heaters, and sage meditation teachers. Two more tidbits about me: I have aphantasia and severely deficient autobiographical memory (SDAM)—conditions that are only starting to be explored in neuroscience. Regardless, I have no doubt that we'll find ways to make this semester memorable for everyone!

About the Teaching Assistant

Hi everyone! My name is Charlotte Hansen, and I'll be your TA for this course. Here's a little bit about me: I'm currently a sophomore majoring in neuroscience with a minor in Hispanic studies on the premed track. I took this course last year and really enjoyed it, so I'm very excited to be coming back in a new role. I've been involved in the lab since Short Term last year and have been serving as a lab manager for the past couple of months. It's been a great experience, and I've really enjoyed being part of the research and the team. I'm looking forward to meeting all of you and helping out with this really awesome course. I'll be around at a lot of class meetings and am always happy to answer questions or talk things through as they come up!

Tentative Course Schedule

Date	#	Topic	Morning	Afternoon	HW (for next class)
5/4 (m)	**1**	**Orientation**	• Icebreakers • Discussion: What is sleep? Why do we sleep? • Lecture: Why we sleep	• Sleep lab tour • Discussion: Hacking sleep	• Moorcroft Ch. 1-2 • Short videos (links on Lyceum): EEG, Generation, Time-Frequency Analysis, & Fourier Analysis • Get started on your CITI (biomedical) training (due 5/11 by 10am)
5/5 (t)	**2**	**Targeted Memory Reactivation (TMR)**	• Lecture: Memory consolidation + TMR • Read & discuss: Oudiette & Paller (2013)	• Scoring pre-test • Mini-presentation sprint: - Rasch et al. (2007) - Hu et al. (2015) - Rudoy et al. (2009)	• Moorcroft Ch. 5 • Paller, Creery & Schechtman (2021) • Atlanta School of Sleep Medicine Video #2 (51 min) • *Optional reading:* - *Berry et al. (2017) AASM Manual (pp. 12-31)* - *Malhotra & Avidan scoring chapter*
5/6 (w)	**3**	**Your Mission** (should you choose to accept it)	• Scoring post-test • Mission briefing • Form groups • Establish team process	• Literature search: - Find your replication target (keep it simple)	• Carbone & Diekelman (2024) • Read target article (w/ any supplemental materials)

Date	#	Topic	Morning	Afternoon	HW (for next class)
5/7 (r)	**4**	**Ethics**	• Perusall annotation of existing IRB sleep protocol	• Group work: - "IRB" protocol, including consent & debriefing - To-do list & assignments	• Tingley (2022) - Bring to class "one cool finding" related to chronobiology • By AM class on Monday, have submitted your CITI (biomedical) **training certificate** to Lyceum ✦ https://www.bates.edu/institutional-review-board/training-requirements-for-all-human-subjects-researchers/
5/11 (m)	**5**	**PsychoPy**	★**CITI training certificate** due *before* class (Lyceum) • Chronobiology findings presented • Group reports • PsychoPy/Python introduction	• PsychoPy challenges • Working with EEG trigger codes • Group work	• EGI manuals - https://www.egi.com/images/stories/manuals/geodesic-sensor-nets-hydrocel-net-technical-manual-rev-53.pdf ‣ Ch. 1-2; 6-7 - https://www.egi.com/images/stories/manuals/net-station-5-5-geodesic-eeg-software-user-manual-rev-01.pdf ‣ Ch. 3; 5-6

Date	#	Topic	Morning	Afternoon	HW (for next class)
5/12 (t)	**6**	**EEG**	• Group reports • Net application practice	• More net application practice • EEG acquisition practice • Group work	• Moorcroft Ch. 3-4 • Watch videos (Lyceum): - Net application videos (~25 min; Lyceum) - Net Station 5 acquisition video (24 min)
5/13 (w)	**7**	**Get Ready!**	• Journal club group assignments & dates: - An article that cited or was cited in your target article • Journal club prep	• Scientific posters • Group work - Poster template - Code - Experimenter script - Recruit participants	• Moorcroft Ch. 10 • Any necessary group work
5/14 (r)	**8**	**Get Set!**	• Group reports • Group work	• Group work • Recruit participants	• Moorcroft Ch. 11 • Any necessary group work
5/18 (m)	**9**	**Pilot**	• Group reports • Group work	• Each group pilots protocol (w/o sleep) • Use any downtime to refine protocol	• Any necessary group work • Journal club prep
5/19 (t)	**10**	**Run**	• Group reports • Journal Club (Group 3 leads)	• Group 1 runs participant - Other groups observe	• Any necessary group work • Journal club prep
5/20 (w)	**11**	**Run**	• Group reports • Journal Club (Group 1 leads)	• Group 2 runs participant - Other groups observe	• Journal club prep • Polish lab protocol
5/21 (r)	**12**	**Run**	• Group reports • Journal Club (Group 2 leads)	• Group 3 runs participant - Other groups observe	• By AM class on Monday, have submitted your **lab protocol** (1 per group)

Date	#	Topic	Morning	Afternoon	HW (for next class)
5/25 (m)	**13**	**Digital Poster Prep**	★**Lab protocol** due *before* class (1 per group; Lyceum) • Group poster work	• Group poster work	• By AM class tomorrow, have submitted your **poster due** (1 per group)
5/26 (t)	**14**	**Present**	★**Group poster** due *before* class (1 per group; Lyceum) • Poster presentation practice	• Digital poster presentations • Finalize lab protocol	• Work on your **final reflection** (individual)
5/27 (w)	**15**	**Wrap-Up**	• Mission debriefing • Group- & self-assessment	• Independent work on your Final Reflection *(no class)*	★Your **final reflection** due by 4pm today (individual submission; Lyceum)

Schedule is subject to change to improve pacing and/or accommodate unforeseen events (e.g., severe weather, pandemic, alien abduction). Check announcements over email.