

**Rock and Roll physics! Building guitars from scratch!**

**2-4 persons per group: 55 lab points. Due Friday, May 17<sup>th</sup>**

*Guitars, like all musical instruments, are based on resonance. Strings vibrate when struck and pass their vibrations into the bridge of the guitar, usually placed centrally to a membrane fixed at the perimeter.*

*This membrane then vibrates the air inside a resonant chamber, which then creates sound which ‘escapes’ through sound holes placed in the front.*



*Building a guitar from scratch is relatively straight forward, as long as one understands the basic components of the system.*

*For many students, simply learning how to use power tools and experiencing the design process is, in and of itself, rewarding.*

**What Clark will provide you:**

Each team of 2-3 students will be provided with a ‘neck blank’ of wood, with a cross dimension of 3”x4” and roughly 4’ long. Additionally each group will receive (if desired) a single 2’x4’ quarter inch thick veneer/plywood panel from which to fashion the front and back of the guitars’ resonant cavity. Alternatively, students may choose to start with ‘premade’ cavities such as cigar or wine boxes, or any other, well crafted ‘box’. Finally, Clark will provide you with strings and ‘guitar tuner’ pegs (between 4-6, depending on availability).

**Build Calendar and tool availability**

**[Start date:                      End date of formal class time                      final due date                      ]**

The student will be given approximately four weeks of ‘in class’ time to work on their guitar project. Total class time per week will vary with calendar, lectures, holidays, etc..(and usually including spring break, a time when students are encouraged to take their guitars home to work on) but usually consists of 1-2 hours per week for the duration of the unit on sound and resonance. After six weeks, formal, in-class time for guitar construction will cease, but students may continue to work on ‘finishing touches’ as time allows (if there is spare time after lecture or the daily lab has been completed). All guitars are ‘due’ on May 15<sup>th</sup> so they can be placed on display in the library display case.

***Suggestion:*** Now is a good time to ‘get to know’ your neighbors with tools. Ask them to show you how to use them! Ask them to give you advice how to accomplish your goal!

***Suggestion:*** View the many ‘how to build guitar’ videos Clark has posted.

## The basic requirements:

1. 4- 6 strings guitar with a decent resonant cavity (and/or well place magnetic pick ups)
2. 8 or more frets placed on the neck such that musical scales can be played on each string
3. Guitar should be 'tunable' such that chords can be played.
4. Guitar should be complete, robust and look finished.

## Areas of 'guitar engineering' to consider for a well -crafted instrument

- How will the neck tie into the body?
- How will the bridge mount to the face of the guitar?
- How will you achieve 'tight' strings across the 'nut' at the top of the guitar?
- How strings will be mounted to the body?
- If considering a shape other than rectangular, how will you create the curved sides?
- How will you mount the front and rear faces to the sides?
- If considering building an electric guitar, how will you mount the magnetic pickup?

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### *----Grading rubric for guitar----*

<b>Did you finish the guitar?</b> _____ x 3 = _____	It is complete and well crafted			It is only partially finished	
	5	4	3	2	1
<b>Is it acoustically successful?</b> _____ x 3 = _____	It sounds nice with good resonance			It doesn't resonate well and has wrong sounds	
	5	4	3	2	1
<b>How creative is your design?</b> _____ x 2 = _____	Clear creative thought put in			The simplest design possible	
	5	4	3	2	1
<b>Overall fit and finish?</b> _____ x 2 = _____	The guitar is well joined and finished			The guitar is poorly constructed with many jagged edges	
	5	4	3	2	1
<b>On time?</b> _____ x 2 = _____	The guitar is early or on-time			The guitar is late	
	5	4	3	2	1

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**Total score \_\_\_\_\_ / 55 pts possible.**

**Notes:**