Instructor: Dr. Laura Rider
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Office Hours: Tues, Wed 11-12 and by appointment
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Description In 2000, the Clay Math Institute designated a $7 million prize fund—$1 million for the solution to each of the seven Millennium Problems. The Millennium problems are mathematical conjectures that were deemed 'important' and whose solutions have stumped experts for many years. Six of these problems remain unsolved today.

These problems are related to a range of higher level mathematics including number theory and the distribution of primes, theory of computation, physics, topology, and so on. In this seminar, we'll discuss these problems, some related mathematics, and the surrounding history giving students a taste of the vastness of the mathematical landscape.

Text The Millennium Problems: The Seven Greatest Unsolved Mathematical Puzzles Of Our Time by Keith J. Devlin.

Problems:	Riemann hypothesis
Poincaré conjecture	Birch and Swinnerton-Dyer conjecture
P vs NP	Navier–Stokes existence and smoothness
Hodge conjecture	Yang–Mills existence and mass gap

Schedule and Expectations We will meet in room E17-133 on Tuesdays from 3-5pm officially. We will unofficially start at 3:30. You are expected to attend every class meeting Your associate advisor is Yonah Borns-Weil. His email address is yonahb@mit.edu.

Meeting 1: 9/15	Meeting 7: 11/03
Meeting 2: 9/22	Meeting 8: 11/10
Meeting 3: 9/29	Meeting 9: 11/17 - maybe no class?
Meeting 4: 10/06	Meeting 10: 11/24
10/13 - No class. Monday schedule.	
Meeting 5: 10/20	Meeting 11: 12/01
Meeting 6: 10/27	Meeting 12: 12/08

Grading The class is Pass-Fail only, and anyone making a reasonable effort will pass. Some class participation is required of every student.

About the seminar The priority of this seminar is for us to adjust to MIT together, get to know each other, and for each of you to feel like if some problem or challenge should arise, then you know of several resources available. This includes being able to talk to me or Yonah if you like.

The other goal for the seminar will be to talk about some interesting math. Each of you can make a decision about how much time you would like to put into this course. We can study each millennium problem as in depth or superficially as you like. We can focus on the problem itself, the surrounding mathematics, or even the history related to the problem. Also, we have a lot of freedom to change the format of the seminar as the semester goes on. I'd like to spend about two weeks on each millennium problem. I'd like to cover at least 5, and have a special lecture or two on the remaining problems on the last class meeting. (I expect that preparation for the seminar should take less than an hour most weeks.)

Each of you will choose one millennium problem. You may choose the same problem as a fellow student and work together. For the problem you choose, you will be considered the lecture coordinator. Before the two weeks of your problem, you will have read about your problem and decide on a few related math topics that it builds upon (maybe 3-5 topics). During the first meeting, you'll choose helpers or ask for volunteers to cover your 3-5 topics. During the second week, your 3-5 helpers will each present a mini-lecture on their topic (6 minutes), and then you'll give a short introduction to the problem (10-15 minutes). I want to encourage all of you to interrupt during discussions. Feel free to bring your smart phone or laptop to google topics during class.