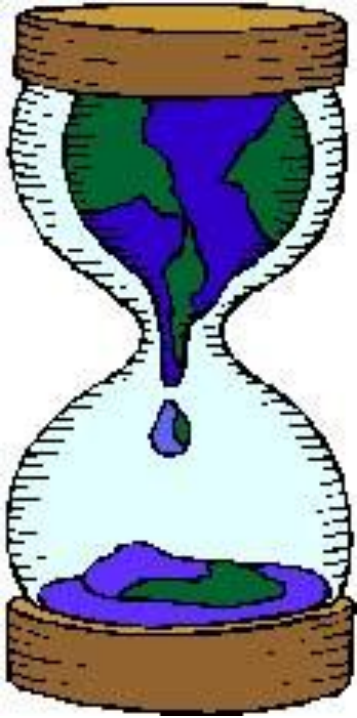


***Welcome to***

# **GC 170A1 INTRODUCTION TO GLOBAL CHANGE**



**Your should have obtained a  
Course Information Sheet  
when you entered the classroom.  
Please get one from one of the Graduate  
Teaching Assistants if you missed it.**

***Your Professor:***

**Dr. Katie Hirschboeck \***  
**Associate Professor of Climatology**  
**Laboratory of Tree-Ring Research**

**\* (pronounced: "hersh-beck")  
but you may call me "Dr H"**

# Objectives for today's class:

- 1 – Introduction to your Teaching Team  
(and how you can be a part of it)
- 2 – Overview of the course and how  
you will benefit from it
- 3 – Explanation of the course logistics
- 4 – What to do for your First Assignment!!!

# This is a General Education / Teaching Team Course



# ***Your Teaching Team:***

**Professor: Dr. Katie Hirschboeck**

(Laboratory of Tree-Ring Research, LTRR)

**Office: Bannister Tree-Ring Building, room 319**



**Graduate Teaching Assistants (GTA's)**





# Your Graduate Teaching Assistants (GTA's)

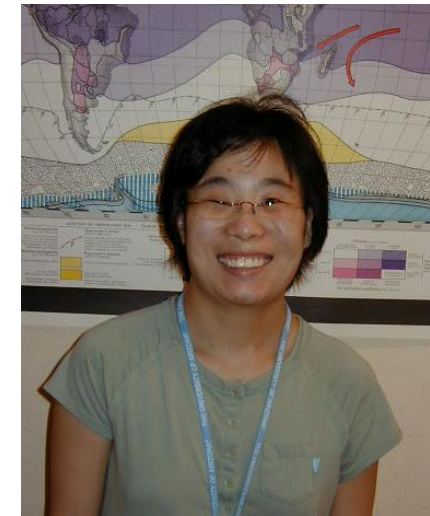


**Adriana Zuniga**  
Arid Lands

**Scott Jones**  
Arid Lands



**Kit O'Connor**  
Natural Resources



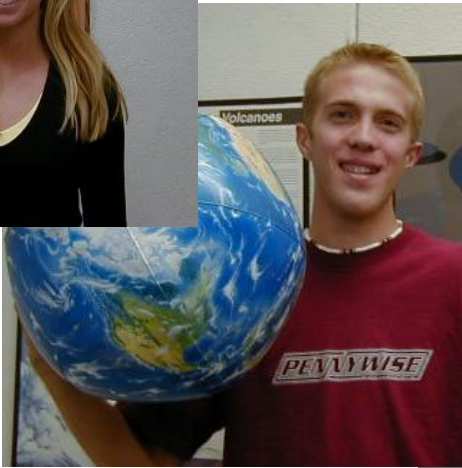
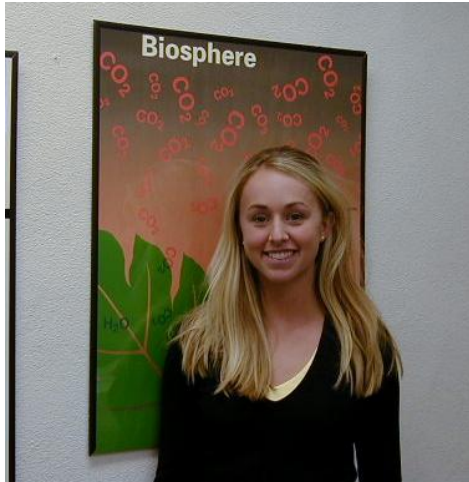
**Saeahm ("Sam") Kim**  
Hydrology & Water Resources



**GTA Office Hours**  
**will begin next week**

# *and* Undergraduate Preceptors

## THIS COULD BE YOU!!





*Come in for an interview and learn more!*



**WHAT IS THIS COURSE  
ALL ABOUT?**

**SCIENCE  
& PHYSICAL SCIENCE CONCEPTS**

**THE EARTH**

**HOW & WHY  
GLOBAL CHANGES OCCUR**

**YOUR ROLE AS  
A CITIZEN OF OUR PLANET**



# Why study the Earth System & Global Change?

## Massive Chunk of Greenland Glacier



A massive chunk of Greenland's Jakobshavn Isbrae glacier broke off the sea earlier this month, startling scientists who detected the event thanks to satellite images.

## Even More Hot Times



The sweet...

## 'Weird' Weather Is the New Normal



Dramatic swings between very wet, very dry and catastrophically stormy weather are likely to be the norm from now on, according to scientists who point to an overall warmer global climate as the source of the new meteorological reality.

"It's a new normal, and I really do think that global weirding is the best way to describe what we're seeing," Texas Tech University climate scientist Katharine Hayhoe told reporters.

While it's impossible to point to climate change as the cause of any single event, such as the devastating Joplin, Mo., tornado on May 22, Hayhoe says the pervasive background of a warmer global climate now has an impact on every storm, heat wave and wintry chill.

She and other scientists joined business leaders in a teleconference held by the Union of Concerned Scientists to highlight the mounting toll from manmade climate change.

The increasing ferocity of storms is putting a financial strain on the global risk industry, prompting some insurers to now advocate a more rapid shift to renewable energy and away from climate altering carbon-based fuels.

Photo: FEMA



The average annual losses from natural disasters have skyrocketed from \$25 billion in the 1980s to around \$130 billion in the first decade of the 21st century.

...increase in heat ... across Europe in 2003 ... thousands of fatalities." — Noah Diffenbaugh

## Warmer-Weather Species Invade Arctic as Climate Warms

July 16, 2010



Inuit residents of Nunavut are being surrounded by plants and animals they have never seen before as a warmer climate allows the species to expand northward into Arctic Canada.

"There's 15 species that have been identified as exotic, meaning species that weren't historically in Nunavut," Environment Department spokesman Steve Pinksen told the CBC.

He said that the exotic plants could have been introduced through bird droppings or from traces of soil left on someone's footwear.

Some insects could have been brought north in cargo aboard ships and planes, Pinksen told the broadcaster.

Scientists in Canada have recorded what they call a "substantial warming signal" across the country from 1936 to 2006, with a 9.5-degree Fahrenheit rise in mean February temperatures and a 2.7-degree rise for May.

University of Alberta researchers report this warming has brought on earlier bloom times for trees and wildflowers in the central parklands of the province.

Writing in the journal Bioscience, they write that a flower



Life forms that are not native to Nunavut's Arctic environment have started showing up over the past few years, including a wasp-like insect.



The threat of waterborne disease is mounting daily across the Pakistan flood zone.

<http://www.earthweek.com/>



the news continues . . .

## Western Wildfire Part of New Climate Reality: Scientist

July 5, 2013



Scientists warn that catastrophic wildfires, like the one that killed 19 firefighters in Arizona, are part of a new "normal" for the environment of the American West.

Arizona has warmed faster than any other state since 1970, with temperatures rising at a rate of 0.72 degree Fahrenheit per decade.

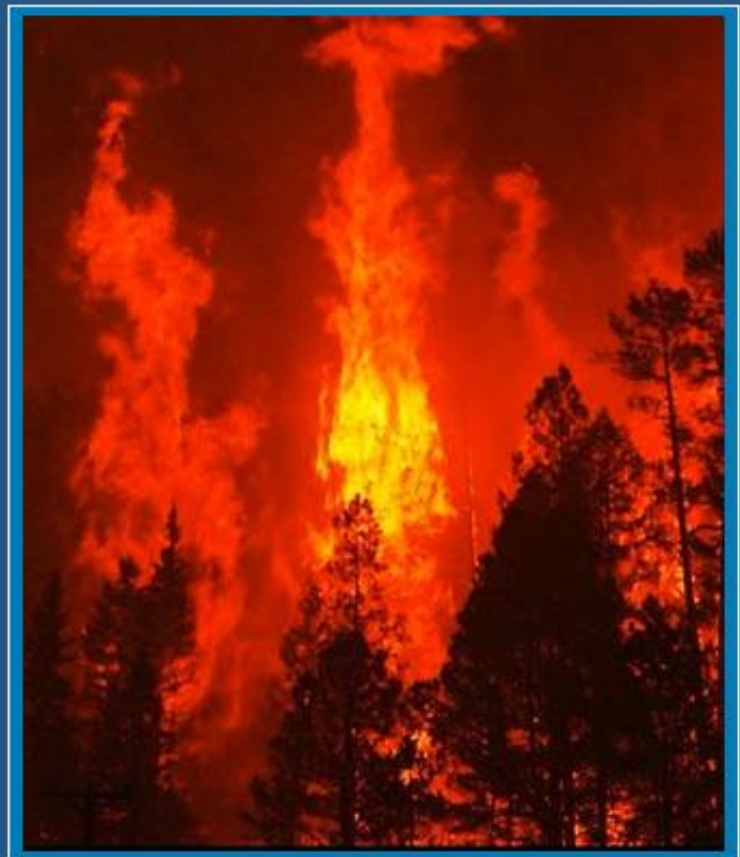
Climate expert Gregg Garfin of the University of Arizona points to a decade from 2001 to 2010 when his state was the hottest on record in both spring and summer.

He says warmer winters have caused that season's precipitation to fall as rain rather than snow, allowing streams and the soil to dry out more quickly when spring's arid heat arrives.

This is leaving more dry vegetation to burst into flames when struck by lighting or ignited by other factors.

A policy of putting out all fires that was established about 1900 has also disrupted the natural rhythm of the landscape, leaving vast amounts of flammable material piled up and ready to catch fire under the hotter and warmer conditions of the 21st century.

Photo: File



One of the most deadly Arizona firestorms in a generation killed 19 firefighters as it blackened nearly 10,000 acres northwest of Phoenix.

Global W



at least one  
More than  
researcher  
would be  
They urge  
instead of  
Experts  
frequent  
Massive  
many b  
near th  
And m  
deplet  
replen  
"We  
dema  
fails  
futu

and dire  
Institute

While international  
chemicals from inflicting further damage to the protective  
ozone level, it will take decades for the ozone hole to  
significantly recover.

Photo: File

"We know that damaging UVB radiation can penetrate  
to considerable depths in clear ocean waters." Carlos

Rescue workers pump water from a section of the  
Beijing-Hong Kong-Macao Expressway in Fengtai district  
of Beijing on Monday afternoon.

Light Linked to Climate Change  
Team: Experts  
August 10, 2012

Arctic Poised For Greatest Ice Loss Ever This Summer  
The recent  
July 20, 2012

May 31, 2013



July 20, 2012

12

July 27, 20

## **Questions GLOBAL CHANGE SCIENTISTS are asking and studying:**

- **How and why are these changes occurring?**
- **What are the impacts? Who will be most vulnerable? Where will impacts be greatest?**
- **Can human beings do anything to stop or mitigate these changes?**
- **. . . or are they part of “natural variability” that will happen no matter what we do?**
- **How can humanity adapt to global changes?**



# THESE ISSUES ARE NOT WITHOUT CONTROVERSY!! We'll address this too!



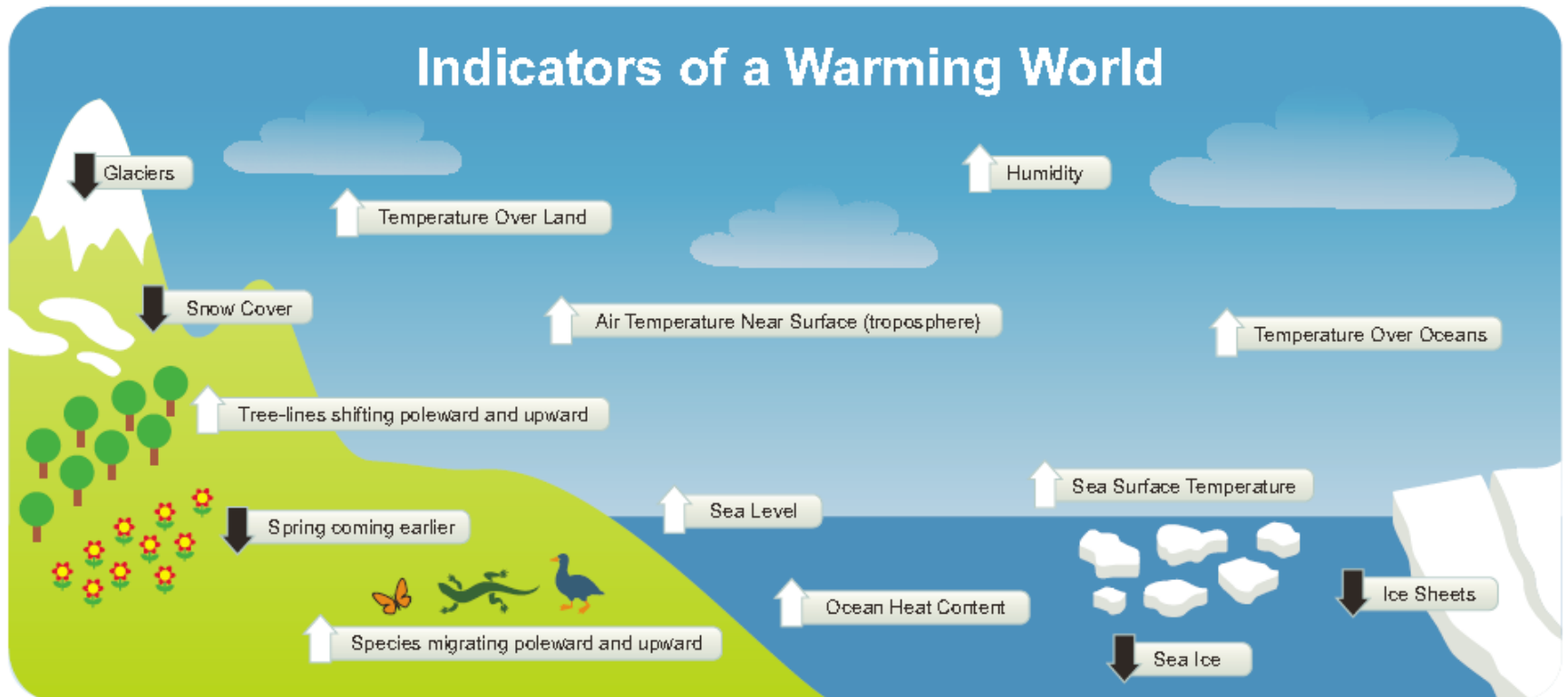
SHOULD THE UNITED STATES ADOPT A TAX ON CARBON?

Should the United States adopt a tax on carbon? Yes: It would spur growth, innovation

SHOULD THE UNITED STATES ADOPT A TAX ON CARBON?

Should the United States adopt a tax on carbon? No: It would hobble economic recovery

**GOAL #1:** By the end of the semester, you will be able to explain how and why each of these indicators are changing and what it means for the planet – and you!



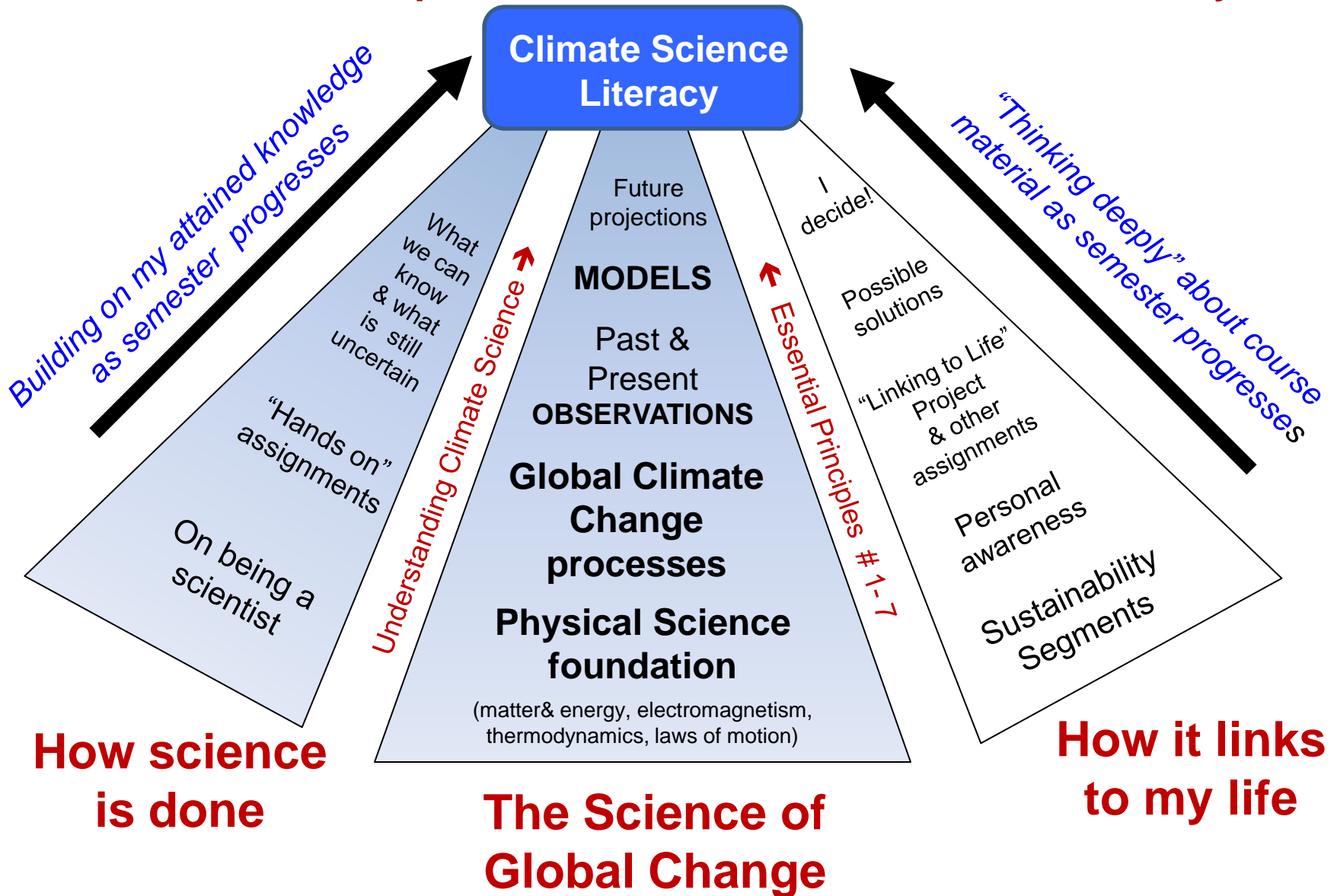
**GOAL #2:** By the end of the semester, you will be able to critically evaluate and knowledgeably discuss the indicators that point to a “human” fingerprint in what’s driving climate change:



**... and then make some informed decisions on what can be done about it!**

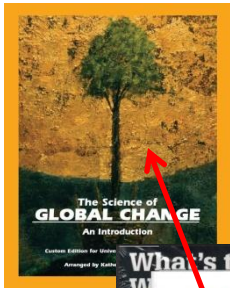


# OVERALL GOAL: Enhanced Understanding Of Global Change Science, How It Operates, & What It Means To Me Personally

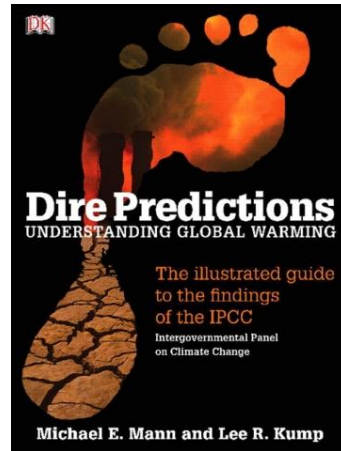


# **COURSE LOGISTICS**

# COURSE LOGISTICS



E-text



*Required:*  
**2 TEXTBOOKS**  
*1 e-book (online)*  
*+ one paperback*

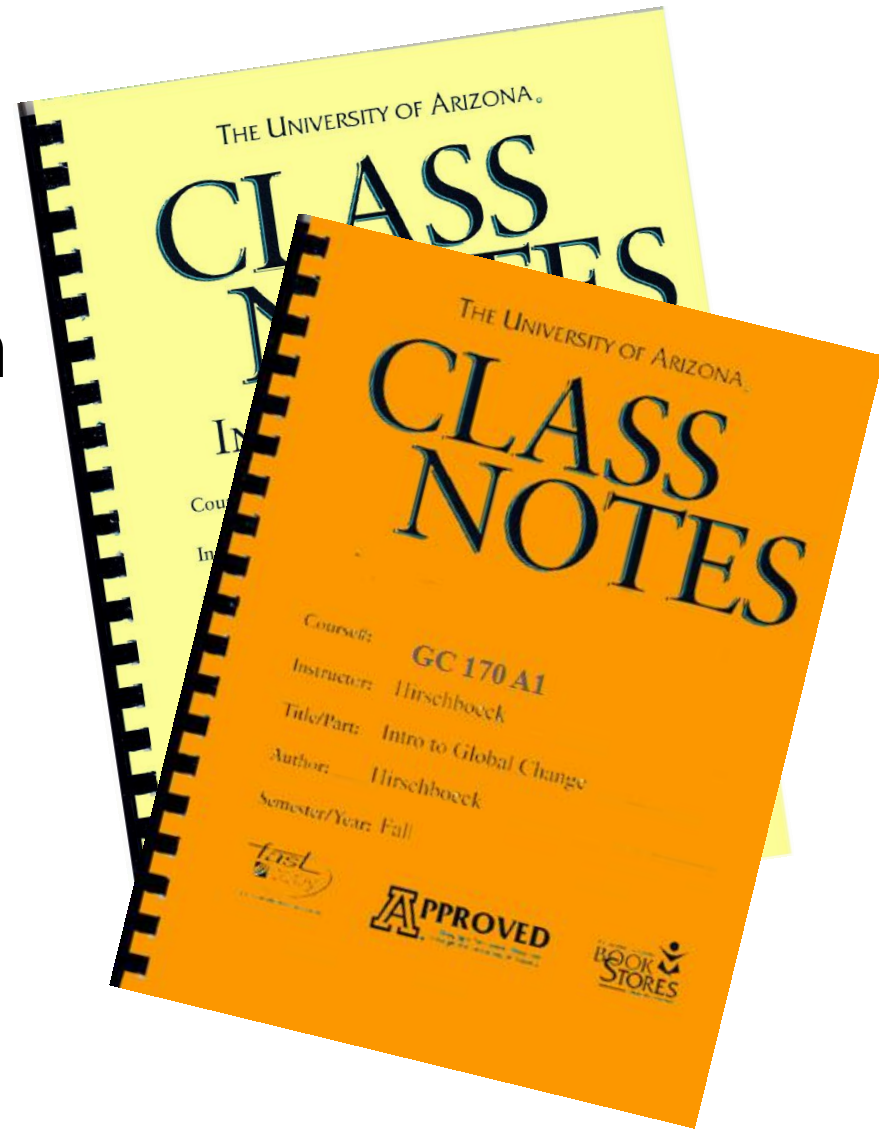
Begin reading Chapter 1 now in E-Text. . .

NOTE: assigned readings will be listed in the weekly  
**D2L Checklist &**  
on the **Reading Assignments Schedule.**



# COURSE LOGISTICS

. . . Plus a **CLASS NOTES PACKET** which will be available in the ASUA Bookstore sometime **next week** (after Labor Day).



# COURSE LOGISTICS

... plus a  
Turning Tech “CLICKER” Device

OR

a ResponseWare License to use  
with your own device (laptop,  
smartphone, tablet)

Clickers are available in the ASUA  
Bookstore; the Responseware  
license is purchased only.

You'll need a registered response device starting  
NEXT WEEK ON Thursday.



*Turning Technologies  
Response Device  
(Clicker)*

OR

*ResponseWare License  
to use with:*



# *How this class will operate:*

**Class is divided  
into ~ 20  
collaborative  
learning groups**



**Most of you are  
first-year  
students & non-  
science majors**

# WHAT KIND OF BACKGROUND DO I HAVE TO HAVE?

- **CRITICAL READING SKILLS**
- **WRITING SKILLS**
- **BASIC MATH & QUANTITATIVE REASONING SKILLS**
- **HIGH SCHOOL SCIENCE**
- **TEAM WORK SKILLS**

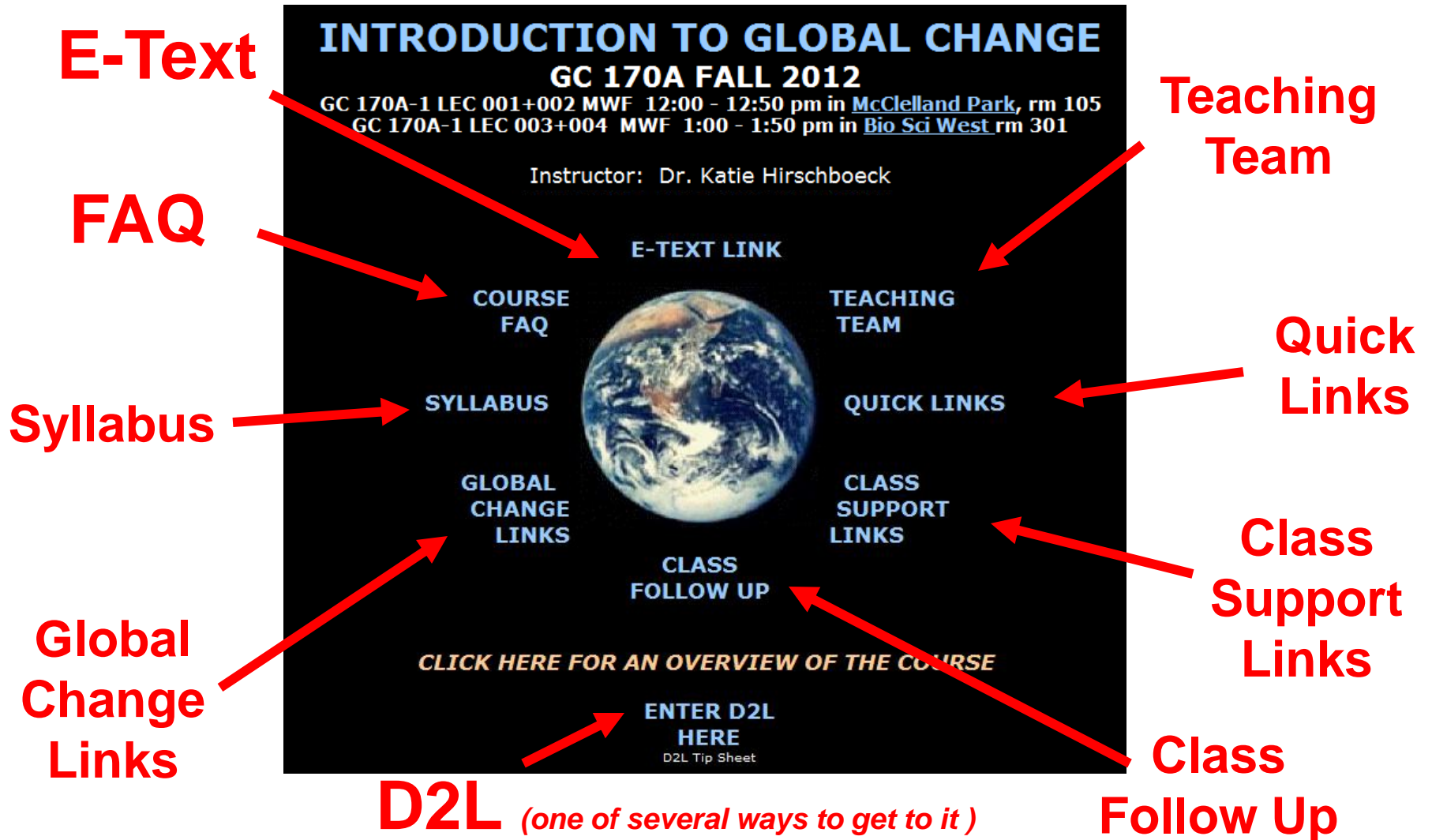
**Important: regular computer access is REQUIRED for this class!**



# COURSE LOGISTICS

GC 170A Website (external & in D2L)

<http://www.ltrr.arizona.edu/kkh/natsgc/>

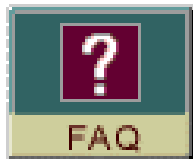
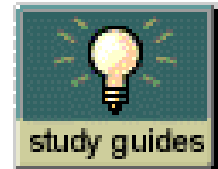
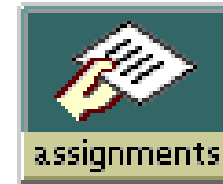
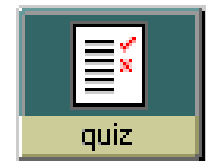


# COURSE TOOLS WE'LL USE in D2L:

*D2L = "Desire To Learn"*

**OUR D2L SITE  
MAY LOOK  
DIFFERENT THAN  
D2L IN SOME OF  
YOUR OTHER  
COURSES . . .**

**THE CHECKLIST  
WILL GUIDE YOU!!**



# OUR CLASS D2L SITE LAYOUT . . . .

The screenshot shows the D2L interface for course GC170A1. At the top left is the Arizona State University logo. The course title 'GC170A1' is displayed. Navigation links include 'Course Home', 'Classlist', 'Chat', 'Discussions', 'GRADES', 'SEMESTER-ON-A-PAGE', and 'READING & RQ SCHEDULE'. A 'Gradebook' callout points to the 'GRADES' link. A 'Semester-on-a-Page' callout points to the 'SEMESTER-ON-A-PAGE' link. A 'Reading & Online Quiz Schedule' callout points to the 'READING & RQ SCHEDULE' link. Below the navigation is a 'News' section and a 'Calendar' section. The 'GC COURSE TOOLS' section contains a grid of icons for 'E-Text Link', 'Course Web', 'Syllabus', 'Course FAQ', 'Checklist Tool', 'Class Follow-Up', 'Videos', 'Dropbox', 'Assignments', 'Self Tests', 'RQ's', and 'Study Guides'. A callout 'Our D2L Course Tools' points to this grid. The 'Calendar' shows the date 'Tuesday, August 27, 2013' and an event on 'AUG 29' at '12:30 PM' for 'Read Essay "On Scientific Method" by Robert Pirsig - Due'. A callout 'Events (due dates etc.)' points to this event. At the bottom, the 'LATEST NEWS' section features the heading 'LATEST NEWS & ANNOUNCEMENTS' and the text 'WELCOME TO GC 170A1 INTRODUCTION TO GLOBAL CHANGE!'. A callout 'News & Announcements' points to this section.

Reading &  
Online Quiz  
Schedule

Semester-on-a-Page

Gradebook



GC170A1

Course Home Classlist Chat Discussions GRADES SEMESTER-ON-A-PAGE READING & RQ SCHEDULE

News

Calendar

GC COURSE TOOLS

GC 170A1 INTRODUCTION TO GLOBAL CHANGE



E-Text  
Link



Course  
Web



Syllabus



Course  
FAQ



Checklist  
Tool



Class  
Follow-Up



Videos



Dropbox



Assignments



Self Tests



RQ's



Study Guides

LATEST NEWS

LATEST NEWS & ANNOUNCEMENTS

(check this spot regularly for all important announcements about our class)

WELCOME TO GC 170A1  
INTRODUCTION TO GLOBAL CHANGE!

Tuesday, August 27, 2013

Upcoming events

AUG 29 12:30 PM Read Essay "On Scientific Method" by Robert Pirsig - Due

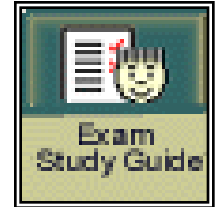
Events  
(due dates etc.)

News &  
Announcements

Our D2L  
Course  
Tools

# Multi-Tiered Testing Approach:

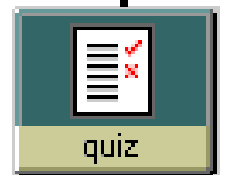
Midterm & Final  
Individual Exams



In-class Individual &  
Group Tests



Online Readiness  
Quizzes



Ungraded  
Self-Tests



**HIGH  
STAKES  
TESTING**



**LOW  
STAKES  
TESTING**



# Example: **Short in-class test procedure:**

**10-questions!**

**You'll take the test as an individual first . . .**



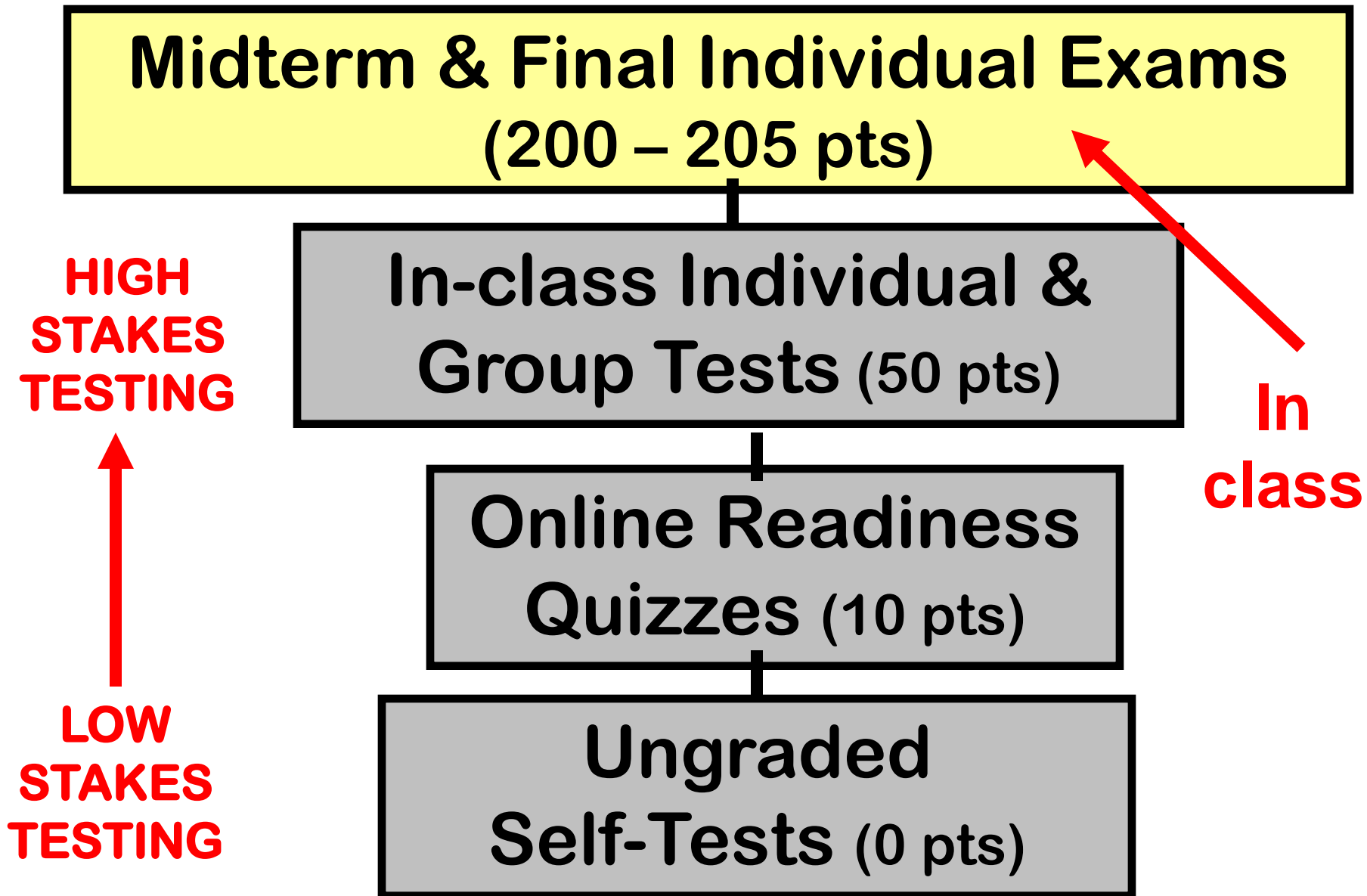
**After individual tests are completed . . .**

**you'll get into your group & take the same test together as a group!**



**You'll find out your Group Test score right after you take it . . .**

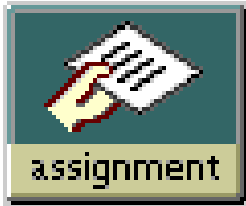
# Multi-Tiered Testing Approach:



# Group

# ASSIGNMENTS

# Individual



In Class  
assignments

## GROUP ASSIGNMENTS *(In-Class Activities)*



**G-1 Understanding Absorption Curves**



**G-2 Energy Efficiency**



**G-3 Tree-Ring Activity Parts I & II**



**G-4 Applying the Energy Balance Terms**



**G-5 Volcanism & Climate**

## INDIVIDUAL ASSIGNMENTS *(Short Writing Assignments)*



**I-1 Climate Science Basics**  
Lesson 1 CO<sub>2</sub> & the GH Effect



**I-2 Climate Science Basics**  
Lesson 2 Mother Nature's Influence



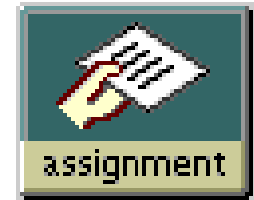
**I-3 Climate Science Basics**  
Lesson 3 Observable Changes



**I-4 Climate Science Basics**  
Lesson 4 Intro to Climate Modeling



**I-5 Class "Climate Action Debate" Preparation**



Short Writing  
assignments

## LINKING-TO-LIFE PROJECT *(Individual Term Project in 4 Parts)*



**Part A Your Ecological Footprint**



**Part B Thinking More Deeply**



**Part C Film Review Discussion Posts**



**Part D Final Project Report**

Linking-to-Life  
Term Project  
(parts distributed throughout  
the semester)





### Checklists

Checklists

Week 01 - Tasks for Aug 25-31

Week 01 - Tasks for Aug 25-31

#### Week 01 - Tasks for Aug 25-31

**Purchase Textbooks**

- Purchase "The Science of Global Change" (SGC) E-Text & "Dire Predicitons" (DP) textbooks**

Our two textbooks have been arranged and/or selected specifically for this class and are available at the ASUA Bookstore in a single package. A pamphlet with registration directions to access the SGC E-Text online comes shrinkwrapped in the Textbook Package. It is labeled PEARSON Online Access. The package also contains the *Dire Predicitons* paperback text.

[NOTE: Contact Dr. H immediately if you discover that for some reason the bookstore has run out of copies.]
- Purchase the GC 170A Class Notes packet**

The **CLASS NOTES PACKET** will be available for purchase on Tuesday afternoon of this week. You can get it at the **ASUA Bookstore** at the textbook **KIOSK** on the 1st floor (basement) of the bookstore.

PLEASE OBTAIN IT AS SOON AS ITS AVAILABILITY IS ANNOUNCED and **BRING IT TO CLASS next week.**

[NOTE: The bookstore typically runs out of copies of the CLASS NOTES at some point so you may need to put in a **SPECIAL ORDER** with the bookstore to get a copy run off for you personally. This usually takes at least 24 hours.]
- Purchase Turning Tech Response Card or ResponseWare License**

The logistics of how we will use "Clickers" in this class will be explained in class in more detail.

(NOTE: You should be able to use the Turning Tech clicker in several of your UA courses.)

# The D2L Checklist Tool

[ Check off each task as you complete it to stay on track & document your progress ]

# ASSIGNMENTS FOR THURSDAY:

1. On the CLASS WEBPAGE, read & study the **Syllabus** and the **online FAQ** (Frequently Asked Questions)

**POP QUIZ in class coming up about this!**

(To test yourself, take the Practice Self Test)

2. **Purchase and REGISTER YOUR E-TEXTBOOK & begin reading CHAPTER 1.**



3. Go to **QUICK LINKS** & read the short essay “**On Science**” by Robert Pirsig  
It will be discussed in class on Thursday.

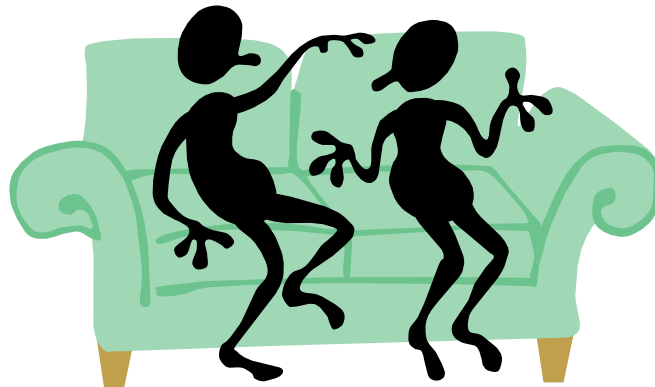
**PASSWORD = natsgc**

**QUESTION BREAK!**



## *Get to know someone in class:*

- 1. Name?**
- 2. Where from?**
- 3. What year & major?**
- 4. Most interesting place on Earth visited?**
- 5. Ever experienced an unusual environmental phenomenon?**  
(flood, landslide, earthquake, tornado, wildfire, etc. . )





# Dr. Katie Hirschboeck

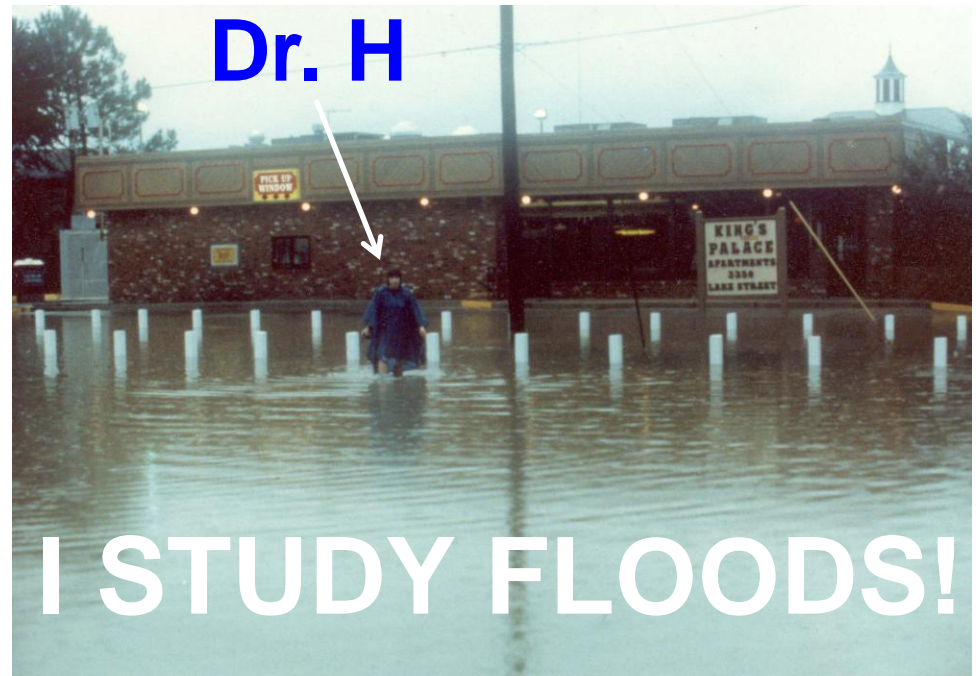
## Assoc Professor of Climatology

Climate Scientist, Laboratory of Tree-Ring Research &  
Chair, Global Change Graduate Interdisciplinary Program

Joint appointments: Hydrology & Water Resources, Atmospheric Sciences,  
Geography & Regional Development, Arid Lands Resource Sciences

*(previously at Louisiana State University)*

B.S. & M.S. Univ of Wisconsin-Madison (Geography)  
Ph.D. University of Arizona (Geosciences)



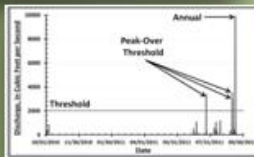
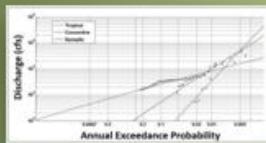
# Dr H's Lab:



**ATMOSPHERIC CIRCULATION  
EXTREMES**

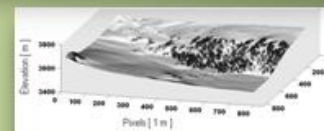
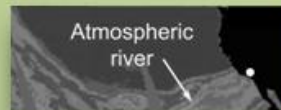


**DROUGHTS**

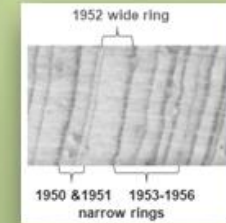


**EXTREME  
VALUE  
STATISTICS**

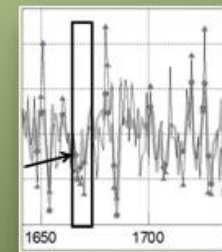
**ENHANCED  
MOISTURE FLUX**



**SNOW COVER**



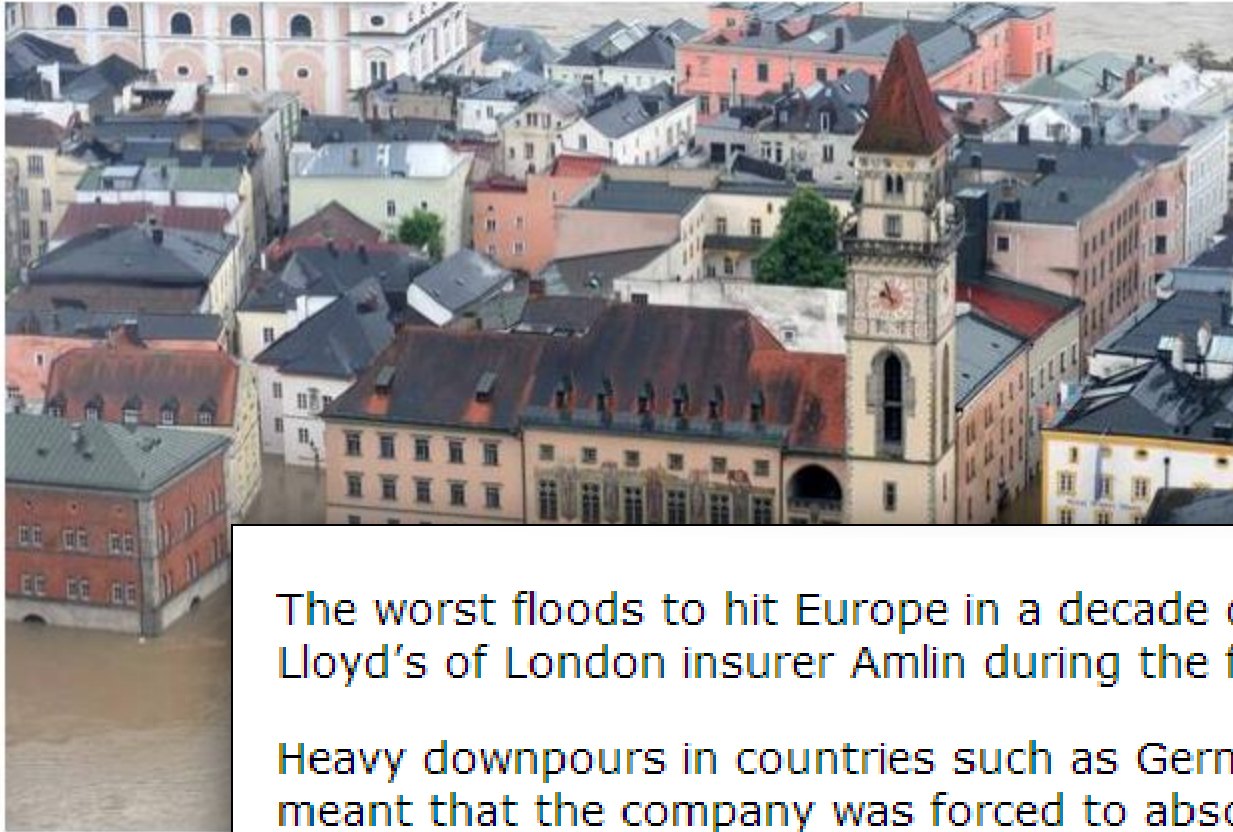
**RING WIDTH  
EXTREMES**



**PAST  
STREAMFLOW  
EXTREMES**

# EXTREME EVENTS LAB

## Floods in Europe dampen the profits picture



Deluged: the Lloyd's of London

**CLIMATE  
EXTREMES  
HAVE HUGE  
BUSINESS  
IMPLICATIONS!**

The worst floods to hit Europe in a decade dented profits at Lloyd's of London insurer Amlin during the first half of the year.

Heavy downpours in countries such as Germany and Hungary meant that the company was forced to absorb £32.2 million of catastrophe losses in the period.

The floods in May and June are estimated to have caused tens of billions of euros of damage across central Europe and came after a period of torrential rain.



# Adriana Zuniga

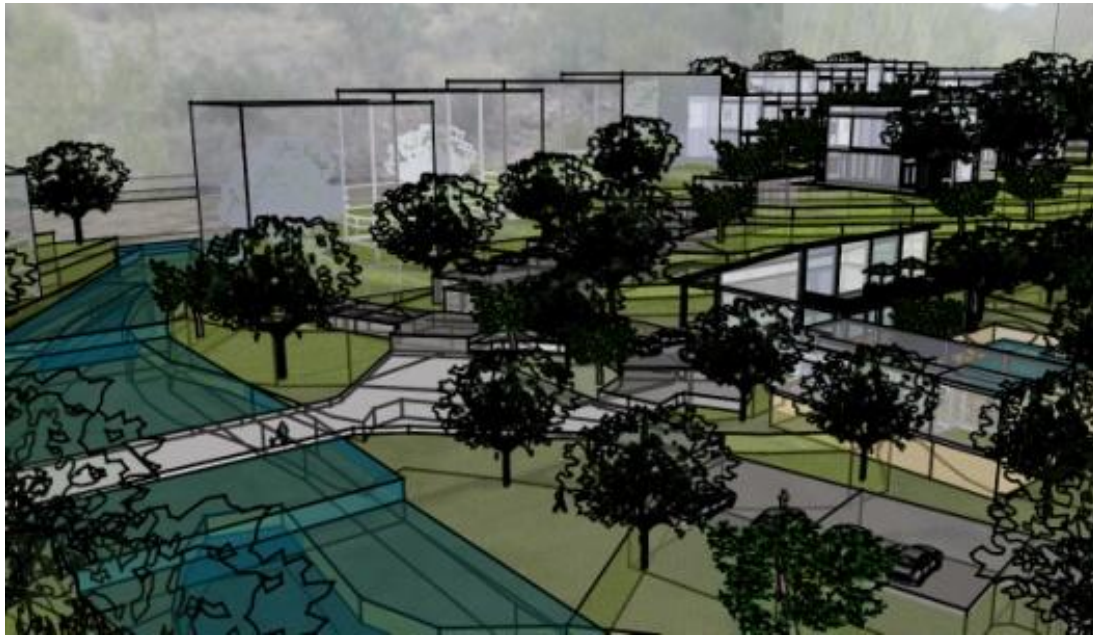
PhD Major: Arid Lands Resource Science

PhD Minor: Global Change



## What do I do?

I study the impacts of neighborhood design on human usage of natural open spaces



Aerial view of the Villas at Starr Pass: a sustainable design presented for my Master's thesis in which natural open space was maximized through increased density and clustering housing

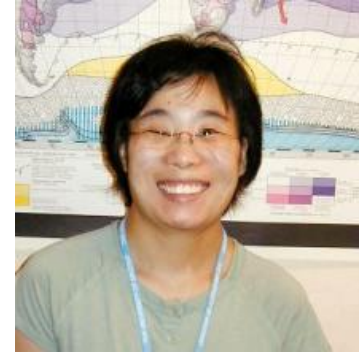
## Why is it important?

Designing neighborhoods that preserve natural open spaces within cities and encourage human utilization of these spaces may enhance physical health, sense of community and wellbeing





# Saeahm Kim



**Major: Hydrology**

**Third year master's student**

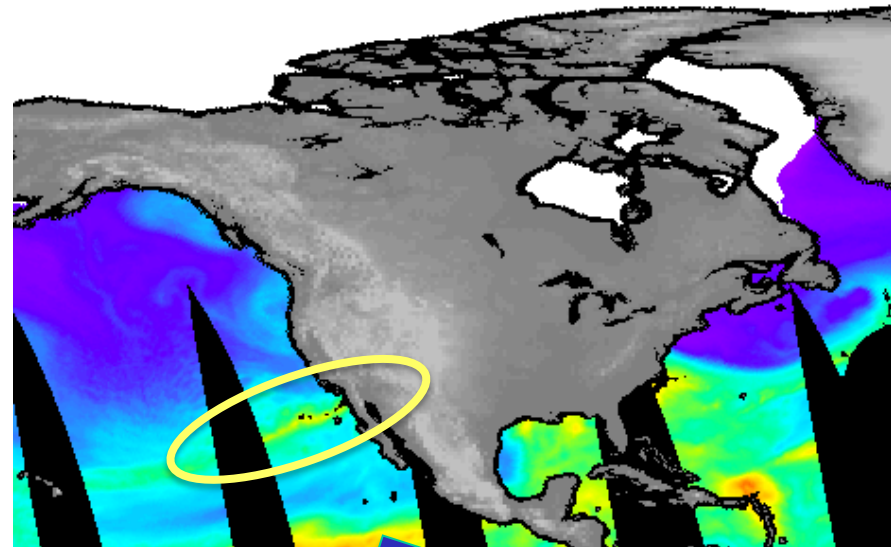
**Second year as a TA for this class**

**Research: studying the role of **ATMOSPHERIC RIVERS (ARs)** in flooding in Arizona watersheds**

**Do ARs cause more extreme floods to occur than non-AR floods? How so?**

2010/01/21 - evening passes (local time)

210 240 270 300



**Atmospheric river making landfall**



# Scott Jones



PhD Major: Arid Lands Resource Sciences  
Minor: Global Change





# Christopher “Kit” O’Connor

**PhD Candidate: School of Natural Resources and the Environment & Laboratory of Tree-Ring Research**

B.S. in Agricultural Science and Entomology, Penn State  
M.S. in Biology and sustainable forestry, UQAMRPCV Niger, West Africa 2000-2003

**Study Dendroecology in the Fire and Restoration Ecology Lab**

**With a focus on long-term changes in:**

- Forest species and structure
- Fire size, frequency, and severity
- Bark beetle outbreak dynamics, size, and severity
- Climate interactions with all of the above



# “Dr. H” CLASSROOM POLICIES



(more at online FAQ “Frequently Asked Questions”):

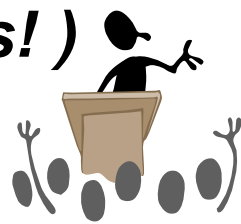
1. Sorry, but no questions can be answered *before* class until teaching equipment is set up.
2. Questions *after* class will be answered after the equipment has been shut down.
3. **Don’t distract your fellow students!** Unless laptops, phones or tablets are being used in class for an approved “Response Device Session” all electronic devices must be shut off throughout the class period. See FAQ #36
4. **No Texting – you could be called on at any moment!**
5. Respect your professor and each other. **Refrain from side conversations** during lectures, presentations, videos, etc.
6. Coming & going is distracting and disruptive to your classmates and the professor! **If you get up and leave the classroom in the middle of class, please don’t return!**



# WHAT KIND OF STUDENT SHOULD I BE IN ORDER TO GET MY MONEY'S WORTH OUT OF THIS COURSE?

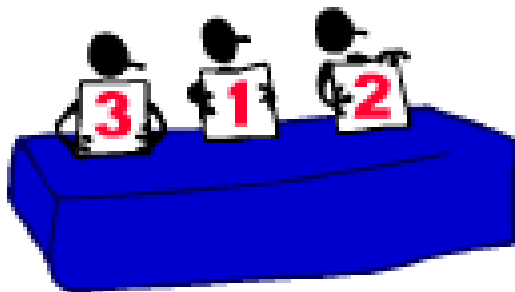
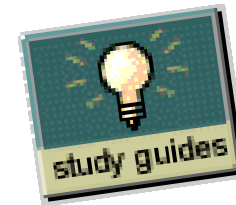
*Students who mesh well with Dr. H's teaching style and the format of this GC 170A lecture section:*

- **Like a class that is structured with lots of online support**
- **Enjoy working with fellow students in groups during part of the class period (not a loner)**
- **Have convenient access to a computer and the internet and check it frequently**
- **Are "visual" learners who like lots of graphics & videos in lectures**
- **Attend class regularly and like to keep up with the material as it is taught (tiered testing helps! )**

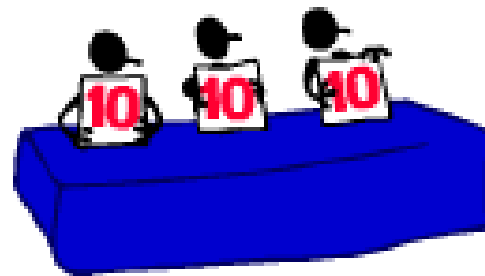


• **Have a sense of humor!**

Taking full advantage of **ALL** the learning tools and resources this course offers offer will give you the best return on your investment . . . .

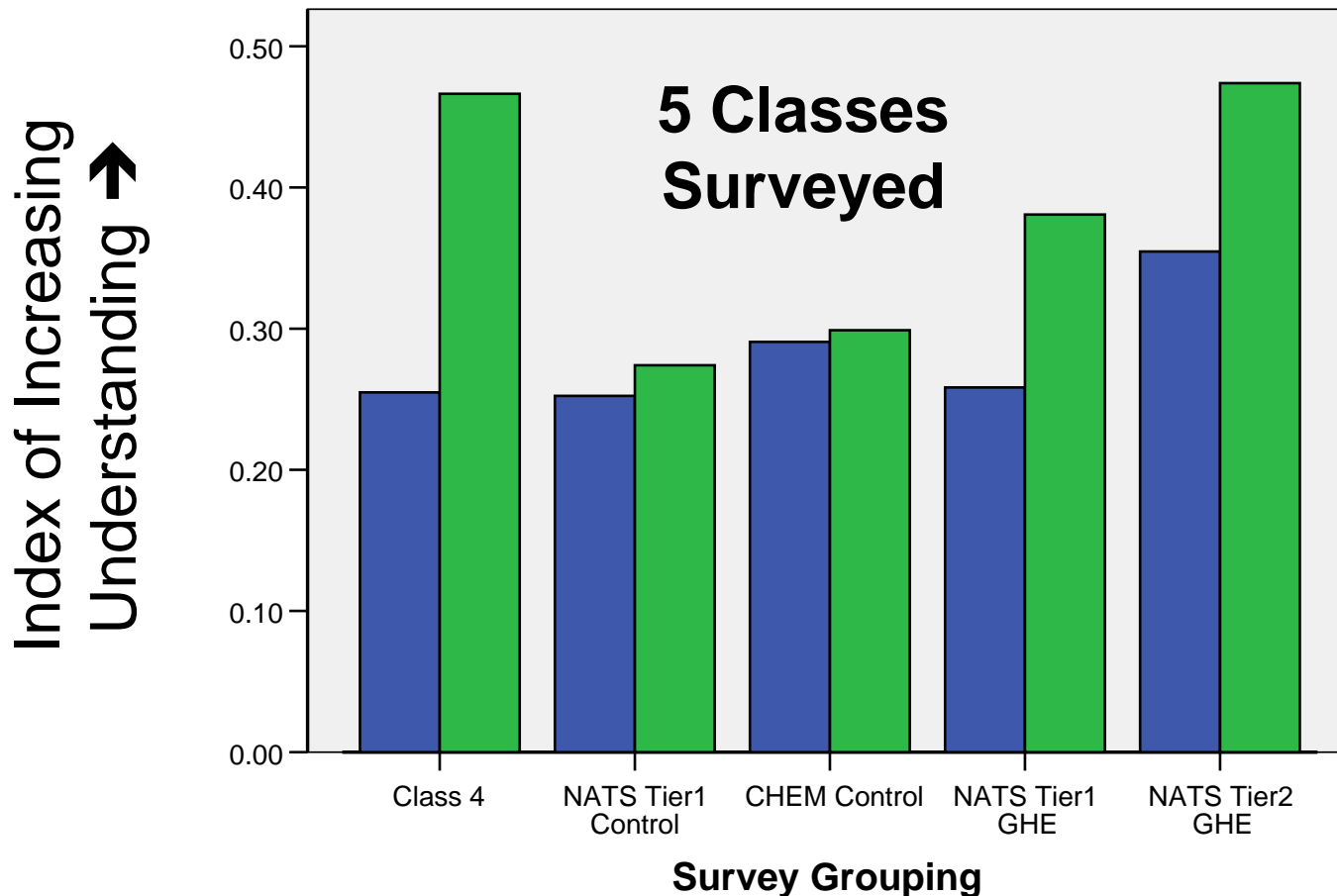


OR




# Student Pre & Post-Test Study on : “How well do you understand the science underlying the GREENHOUSE EFFECT?”


 = Start of Semester Scores       = End of Semester Scores



# “How well do you understand the science underlying the GREENHOUSE EFFECT?”

**Dr. H's  
GC Class**

 = Start of Semester Scores

 = End of Semester Scores





# About the Teaching Team Program & becoming a Preceptor

(see Syllabus & GC 170A website for additional details on being a Preceptor in this class)



## Teaching Teams Program

*Putting People Back Into Education*

# What is a Preceptor?



- Motivated and responsible student
- Facilitator
- Peer Tutor
- Classroom leader

# Why should I Become a Preceptor?

- Personal involvement with your course – YOU can help make it a better course through your input
- Learn new professional and leadership skills
- Learn the material better by helping others learn
- Opportunity to excel in the course !!
- Get to know your professor & TA's as mentors and future references for applications, jobs, etc.
- It's FUN!!!!



# Do Preceptor's get any academic credit?

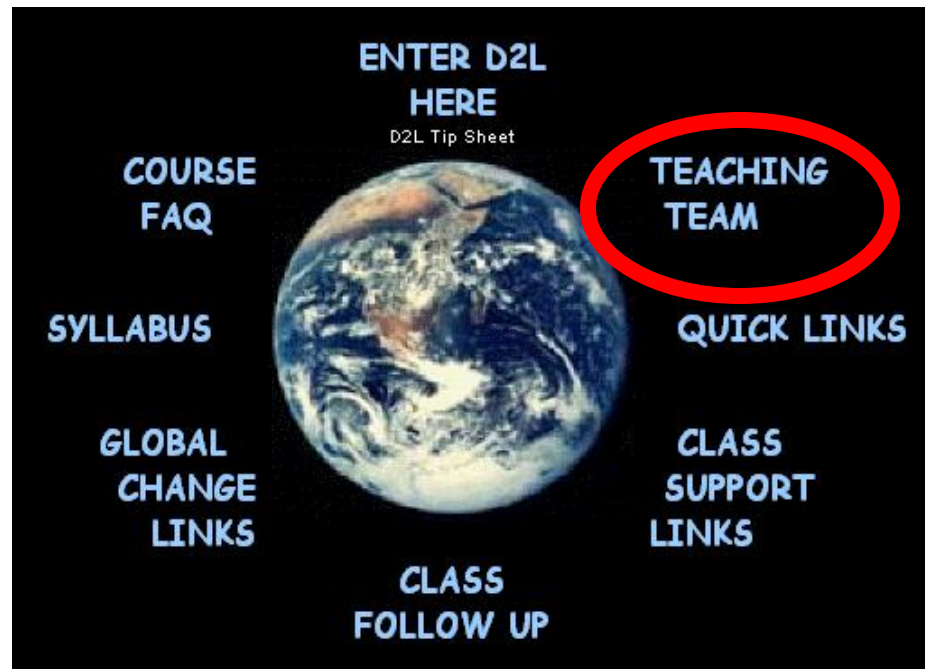
Preceptors receive 3 units academic credit by enrolling in one of the following courses:

LASC 197a: Preceptor Training Course

OR if in the Honors Program, preceptors can receive **HONORS CREDIT** in GC170A.

# How do I find out more?

See the PRECEPTOR SECTION  
under TEACHING TEAM  
on our GC 170A WEBPAGE:



<http://www.ltrr.arizona.edu/kkh/natsgc/>



## **RECAP: ASSIGNMENTS FOR THURSDAY:**

1. On the **CLASS WEBPAGE**, read & study the **Syllabus** and the **online FAQ** (Frequently Asked Questions)  
**POP QUIZ in class coming up about this!**  
(To test yourself, take the Practice Self Test)
2. **Purchase & REGISTER YOUR E-TEXTBOOK & begin reading CHAPTER 1.**
3. Go to **QUICK LINKS** & read the short essay “**On Science**” by Robert Pirsig -- it will be discussed in class on Thursday.



**PASSWORD = natsgc**

**SEE YOU ON  
THURSDAY!!**

(if you want to  
**ADD the course**  
see Dr H right now!)