Physics 107 FACT SHEET

Spring Term, 2006

FACULTY:

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Prof. Joan Marler	Y-111	6083	E-mail: `joan.marler@lawrence.edu`

STUDENT ASSISTANTS: In addition to one of the faculty members, an upper-class physics major will function as an assistant in each laboratory session. This year, Claire Weiss, Nathaniel Douglas, and Duncan Ryan will serve in this capacity.

MEETING TIMES:

Lectures:	9:50 AM MWF, except on conference days	Y-121
Conferences:	some Wednesdays, one Friday; various times	TBA
Laboratory:	1:10–4:00 PM Mo *or* 8:10–11:00 AM Tu *or* 1:10–4:00 PM Tu	Y-115, 118

OFFICE HOURS:

Prof. Cook:	7:00–9:00 PM most Su; 1:30–3:00 PM Th; by appointment.
Prof. Marler:	11:00–12:00 AM We; by appointment

REQUIRED MATERIALS:

1. Primary text: Thomas D. Rossing, F. Richard Moore, and Paul A. Wheeler, *The Science of Sound*, Third Edition, (Addison-Wesley, Reading, MA, 2004; ISBN 0-8053-8565-7). [available at Conkey's]
2. Laboratory notebook: National Bound Notebook #43-648 is best but any *bound* (i.e., not spiral) notebook that has graph paper on at least one side of the page, has numbered pages, and is at least 8.5"×11" in size will be acceptable. You may certainly use a previously used notebook provided it has about 75 blank pages. [available at Conkey's]
3. This packet, which includes the Laboratory Scheduling Questionnaire, the (tentative) Laboratory Section list, the Physics 107 Fact Sheet (including the course schedule), the assignments for the term, supplementary problems, and the course bibliography (including the list of books on reserve). [distributed at first class]
4. Physics 107 Laboratory Instructions. Beyond the instructions for all of the experiments save the last one (which will be distributed towards the end of the term), this bound booklet includes two appendices on keeping laboratory notebooks, an appendix on saving files from the laboratory computers, an appendix on propagation of uncertainty, and an appendix on least squares fitting. The charge to cover the costs of printing and binding this manual is $7.65. Once the registration for the course has settled down, I will ask the Business Office to post that charge (plus 5% Wisconsin sales tax) to the account of each student in the course. [distributed at the first meeting of the laboratory]
5. Battery operated pocket calculator. Since some of the problems on the assignments will involve numerical work, you should acquire an inexpensive pocket calculator if you don't already own one. A calculator that is able only to add, subtract, multiply, and divide will be inadequate; one having sine, cosine, logarithmic, and exponential capabilities as well will be necessary. A graphing calculator is *not* necessary. [available at any number of stores in Appleton and in the shopping malls west of town]
6. (optional) USB flash memory stick. You may occasionally want to be able to save files generated on the computers in the laboratory. Two routes are available. You can write the files to a USB memory stick or—and this is the recommended procedure—you can save laboratory-generated files in your University computer account. Instructions are included in Appendix C of the laboratory manual.

SUPPLEMENTARY MATERIALS: Occasionally, assignments will direct your attention to various materials beyond those enumerated above. These materials will be on reserve in the main library. Frequent examination of these materials will provide additional perspectives on the material of the course. A list of materials on reserve in the library is included with this packet. The general books listed will be valuable throughout the term. All items on the list will become useful during the last few weeks of the term when you will be asked to read beyond our primary text on at least one grouping of musical instruments.

GENERAL EDUCATION REQUIREMENTS: Physics 107 satisfies the distribution requirement for a laboratory science course. It also satisfies the competency requirement for a course that emphasizes mathematical reasoning or quantitative analysis.

SCHEDULE: The attached schedule for this course indicates the topics of all lectures and the dates of all conferences, directs your attention to pertinent sections of the primary text, identifies the focus of each laboratory activity, and tabulates the due dates for all assignments and the dates of all examinations.

LABORATORY: The laboratory will meet every week (*including* the first week but *excluding* the week of Memorial Day at the end of May). The accompanying schedule indicates the laboratory activity for each week.

Each student will be assigned to one of the three laboratory sections, which meet on Monday afternoon, Tuesday morning, and Tuesday afternoon. Each section will start at the time indicated above (1:10 PM or 8:10 AM) in Y-115 (adjacent to the general laboratory, Y-118) for a group discussion of the day's activity. The official ending time for the laboratory is 4:00 PM or 11:00 AM. While we cannot absolutely guarantee that everything will go smoothly during the laboratory afternoon, it is our intention that exercises will be set so that, even with a few "bumps", the in-laboratory portions can be comfortably completed in the 170-minute laboratory time.

Each laboratory exercise involves

- Preparing ahead of time by reading the instructions for the day's exercise. Actually, experience suggests the wisdom of reading those instructions *twice* before coming to the lab.

- Preparing your laboratory notebook—again ahead of time—by putting in a title, drafting a statement of purpose, and entering anything else (sketch of apparatus, preliminary description of procedure, list of questions you want to ask, outline of data tables or of the format for data to be entered into EXCEL, ...) that may help speed the progress of the activity in the laboratory. *The importance of coming to the laboratory prepared cannot be overstressed. If you know what you are doing, everything will move smoothly; if you can't figure it out ahead of time, you will come in ready to ask useful questions right at the start of the session. In either case, the likelihood of timely completion of the exercise is markedly enhanced by thorough advance preparation.*

- Bringing your laboratory notebook and the instructions for the exercise of the day to each session.

- Performing the exercise and keeping a careful record of your activities. The instructor will discuss the expected contents of a laboratory record at the beginning of the first laboratory meeting. Further, two appendices in the laboratory manual address this topic.

- Completing your laboratory record in your notebook. Unless your instructor announces otherwise, your completed record is to be handed in when you leave your laboratory session. Occasionally, your laboratory record will need to be completed after the laboratory session is over and, in those cases, the report will be due 49 hours after the end of the laboratory session, i.e., by 5:00 PM two days later for afternoon sessions, by noon two days later for the morning session.

Of course, it is unreasonable for us in the first week to expect you (and especially those of you in the Monday laboratory section) to have acquired a laboratory notebook (and—if you choose—a USB flash memory stick) before the first meeting. Thus, your laboratory record in the first week (only) can be kept on loose sheets of paper which you later tape into your notebook. Files can be saved *temporarily* in the folder `C:\Data` on the local hard drive, but will have to be copied to your University account and removed from that folder at the end of the laboratory session. And—since instructions for the first exercise will not be distributed until the start of the laboratory section, advance preparation for that exercise is clearly not expected. *For all subsequent weeks, however, you will have the instructions well ahead of the laboratory time, you will be expected to prepare as outlined above before coming to the laboratory, and you will be expected to bring with you your laboratory notebook, the laboratory instructions, and—if you choose—a USB memory stick.*

Finally, a brief warning: We do not believe we are asking for more than an hour and a half to two hours of time outside the laboratory period each week. To be sure, you need to prepare for each laboratory session ahead of time and, on *a few* of the exercises, you will need to complete your write-up after the laboratory session is over. Do guard your time. Keep in mind that the laboratory is only 25% or so of the course; do not spend 50% of your course time on the laboratory. If you find yourself spending more than a couple of hours a week out of the laboratory on the laboratory, please come talk with us. If we are setting unreasonable expectations, we should know about it; if you are simply using time inefficiently, perhaps we can help you regain control. Laboratories have a way of becoming a time-sink for the unwary; please be wary.

CONFERENCES: The schedule also indicates days—all but the last of them Wednesdays—on which conference meetings will be substituted for lectures. Each conference will provide students with an opportunity to discuss the material covered since the previous conference. The class will be broken into three smaller groups for these conferences. One of the conferences will meet during the regular class time. Schedule information to facilitate assigning students to conference sections will be gathered on the second or third day of class.

MATHEMATICAL EXPECTATIONS: Even though Physics 107 is intended to be accessible to students who have little formal training in mathematics, physics is a quantitative science and much of its substance is most compactly and accurately expressed in mathematical or graphical form. Ability to do simple algebra,[1] to read graphs, and to perform short calculations on a pocket calculator is expected. More elaborate mathematical operations are not required. If you feel you need a refresher in some of these skills, note that the Center for Teaching and Learning (CTL) offers the following short workshops early in Term III:

Algebra Workshop	Tu 28 Mar @ 4:30 PM, Th 30 March @ 6:30 PM
Graph Workshop	Tu 28 Mar @ 6:30 PM, Tu 4 Apr @ 4:30 PM
Word Problem Workshop	Th 30 Mar @ 4:30 PM, Tu 4 Apr @ 6:30 PM

Each workshop will last approximately 1-1/2 to 2 hours; all will be held in Briggs 420. No registration is necessary; simply show up at the indicated starting time.

MUSICAL EXPECTATIONS: Some familiarity with musical notation is assumed. We will also make use of the nomenclature of scales (e.g., A-major, B$^\flat$-minor) and intervals (e.g., perfect fifth, minor third), but some attempt will be made to define these quantities when we first encounter them.

ASSIGNMENTS: Written assignments will be due at the class period following each conference session. The accompanying assignment sheets identify what is to be handed in, present several questions for you to think about, and sometimes recommend reading beyond the primary text. Please keep in mind that the answer to a problem is much less important than the method by which you deduce it. *All submitted solutions must be complete, i.e., they must contain not only the answer, not only a succession of equations, but also—and most important—enough narrative to*

[1] For example, given $3x = 12$, find x; given $f = 440$ cycles/s, $c = 330$ m/s, find λ if $\lambda f = c$.

make clear how you thought your way carefully and logically from first principles. Altogether, these components constitute a solution to the problem. As you can see, a solution is much more than an answer. An answer alone will receive no credit, even if it is correct. It is your job in all submitted work to convince me that you have identified the applicable principles, recognized clearly what those principles are, and worked your way step-by-step from that starting point to the solution. For—I believe—sound pedagogic reasons, I will not assume unwritten or undefended steps have been done correctly. *No late assignments will be accepted.*

EXAMINATIONS: One in-class hour examination and one final examination will be administered. More detailed statements about each will be made closer to the time of the examinations.

HONOR SYSTEM: The honor pledge is to be signed on all submitted work (problem assignments, laboratory write-ups, the hour examination, the final examination). You are expected to present only your own work on the hour examination and the final examination. A laboratory record is to be kept by each student, and laboratory reports are to be written individually and should contain only your own phrasings of explanations and analyses. Regular problem assignments are to be individually written and submitted. Especially on the problem assignments and on the analysis of the laboratory experiments, however, you are encouraged to learn from one another by talking together and sharing insights. I establish only two ground rules: (1) Working together will be most effective if all individuals contribute more or less equally to the group effort; you should be wary if you are always on the receiving end in such effort, for ultimately you will be expected to perform on your own. At the very least, once you have finished solving an exercise in a group, you should be *absolutely certain* that you have made the *collective* group wisdom a part of your own *personal* understanding and that you could solve a similar exercise by yourself. (2) Where substantial help has been received through conversation with another, I ask that you follow common scientific courtesy and acknowledge that help briefly in your submitted work.

GRADING: Each student's final grade in this course will be based mostly on the laboratory exercises, the hour examination, and the final examination. Diligence and success in completing problem assignments will also be taken into account. The following *approximate* weights will be assigned to the different parts of the course in determining the final grade:

laboratory:	≈25%	hour examination:	≈25%
final examination:	≈40%	problem assignments:	≈10%

While the problem assignments do not *appear* to count very heavily in the grading system, be assured that your performance in *all* other aspects of the course will be markedly influenced by how much attention you pay to these problems. Furthermore, the extent to which you have paid attention to the problems and your general success on those assignments can be the deciding factor in borderline cases.

The laboratory grade is determined from the instructor's appraisal of both the student's laboratory activity and the student's laboratory notebook; the former is a subjective evaluation of presence, preparation, and participation during the laboratory period, and the latter is an objective evaluation of the notebook.

During the term, each student will hand in eight laboratory write-ups. Six of the eight will be assigned a letter grade. The remaining two will be graded S/U. The contribution of the grades on write-ups to the laboratory grade in the course will be determined by combining letter grades and S/U grades in the same way that the registrar combines those grades in determining standard GPAs. The table at the top of the next page indicates which write-ups will be given a letter grade and which will be graded S/U.

Grading Approach in Laboratory

Week	Date	Grading Approach
1	27,28 Mar	S/U grade on Experiment 1 (Orientation). (This approach will help you begin to see what is expected in a write-up.)
2	3,4 Apr	Letter grade on Experiment 2 (PVA).
3	10,11 Apr	Letter grade on Experiment 3 (SHM).
4	17,18 Apr	Letter grade on Experiment 4 (Lasers) and on Experiment 5 (Standing Waves).
5	24,25 Apr	Letter grade on Experiment 4 (Lasers) and on Experiment 5 (Standing Waves).
6	1,2 May	Letter grade on Experiment 6 (Sounds Together); S/U grade on Experiment 7 (Chladni Plates)
7	8,9 May	Letter grade on Experiment 6 (Sounds Together); S/U grade on Experiment 7 (Chladni Plates)
8	15,16 May	Nothing handed in
9	22,23 May	Letter grade on Experiment 8 (Waveforms and Vibration Recipes)
10	29,30 May	No laboratory meeting

SUGGESTIONS ON STRATEGY:

1. Try hard to stay on top of the course week by week if not day by day. Seek help from some resource at the *very* first sign of confusion or difficulty. Like music theory, physics develops sequentially and unresolved confusion at some point is quite likely to lead to even deeper confusion at a (nearby) later point.

2. Make every effort to give the reading a first pass *before* the associated class so that your mind is already alert to the general topic and so that you are better prepared to fold the material of the lecture into your growing understanding.

3. Come to each laboratory session fully prepared for the exercise of the day.

4. Work with one another, especially as you grapple with the reading and the problem assignments.

5. Make a serious attempt to solve all problems on a given assignment *before* coming to the associated conference meeting so you know what questions to ask.

SUPPORT MECHANISMS: When you have questions about the problem assignments, the reading, the laboratory, and/or other topics related to the course, your options for assistance include

1. Looking at the appropriate sections in some of the books on reserve in the library. Often another author's perspective on a topic can provide clarification. Indeed, you may find one or another of those books that regularly speaks to you more effectively than the assigned text. If so, by all means, make frequent use of that alternative resource.

2. Consulting with a classmate. This activity will either help you to realize that you are not the only one confused (and maybe help both of you to figure it out) or help you to resolve your confusion. Either way, the conversation has value.

3. Making notes of your questions and being sure to ask them in the next conference section.
4. Looking at published problem solutions, which—shortly after the due date for each assignment—will be added to a notebook that can be checked out for two-hour periods from the main circulation desk in the library.
5. Sending me an email message in which you carefully articulate your question. I will try to respond within 24 hours. (*Note*: If responding to your messages grows to require several hours a day, however, I may have to abandon the activity. My hidden agenda is, of course, to induce you to phrase your question so carefully that you will see its answer yourself.)
6. Visiting with Prof. Cook or Prof. Marler at a scheduled office hour. Appointments can be made if the official office hours are not convenient for you.

SCHEDULE: In this schedule, reading assignments in the primary text are indicated in square brackets.

27	Mar	Introduction: Sound as Vibration
	LAB	*Exp. 1: Using the Laboratory Computers/Elements of Data Analysis*
29	Mar	Pertinent Physics Jargon [Chap. 1]
31	Mar	Characteristics of Vibrating Systems [Chap. 2]
3	Apr	Waves and Wave Propagation [Chap. 3]
	LAB	*Exp. 2: Position, Velocity, Acceleration*
5	Apr	CONFERENCE ON ASSIGNMENT 1
7	Apr	ASSIGNMENT 1 DUE (at start of class)
		Standing Waves and Resonance [Chap. 4]
10	Apr	Hearing and Critical Bands [Chap. 5]
	LAB	*Exp. 3: Simple Harmonic Motion*
12	Apr	CONFERENCE ON ASSIGNMENT 2
14	Apr	ASSIGNMENT 2 DUE (at start of class)
		Loudness [Chap. 6]
17	Apr	Pitch [Chap. 7, pp. 121–135]
	LAB	*Exp. 4: Interference: Wavelength of Light with a Steel Rule* or
		Exp. 5: The Driven String: Resonance and Standing Waves
19	Apr	CONFERENCE ON ASSIGNMENT 3
21	Apr	ASSIGNMENT 3 DUE (at start of class)
		Timbre [Chap. 7, pp. 135–144]
24	Apr	Consonance and Intervals [Chap. 8]
	LAB	*Exp. 5: The Driven String: Resonance and Standing Waves* or
		Exp. 4: Interference: Wavelength of Light with a Steel Rule
26	Apr	CONFERENCE ON ASSIGNMENT 4
27	Apr	(7:00–9:00 PM, Y-118) Help session before hour examination
28	Apr	ASSIGNMENT 4 DUE (but you are excused from handing it in)
		HOUR EXAMINATION [Covering Assignments 1–4]

1	May	Scales and Temperament [Chap. 9]
	LAB	*Exp. 6: Two Sounds Together: Ear Test, Beats, Lissajous Patterns* or *Exp. 7: Chladni Plates: Resonance and Normal Modes in 2D*
3	May	Scales and Temperament [Chap. 9]
5	May	NO CLASS (READING PERIOD)
8	May	Auditorium Acoustics [Chap. 23]
	LAB	*Exp. 7: Chladni Plates: Resonance and Normal Modes in 2D* or *Exp. 6: Two Sounds Together: Ear Test, Beats, Lissajous Patterns*
10	May	CONFERENCE ON ASSIGNMENT 5
12	May	ASSIGNMENT 5 DUE (at start of class) String Instruments [Chap. 10]
15	May	Brass Instruments [Chap. 11]
	LAB	*Exp. 8: Frequency Decomposition and Fourier Analysis, Part I*
17	May	Woodwind Instruments [Chap. 12]
19	May	Percussion Instruments [Chap. 13]
22	May	Keyboard Instruments [Chap. 14]
	LAB	*Exp. 8: Frequency Decomposition and Fourier Analysis, Part II*
24	May	The Voice [Chap.'s 15, 16, and 17]
26	May	ASSIGNMENT 6 SHOULD BE COMPLETED (See note on assignment sheet) Recording and Reproduction of Sound [Chap.'s 18, 19, 20, and 22]
29	May	MEMORIAL DAY - NO CLASS
	LAB	Laboratory will not meet this week.
31	May	Electronic Production of Sound [Chap.'s 26 and 27] Digital Computers and Sound [Chap.'s 28 and 29]
2	Jun	CONFERENCE ON ASSIGNMENT 7
3	Jun	(12:00 Noon) ASSIGNMENT 7 DUE
6	Jun	(7:00–9:00 PM, Y-118) Help session before final examination
7	Jun	(8:30 AM) Final Examination (covering entire course)

Physics 107 PHYSICS OF MUSIC: ASSIGNMENTS Spring Term, 2006

ASSIGNMENT 1 (due at the start of class on Friday, 7 April)

Reading: Rossing, Chapters 1, 2, 3
Supplementary Reading:[2] Backus, Introduction, Chapters 1, 2, and 3; Benade, Chapters 1, 2, and 3
Try problems:[3]
Rossing: pp. 19–20: Q3, Q4, E5, E8, E9, E11; pp. 36–37: Q2, E1, E2, E4;
pp. 57–59: Q3, E1, E2, E3, E6, E9
Supplementary:[4] 1-1, 1-2, 1-4, 1-5, 1-6, 1-8, 1-9; 2-3, 2-5
Hand in problems:[5,6]
Rossing: pp. 19–20: E8(a), E8(b), E11; p. 37: E1, E4; p. 58: E2,[7] E3
Supplementary: 1-4, 2-3(b), 2-5

ASSIGNMENT 2 (due at the start of class on Friday, 14 April)

Reading: Rossing, Chapters 4 and 5
Supplementary Reading: Backus, Chapters 4 and 5; Benade, Chapters 6 and 10
Try problems:
Rossing: pp. 72–74: Q1, Q4, E2, E3, E5, E8; pp 96–98: Q2, E1, E2
Supplementary: 2-6, 2-8, 2-12, 2-13, 2-14
Hand in problems:
Rossing: p. 73: E3, E5; p. 97, E1
Supplementary: 2-12

ASSIGNMENT 3 (due at the start of class on Friday, 21 April)

Reading: Rossing, Chapter 6 and Chapter 7, pp. 121–135
Supplementary Reading: Backus, Chapters 5; Benade, Chapters 5 and 13
Try problems:
Rossing: pp. 118–120: Q1, E1, E2, E4; pp. 147–149: Q1, E2, E4, E8
Supplementary: 3-3, 3-4, 3-5, 3-7, 3-10, 3-12, 4-2
Hand in problems:
Rossing: p. 119: E2; p. 147–148: E2
Supplementary: 3-4, 3-7, 3-10, 3-12, 4-2

[2]These readings are not required, but you may find them helpful. All items referred to here will be found on two-hour reserve in the main library.

[3]Read *all* of the review questions, questions, exercises, and experiments at the end of each chapter. You should attempt to solve all of the problems identified in this section of the assignment. I shall use the prefix R to identify review questions, Q to identify questions for thought and discussion, E to identify exercises, and Exp to identify experiments from the sections at the very end of each chapter in Rossing.

[4]The supplementary problems are found in a separate document that is appended to this fact sheet.

[5]Solutions to the problems designated in this group are to be written out carefully and handed in at the beginning of the class session following the conference meeting on the assignment.

[6]Remember that a solution to a problem contains not only the answer but also sufficient narrative to explain how you deduced the answer from the given information. Please review the paragraph titled ASSIGNMENTS on page 3 of this fact sheet.

[7]Ignore the last question in this exercise; it is premature.

ASSIGNMENT 4 (due at the start of class on Friday, 28 April)

This assignment must be completed by the time of the hour examination and it is included in the assignments covered on that examination. You must *do* this assignment and, in particular, you should make every effort to solve the problems designated "hand in" and to ask about them in the conference meeting on Wednesday, 26 Apr. You are, however, excused from actually handing in carefully written solutions to those problems.

Reading: Rossing, Chapter 7, pp. 135–144 and Chapter 8
Supplementary Reading: Backus, Chapters 6 and 7; Benade, Chapters 7 and 14;
Sundberg, Chapter 4
Try problems:
Rossing: pp. 147–149: E10, E11; pp. 172–173: Q2, Q3, E2, E6
Supplementary: 4-1, 4-3, 5-1, 5-3, 5-4, 5-18
Hand in problems:
Rossing: p. 148: E10, E11; p. 172, Q3
Supplementary: 4-1, 5-3, 5-18

ASSIGNMENT 5 (due at the start of class on Friday, 12 May)

Reading: Rossing, Chapters 9 and 23
Supplementary Reading: Backus, Chapters 8 and 9; Benade, Chapters 15, 16, 11, and 12
Try problems:
Rossing: pp. 189–190: Q3, E6[8]; pp. 543–545: Q1, Q2, Q4, E2, E3,[9] E6
Supplementary: 5-5, 5-7, 5-10, 5-11, 5-12, 5-13, 5-14, 5-17
Hand in problems:
Rossing: p. 190: E6[10]; p. 544: E2, E3[11]
Supplementary: 5-5, 5-10, 5-12

ASSIGNMENT 6 (should be completed by Friday, 26 May)

Reading: Rossing, Chapter 10; Suggested problems: Q1, Q2, E1, E5
Chapter 11; Suggested problems: Q3, Q5, E1, E4
Chapter 12; Suggested problems: Q1, Q3, E1, E5
Chapter 13; Suggested problems: Q3, E2, E5, E8
Chapter 14; Suggested problems: Q1, Q3, Q4, E1, E3, E5
Chapter 15; Suggested problems: Q1, Q2, Q4, E1, E2
Chapter 16; Suggested problems: Q1, Q2, E2
Chapter 17; Suggested problems: Q1, Q3, E2, E5

The material of this assignment will be represented on the final examination in this course in two ways:

i. I will *not* promise *not* to ask one or more questions about the material specifically discussed in class at the level and in the detail of that discussion. This component is intended to provide incentive for *everyone* to spend some time with the material discussed in class.
ii. I *will* promise that the examination will include a single essay question that will amount to about one-quarter of the examination. While there will be options within other parts of the examination, every student will be required to answer this question. In outline, it will ask you to discuss either the string instruments, the brass instruments, the woodwind instruments,

[8]Note: In part (b) of this problem, omit A_4. You did that pitch already in part (a). Note also that, in the conversion to cents, you want to work not with $\Delta f/f$ but with f_1/f_2, i.e., not with 3/400 but with 403/400.
[9]In the first line of this exercise, read *delay* instead of *decay*.
[10]See footnote 8.
[11]See footnote 9.

percussion instruments, the piano, or the human voice (your choice) from the perspective of this course. I suggest that you choose now which group of instruments you wish to focus on and that, in addition to reading about *all* groups in Rossing, you read as well about your *particular* group in some of the additional sources identified in the accompanying bibliography. I shall attempt in lectures to identify the various items that you should be able to discuss for each group of instruments, but in most cases the lectures will only suggest topics, leaving the detailed information to your supplementary reading.

There will be no problems to hand in on Assignment 6 and no conference on the material, but I urge you to attempt a significant fraction of the problems identified above. Further, you should make it a point to drop by my office (individually or in groups) to discuss these problems and any other questions you have on this assignment.

ASSIGNMENT 7 (due at noon on Saturday, 3 June)

Reading: Rossing, Chapters 18, 19, 20, 22, 26, 27, 28, and 29[12]
Try problems:
Rossing: p. 421: E12; p. 467: Q2; p. 520: Q4, E1
p. 609: E1, E5; p. 633: E1
Supplementary: 7-1
Hand in problems:
Rossing: p. 520: E1; p. 609: E5
Supplementary: 7-1

[12]Rossing treats this material more expansively than we will. I urge you to read all of the material in these chapters, but I will hold you responsible only for those topics that I address at least briefly in class.