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	Day 4				 On the first day of class you will be given a journal a copy of <u>13 Things That</u> Don't; (the journal is yours the book you will return to later) 	Day 1	Jenn. Degnisj	
	Day 4				 On the first day of class you will be given a journal a copy of <u>13 Things That</u> Don't; (the journal is yours the book you will return to later) the class Website is fou 	Day 1	Jenn. Degins)	
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	Day 4				 On the first day of class you will be given a journal a copy of <u>13 Things That</u>. <u>Don't</u>; (the journal is yours the book you will return to later) the class Website is fou by going to faculty.polytechnic.org/physical and clicking on Cosmology, Astornomy and Relativity in the left-hand column; just so you know, if you find a URL on this pdf and i spans only one line, the lind 	me nd t c	Jenn, begins j	
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	Day 4				 On the first day of class you will be given a journal a copy of <u>13 Things That</u>. Don't; (the journal is yours the book you will return to later) the class Website is four by going to faculty.polytechnic.org/phys and clicking on Cosmology, Astornomy and Relativity in the left-hand column; just so you know, if you find a URL on this pdf and i spans only one line, the lini should be active and going the page should only requir click; if the link spans more than one line, you will have copy and paste the link into browser to go to the site (t bit of weirdness seems to b the case in general with pdf made from Excel files); also, be aware that our daily progress is not necessarily set in stone, so expect the calendar to char pretty continuously to reflete 	page		

Third Quarter, 2021-2022

S MONDAY L	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
N 1/17	<u>1/18</u>	1/19	1/20	1/21
MLK Jr Holiday	annel/UCHnyfMqiRRG1u- 2MsSQLbXA 5.) start first part of "The Elegant Universe" at 3:30 min mark found at https://www.pbs.org/wgbh/n ova/series/the-elegant- universe/ just let it run	CLASS: 1.) clarify what journal should be used for; 2.) talk about "2019 OK" and info about meteor craters (any wonder here?); 3.) at <i>unification</i> at 8:30 min mark: talk about trying to find equation that summarizes everythinghow can that be (an equation summarizing stuff)give theory behind springs as example ; talk about Newton (Gmm/r^2 and inventing Calculus) and why he didn't like his theory; explain where Special Relativity came from (start with theory of e/m waves for light and Maxwell's equations, newton's theory of light) note that the Elegant Universe's explanation of the problem comes from a different direction 5.) note that when we get to Quantum Mechanics, we will segue and the weirdness will begin	Day 4	CLASS: 1.) so where are we? Gravity doesn't exist, but gravitational effects do exist due to the interaction of mass and the fabric of space/time; 2.) continue with the Elegant Universe; 3.) back to unification electricity and magetnism and Maxwell's equations (mentioned yesterday); 4.) note that the equations presented in the video are the differential forms of Maxwell's equations (you might name themGauss's Law, Gauss's Law for Magnetism, Ampere's Law and Faraday's Law); 5.) why couldn't Einstein create a Theory of Everything? (difference in strength outweighs similarities); 6.) when you get to how particles inside the atom interact with one another, stop the video and begin to look at Quantum Mechanics (stop at 30:20 min).
1/24	HMWK: 1.) Google "2019 OK" and briefly write up what you find there; 2.) Google "meteor crater;" let your curiosity get the better of you 3.) Go on-line to class Web page and read both "About the Books" and "Course Information." 4.) make your first entry into your journal 1/25	HMWK: 1.) make your second journal entry (you should have a ton of stuff to report by now) 1/26	1/27	HMWK: 1.) journal 1/28

CLASS:	Day 1	CLASS:	CLASS:	Day 4
1.) begin discussion of QM		0.) direct students to	1.) reiterate what-all we've	
with video of creepy guy		homework	covered;	
and double slit experiment;		1.) remind students about	2.) noting that an eigenstate	
2.) introduce Mithuna		superposition rule and	is just one of the possible	
Yoganathan and Looking		measurement rule, then look	states of a system and a wave	
Glass Universe (Google LGU		at LGU wave function video	function's "basis" is the	
to see all of her videos);		(use my original version);	parameter being measured,	
3.) first video: introduction		2.) a secondary video on	(don't) look at video on	
to quantum mechanics (use		wave function (not LGU) is at	quantum interference at	
my original version)		https://www.youtube.com/watch	https://www.youtube.com/watch?v=t	
newer version is intro but		<pre>?v=EmNQuK-E0kI, don't use</pre>	t8gVXDsh7Q&list=PLg-	
also talks about what it		3.) look at quantum	OiIIbfPj3JrdQgqkdlPe_jxRC0mw35∈	
means to be measured		randomness at	dex=3the follow-up to this	
https://www.youtube.com/w		https://www.youtube.com/wa	video is at (don't use)	
atch?v=8Dso6Fv1FUw		tch?v=hGGb0nGTPLk&list=PLg-	https://www.youtube.com/watch?v=s TTgZQVtaPE&list=PLg-	
4.) take a quick look at the		OiIIbfPj3JrdQgqkdlPe_jxRC0m	OiIIbfPj3JrdQgqkdlPe_jxRC0mw35∈	
"newer version"		w35&index=1 (this talks about	dex=4 start at 2.45 (what is	
5.) look at "answers to		the coefficients of the wave	observable in double slit	
questions" video (talks more		functionthe probability	experiment);	
about "what is a		functions), also, outcome	3.)	
measurement?" at		random but probability not	,	
https://www.youtube.com/w		how likely are possible		
atch?v=YBcQ0PeFsx4;		outcomes?the Born Rule at		
		https://www.youtube.com/wa		
		tch?v=VHIqY44fOg0&list=PLg-		
		OiIIbfPj3JrdQgqkdlPe_jxRC0m		
		w35&index=2 (mention magn		
		of complex numbers are		
		called amplitudes n angles		
		phases)		
HMWK:		HMWK:	HMWK:	
1.) journal;		1.) journal;	1.) Google Amy Noetherread	
2.) google "wave function"		2.) pretend you are taking	about her life	
in quantum mechanics and		your first ORAL EXAM. Write	2.) look at the video about	
see if you can find a video		out the talking points you	Noether's Theorem at	
that explains what it is (put		would hit in that exam. In	https://www.youtube.com/wat	
URL in your journal)		other words, what have we	ch?v=CxIHLqJ9I0A&list=PLq-	
		talked about in the last two	OiIIbfPj3JrdQgqkdlPe_jxRC0m	
		weeks THAT YOU HAVE	w35 windex=7 (note that she	
		FOUND REALLY INTERESTING	misspoke about gravitational	
			potential energy at the 3:10	
			markdon't be put off by this-	
			-it's easy to do when riffing)	
			3.) concerning the video, read	
			and think about the first three	
			comments (from Eric Vilas and	
			12tone)	
			12(0)(e)	
1/31	2/1	2/2	2/3	2/4

h?v=rciVgQm-F_U&list=PLg- OiIIbPj3JrdQgqkdlPe_jxRCOmw 35&index=9 2.) show video of laser beam spreading out as slit cuts beam off "visualization of Heisenberg's Unc Prin.flv" 2.) look at the Schrodinger Equation from two authors, the first from LGU: https://www.youtube.com/watc h?v=ZfKq3g3MHqE&list=PLg- OiIIbFj3JrdQgqkdlPe_jxRCOmw 35&index=10 (talks about measurement problem), the other at https://www.youtube.com/w atch?v=QeUMFo8sODk; 3.) how to use Schrodinger equation (LGU) at https://www.youtube.com/w atch?v=DEgWbrMv6- k&list=PLg- OiIIbfPj3JrdQgqkdlPe_jxRC0 mw35&index=11 HMWK: 1.) journal;	even though the probability not due to the imaginary nature of the probability functions(mention that Taylor expansion of "e^i(theta)" is the same as that of "cos(theta) + i sin(theta)"; HMWK: 1.) journal;	Day 1	CLASS: 1.) take a few minutes to show formal derivation of Schrodinger's Equation; 2.) finish up Quantum Mechanicsdo anything not done to date HMWK: 1.) journal; 1.) journal;	CLASS: 1.) Oral Exams? (didn't do another until end of quarterr need to do better next time) HMWK: 1.) journal;
 if you find this interesting and want to look at quantum spin, look at the LGU video at 	2.) if you are still interested and want to learn more, look at the video on quantum entanglement at https://www.youtube.com/w		 2.) Google "Information Theory" to see what it is all aboutsee if you can find a connection between Information Theory and Quantum Mechanics; 3.) think about what you are going to say tomorrow during ORAL EXAM 	
2/7	2/8	2/9	2/10	2/11
2/7 Day 4	2/8 CLASS: 1.) continue with The Elegant Universeduring video, talked about what strong force does (holds protons together in nucleus and weak force (creates new atoms after supernova via radioactive decay); talked about how forces in Standard Theory are assumed to be particle interactions, so String Theory is powerful as string vibrations can act like particle/forces;	2/9 CLASS: 1.) continue/finish The Elegant Universe; 2.) mention Mr. White's triple binary star system https://exoplanets.nasa.gov/news /1672/discovery-alert-first-six- star-system-where-all-six-stars- undergo-eclipses/; 3.) talk about the precision of the universeshow video The Fine Tuning of the Universe . which has good info but is the religious one); 4.) run through discussion of alpha (use PowerPoint) 5.) show video Alpha Changing talk about the consequences of having fundamental constants changing in light of the previous video about the fine tuning of our universe; 6.) intro the Standard Model https://www.youtube.com/wa tch?v=Unl1jXFnzgo	2/10 Day 1	2/11 CLASS: 1.) we are trying to understand how the universe is built, so next up is a discussion of the Standard Model look over ppt on the Standard Model; 2.) look at video about "the beginning and progression onward" at https://www.youtube.com/watch ?v=wNDGgL73ihY "CLASS: 3.) look at un-narrated ""Chronology of Universe"" https://www.youtube.com/watch ?v=DB8651JE3xo kibitz: as you go (inflation, quark asymmetry, why 1 Tev is important, quark clumping; deuterium and He nuclei formation, 50-50 point for energy/radiation distribution, the first neutral atoms and light free streaming, first generation stars, second generation stars, etc.); 4.) look at preambles to Cosmological Timeline (temp/energy AND 2-sizes), then view timeline "

	HMWK:	HMWK:		HMWK:
	1.) journal; 2.) from <u>13 Things That</u> <u>Don't Make Sense</u> , read the Prologue, pages 1-7	1.) journal; 2.) from <u>13 Things That Don't</u> <u>Make Sense</u> , read the Prologue, pages 7-13		1.) journal; 2.) from <u>13 Things That Don</u> <u>Make Sense</u> , read the Prologue, pages 13-19
2/14 CLASS:	2/15	2/16 CLASS:	2/17 CLASS:	2/1 FACULTY
 go through the Fundamental Particles and Forces ppt; talk about quarks, look at ppt on quark charge; find video on fundamental particles 		 read science fiction stories about antimatter show quarks changing colors video; in preamble to talking about the Higgs field, give explanation of what mass is, then talked about how Higgs field replaces those ideas in the Standard Model; to animate Higg's field, show video https://www.youtube.com/wa tch?v=joTKd5j3mzk (the quaint explanation); show the more sophisticated explanation of Higgs at https://www.youtube.com/wa tch?v=kixAljyfdqU talk about how Higgs field isn't only source of mass look at video at https://www.youtube.com/wa tch?v=Ztc6QPNUqls&t=4s 	 read science fiction stories; talk about <u>13 Things;</u> (Slipher and red-shift; Hubble graphs speed vs distance farther out fasteruniverse expandingso farther away implies higher relative speed the prop. const is the Hubble constant; talk WIMPS and cosmic radiation (have students fid video on Bubble Chmbr n Cosmic Radiation); talk about Zwicky's (spherical bastards) problem (stars at edge of galaxy moving too fast); talk about Vera Rubins fights for Zwicky's idea (answer: halo of dark matter explains high vel); look at atomic interactions video (first 30 seconds of alpha decay at https://www.youtube.com/watch? v=gwl2ln9ujc n all beta decay https://www.youtube.com/wat ch?v=2gK-bANOMaU); how larger elements made using beta decay 	PROFESSIONAL GROWTH DAY (no school)
HMWK: 1.) journal; 2.) from <u>13 Things That</u> <u>Don't Make Sense</u> , read pgs 19-25;		HMWK: 1.) journal; 2.) write three-sentence science fiction story that utilizes the idea of anti- particles	HMWK: 1.) journal; 2.) go to the "Secret Stuff" folder on the class Website and read "Drinking Heavy Water'	
2/21	2/22	2/23		2/2
PRESIDENT'S DAY (no schoolagain, you lucky ducks)	Day 1	CLASS: 0.) compressed last few days- will do today tomorrow) 1.) begin to look at light as a particle: start with Photoelectric Effect; 2.) look at video on photoelectric effect at https://www.youtube.com/wa tc?v=MFPKwu5vugg 3.) show photoelectric demo at https://www.youtube.com/wa tc?v=v-1zjdUTu0o 4.) talk about how light is produced by atoms; 5.) video summary how light is produced in an atom is at https://www.youtube.com/wa tc?v=N9NWdNadkIE	CLASS: 1.) talk about emission spectra; 2.) look at silent video about emission and absorption spectra at https://www.youtube.com/wat ch?v=m69GjvN3n0M; 3.) talk about absorption spectralook at flawed video at https://www.youtube.com/wat ch?v=XHpiJ3osTU 4.) show Spectroscope	
		HMWK: 1.) journal	HMWK: 1.) journal;	

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5.) luminosity, energy 2.) for fun, show "night sky density, and apparent with various degrees of city	
density, and apparent with various degrees of city	
brightness:	
brightness, inght, then cerestal sphere,	
6.) standard candles; 3.) talk about types of year	
7.) apparent magnitudes and inice summary of earth	
absolute magnitudes; information (sidereal day, size	
8.) spectral classes comparison to sun, etc.)	
https://www.youtube.com/wa https://ciechanow.ski/earth-	
tch?v=Y5VU3Mp6abI&t=1s and-sun/	
4.) talk about "leap year"	
(find good video for this);	

HMWK: 1.) journal; 3/21 Spring Break	3/22 Spring Break	HMWK: 1.) journal; 2.) determine how far you are, in miles, from where you were in the galaxy when you were born 3/23 Spring Break	HMWK: 1.) journal; 2.) for fun, read the article at http://www.jpl.nasa.gov/news /news.php?feature=6223&utm _source=iContact&utm_mediu m=email&utm_campaign=NAS AJPL&utm_content=daily20160 330-2 3/24 Spring Break	3/25 Spring Break
3/28 Spring Break	3/29 Spring Break	3/30 Spring Break	3/31 Spring Break	4/1 Spring Break
4/4	4/5	4/6	4/7	4/8
atch?v=rBFWikTXFXI 4.) talk about molecular clouds	masses; 3.) look at stellar evolution ppt at http://faculty.polytechnic.org /physics/1%20Astronomy,%2 OCosmology,%20Relativity% 202007to2008/7Section_7_(stellar%20evolution%20and %20planets)/1Summary_S ect_7 stellar_evolution_and_planets /d.%20small_mass_star_evol ution.pdf 4.) look at HISTORY	Day 4	CLASS: 1.) talk about stellar evolution of stars whose mass is greater than 8 solar masses; 2.) talk about supernovas; https://www.facebook.com/wa tch/?v=198111215316701 3.) look at supernova video at 4.) look again at nuclide chart and reiterate where elements larger than Fe come from; HMWK:	 momentum, 2.) talk about pulsars; 3.) listen to pulsars at https://www.youtube.com/res ults?search_query=sound+fro m+pulsars
1.) journal;	1.) journal;		1.) journal	1.) journal
4/11	4/12	4/13	4/14	
Day 1	CLASS: 1.) talk about Kepler's Laws 2.) basic video on laws: https://www.youtube.com/w atch?v=AKbfR5KHUM4 3.) talks about Brahe https://www.youtube.com/w atch?time_continue=83&v=wj OOrr2uPuU&feature=emb_log 0 HMWK: 1.) journal;	CLASS: 1.) do ORAL EXAM HMWK: 1.) jrelax	Day 4	CLASS: 1.) begin to talk about Einstein; 2.) whimsical video on Einstein at https://www.youtube.com/watch?v= N51u7Jy2nZM 3.) present what motivated Einstein to create the Special Theory of Relativity; 4.) point out the difference between the Special and General Theory of Relativity; HMWK: 1.) journal
4/18	2.) think about what you are going to say during the Oral Exam on Friday		4/21	

CLASS: 1.) talk about consequences of Einstein's assumptions; 2.) talk about the Michelson/Morley experiment; 2.) do baseball analogy talk about how "c" can always be the same; 4.) begin to talk about consequences of "c" always being the same using space ship comparison (intro to time dilation and length contraction)good "time dilation" video/lab at https://galileoandeinstein.ph ys.virginia.edu/more_stuff/A pplets/Lightclock/home.html ; 5.) good discussion of causality and the hyperbola patterns mirror proper time count (very essoteric)		CLASS: 1.) talk more about time dilation (powerpoints); 2.) show derivation of time dilation and length contraction; 3.) talk about space-time diagrams and world lines; 4.) talk about problem of units on axes of space/time diagrams (that time is like a distance, like an x/y graph);	CLASS: 1.) talk about relativistic factor and relativistic velocity look again at derivation of length contraction (ppt messed up last time); 2.) give banana-eating chimp problem; 3.) look at a space/time diagramtalk more about units for its axes and notice its vagaries 4.) explain why the primed axes looks the way they do on a space-time diagram; 5.) talk about how you take data off a space-time diagram; 6.) do space-time diagram/world line exercise;	
HMWK: 1.) journal;		HMWK: 1.) journal	HMWK: 1.) journal	
4/25	4/26	4/27 Day 1	4/28 CLASS:	4/29 CLASS:
 talk about magnetism; talk about paradoxes 	 talk about paradoxes; talk about Twins Paradox conceptually; show space/time diagram of Twins Paradox; great cartoon/video about Twins Paradox at https://www.youtube.com/w atch?v=h8GqaAp3cGs 		 talk about general relativity good video on General Relativity: https://www.youtube.com/wat ch?v=tzQC3uYL67U another way to look at General Relativity at https://www.youtube.com/wat ch?v=wrwgIjBUYVc time and space around a black hole (more General Relativity) at https://www.youtube.com/wat ch?v=wrwgIjBUYVc sometime during the AP week, have students do their last Oral Exam 	 do Oral Exam; watch Mechanical Universe on Lorentz Contraction (listing at https://www.youtube.com/pla ylist?list=PL8_xPU5epJddRAB XqJ5h5G0dk-XGtA5cZ)
HMWK: 1.) journal;	HMWK: 1.) journal		HMWK: 1.) journal	HMWK: 1.) journal
5/2	, ,	5/4		
Day 4 Spanish Lit AP	horizon of a black hole (really interesting): https://www.youtube.com/w atch?v=GQZ3R81iyE0&t=100s		Day 1	U.S. History CLASS: 1.)
	HMWK: 1.)	HMWK: 1.)		HMWK: 1.)
5/9	5/10	5/11	5/12	5/13
Calc Comp Sci Principles (4) CLASS: 1.) we will have half the classdo oral exam for those who are here (Caroline, Parm, Alicia, Kekoa, Liem)	Day 4 English Lang AP Physics AP	Chinese Lang Spanish Lang (2) CLASS: 1.) we will have half the class- -do oral exam for those left (Catie, Opal, Griff,		Day 1 Music Theory AP Latin AP
HMWK: 1.)		HMWK: 1.)	HMWK: 1.)	
5/16	5/17	5/18	5/19	5/20

CLASS:	CLASS:	Day 4	CLASS:	CLASS:
1.) start with video	1.) talked about solar		1.) had students look up and	1.) look at video on extreme
https://www.youtube.com/w			present information on Mars,	planets at
atch?v=yWO-cvGETRQ at	2.) have students look up		Jupiter and Saturn;	https://www.youtube.com/wa
the 2:35 minute point to get			use video on retrograde	tch?v=0XUWFtyRzqs
definition of "informaion,"	about Mercury, Venus and		motion to animate that idea	2.) look at 10 strangest
then go to	Earth		(important in understanding	planets at
https://www.youtube.com/w			Mars's motion relative to the	https://www.youtube.com/wa
atch?v=9XkHBmE-N34 to			earth);	tch?v=H8XWy2AvqlU
hear about the information			3.) had students finis planets	3.) if time, look at renegade
paradox and black holes.			off with Uranus and Neptune	planets at
				https://www.youtube.com/wa
				tch?v=nu9l9uKRfLk
				2.) finishing touches on
				semesterblock day even wil happen next Thursday at 1
				pm in rm 110 (we'll hear
				from Dr Lawler, an
				astronomer based in Canada .
				and a friend of R Dunham
HMWK:	HMWK:	-	HMWK:	HMWK:
1.)	1.)		1.)	1.)
5/23	5/24	5/25	5/26	5/22
Day 1	5/24 BLOCK DAY	BLOCK DAY	BLOCK DAY	BLOCK DAY
Dayi	DEOCK DAT	BLOCK DAT	we meet at 1 pm in Rm 110	DEOCK DAT
			we meet at 1 pm m km 110	
5/30			6/2	6/3
Memorial Day	BLOCK DAY	last day of classes		US Honors Day,
Holiday SENIOR				Commencement
TRIP				