

Carleton University

Winter Term 2011

**The College of the Humanities
Humanities Program
HUMS4103: Science in the Modern World**

Prof. David Gardner

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Some hints on what to expect!

Objective: to make you sufficiently literate regarding some of the significant scientific issues of the day so that you will be able to read the newspapers over the next few years with a critical eye. Also, I want to draw some connections between science and disciplines that you are more familiar with, namely, music and art.

I have invited four guest lecturers to assist me with lectures designed to explain to you the scientific background of their various areas of expertise in terms that a layperson can comprehend.

I can be reached at david_gardner@carleton.ca

The lectures are on Thursdays in Paterson Room 303 at 6.00 – 9.00pm. Lectures begin on Thursday **January 6th, 2011**. The topics to be covered are:

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|-----|--------------------------------------|---|
| 1. | Science & Art – a shared creativity? | Prof. David Gardner (College) |
| 2. | Big Bang | Prof. David Gardner (College) |
| 3. | Alchemy to Bohr | Prof. David Gardner (College) |
| 4. | The Fossil Record | Prof. Claudia Schröder-Adams (Earth Sciences) |
| 5. | Evolution | Prof. David Gardner (College) |
| 6. | Cell Biology & Genetics | Prof. David Gardner (College) |
| 7. | “You are what you eat!” | Prof. Gerald Buchanan (Chemistry) |
| 8. | Molecular Biology | Dr. John Nash (Genomics Researcher) |
| 9. | Plagues (Black Death, HIV etc) | Prof. David Gardner (College) |
| 10. | Sex, Drugs & Rock’n’Roll | Prof. David Gardner (College) |
| 11. | Global Warming | Dr. John Stone (Environment Canada) |
| 12. | Pollution | Prof. David Gardner (College) |

Examinations will be:

1. Mid-term Book Review

Imagine you are the junior culture journalist for a national newspaper. In the grand journalistic tradition, given that you hold a Humanities degree, your editor assigns you a book review column for the weekly science page! Your job is to read the assigned books and explain to your readers what they are about and why they should, or should not, bother to read them. **Due on Thursday February 10th during the lecture.**

From the list below of popular science titles, please select one **by Lecture 3** and review it.

Author	Title	Publisher	ISBN	Library
Alder, K.	The Measure of All Things	Free Press 2002	0-7432-1675-X	
Braun, S.	Buzz: The Science & Lore of Alcohol and Caffeine	OUP 1996	0-19-509289-9	
Boorstein, D.	The Discoverers	Random 1983	0-394-40229-4	yes
Bronowski, J.	The Ascent of Man	BBC 1973	0-563-10498-8	yes
Chandrasekhar, S.	Truth & Beauty Aesthetics & Motivations in Science (first four chapters only)	UChicagoPress1987	0-226-10086-3	yes
Clark, W.	Sex and the Origins of Death	OUP 1996	0-19-510644-X	
Crawford, D.	The Invisible Enemy: A Natural History Of Viruses	OUP 2000	0-19-850332 6	

Dawkins, R.	The Blind Watchmaker	Norton	1986	0-393-02216-1	yes
Dawkins, R.	The Selfish Gene	OUP	1976/1989		yes
Dawkins, R.	The Greatest Show on Earth	freePress	2009	978-1-4165-9478-9	
Diamond, J.	Guns, Germs, and Steel	Norton	1997	0-393-31755-2	yes
Gleick, J.	Isaac Newton	Pantheon	2003	0-375-42233-1	
Gould, S.J	The hedgehog, the fox, and the Magister's Pox Harmony, 2003 or any other volume by Stephen Jay Gould			0-609-60140-7	
Hall, S.S.	Merchants of Immortality	Houghton Mifflin	2003	0-618-09524-1	
Jolly, A.	Lucy's Legacy	HarvardUPress	1999	0-674-00069-2	yes
Hawking, S.	A Brief History of Time	Bantam	1988	0-553-05340-X	yes
Hawking, S.	Black Holes & Baby Universes	Transworld	1993	0-593-03400-7	yes
Hawking, S.	The Universe in a Nutshell	Bantam	2001	0-553-80202-X	
Hawking, S.	The Grand Design	Bantam	2010	978-0-553-80537-6	
Highfield, R.	The Science of Harry Potter	Viking	2002	0-670-03153-4	
Kandel, E.	In Search of Memory	Norton	2006	0-393-05863-8	
Kauffman, S.	Reinventing the Sacred	Basic Books	2008	978-0-465-00300-6	
Lane, N.	Life Ascending: The ten Great Inventions of Evolution	Norton	2009	978-0-393-06596-1	
Maddox, J.	What Remains to be Discovered	FreePress	1998	0-684-82292-X	yes
Marks, J.	What it means to be 98% chimpanzee	U California Press	2003	0-520-24064-2	
Mayr, E.	This is Biology	HarvardUPress	1997	0-674-88468-X	
Medina	The Genetic Inferno – Inside the 7 Deadly Sins	CUP	2000	0-521-6404-4	
Rees, M.	Just Six Numbers – The Deep Forces that Shape the Universe	Phoenix	0 75381 022 0		
Sample, I.	MASSIVE – The Hunt for the God Particle	Virgin Books	2010	9780753522110	
Singh, S.	BIG BANG	Fourth Estate (Harpers)	0 00 715251 5		
Watson, J.	The Double Helix	Atheneum	1968		yes
Watson, J.	DNA The Secret of Life	Knopf	2003	0-375-41546-7	
Wolpert & Richards	Passionate Minds – the inner world of scientists	OUP	1997	0 19 854904 0	yes

Some clues about the books:

Alder:	Describes the seven year effort to correctly calculate the size of the metre (which was begun during the French Revolution and contains a hidden error!)
Braun:	a very readable account on how alcohol and caffeine affect human physiology
Boorstein:	the former Librarian of the Smithsonian in expansive mood – a history of how we humans got from there to here.
Bronowski:	this book was the companion to the BBCTV series in the early 1970s. Bronowski presents a superbly imaginative series of articles on the nature of human achievement.
Chandrasekhar:	I confess this is one of my most favourite books. Chandra is as erudite and searching on Shakespeare and Beethoven as he is on Newton.
Clark:	a readable and fascinating account of how cells work – how they begin and end.
Crawford:	A lucid exposition on viruses – and mankind's interactions with them.
Dawkins:	books that made quite a stir when they were published – including his latest.
Diamond:	a fascinating mix of science, anthropology and sociology.
Gleick:	A succinct, clear account of the life of one of the great genius' of Western thought (warts and all)
Gould:	a writer who can make the obscure not only intelligible but leave you wanting more.
Hall:	This book “breathes scintillating life into the most momentous science of our day, assesses the political and bioethical controversies it has spawned...”
Jolly:	another good read, as she elaborates her ideas on the origins of human intelligence.
Hawking:	<i>Brief History</i> : one of the most successful attempts to explain the erudite ideas of current cosmology. Ditto <i>Black Holes</i> and <i>The Universe in a Nutshell</i> . Now we have his latest: <i>The Grand Design</i> . Hawkins recently retired from Newton's old chair as Lucasian Professor of Mathematics at Cambridge and is in the advance stages of Lou Gehrig's disease. An exceptional achievement on all fronts.
Highfield:	a superbly imaginative and informative book – though he concedes that broomsticks may never fly! A must for J.K.Rowling fans.
Kandel:	A most engaging book. A surprising achievement given that this is part autobiography of a Nobel laureate and part lucid account of how he has transformed our understanding of the brain and of the mind.

- Kauffman: For those of you who want a real challenge – this is the one. Kauffman argues against reductionism (fashionable since Newton) as a method of explaining the Universe and everything else! The book covers everything – science, philosophy, economics, history, ethics, poetry, religion ... and is worth the effort.
- Lane: I found it a fascinating read. It is very literate: “The story that unfolds is more dramatic, more compelling, more intricate than any creation myth.”
- Maddox: formerly editor of *Nature* for a quarter-of-a-century, Maddox writes a fascinating book on where the Twenty-first Century might go scientifically.
- Marks: “Mark’s book is a novel, intellectually provocative, and wittily engaging treatment of a topic now a shibboleth of modern genetics.”
- Mayr: A summing up of a long career of biological enquiry. Here the holistic approach wins the day!
- Medina: Even the preface is funny! And Dante’s *Purgatorio* from *The Divine Comedy* is front and centre as an organizing device for the entire book!!
- Rees: A fascinating analysis of why things are the way they are – and a discussion of the concept of multiverses.
- Sample: Sample is an award-winning science writer for The Guardian. This is your best bet for understanding why the search for the Higgs Boson (The God Particle) is so important - it is the only missing piece of the Standard Model of particle physics - which is why everyone is impatiently awaiting the first results from the Large Hadron Collider at CERN.
- Singh: A history of how we have arrived at the BIG BANG theory of the creation of the Universe. Astonishingly, this is a ‘page turner’.
- Watson: A classic. You can smell the adrenaline as Watson and Crick race to beat Linus Pauling in unravelling the structure of DNA.
- Watson: Watson in full flood in a “classic telling of the defining scientific saga of our age.”
- Wolpert & Richards: A book that reveals scientists as passionate human beings – often equally entranced by the arts as by their science. Some have become expert practitioners in both disciplines.

2. **Final Term Paper** (suggest: 10 –15 pages, double spaced)

For the final assignment of the course you are to select a scientific issue that is of concern/interest to you. **Note that science is neither aspects of engineering nor social psychology. Make sure you have my agreement on your topic of choice before submission of your essay.** This will avoid any confusion about putative topics that may be on the borderline of science. I am expecting you to read several (not just one or two) sources for your basic material (which should be revealed in the References section of your essay) and to draw a synthesis and criticism of what you have read. To assist you in your choice the College is subscribing to the weekly *New Scientist* which contains layperson-readable articles on ‘hot’ scientific issues of the day. (For example, global warming, genetically-modified foods, pollution, etc). These copies will be kept on the library shelves in Room 302. Please read them only in the College rooms and return them to the shelves when you have finished reading them. Other sources of inspiration may be found on the internet – though reader beware! Not all internet sites operate with good scholarly premises. It is wise also to find corroborative articles elsewhere.

The heart of your essay should explain the basic science (as we currently understand it) behind the topic under review with an explanation as to why it is an issue that merits concern and/or interest. **Due on Thursday March 31st during the last lecture.**

The final mark for HUMS4103 will consist of:

Fall term Mid-term Book Review	50% of final grade
Fall term Final Term Paper	50% of final grade

Prof. David Gardner, Professor emeritus, former Dean of Science

REGULATIONS COMMON TO ALL HUMANITIES COURSES

COPIES OF WRITTEN WORK SUBMITTED

Always retain for yourself a copy of all essays, term papers, written assignments or take-home tests submitted in your courses.

PLAGIARISM

The University Senate defines plagiarism as “*presenting, whether intentional or not, the ideas, expression of ideas or work of others as one’s own.*” This can include:

- reproducing or paraphrasing portions of someone else’s published or unpublished material, regardless of the source, and presenting these as one’s own without proper citation or reference to the original source;
- submitting a take-home examination, essay, laboratory report or other assignment written, in whole or in part, by someone else;
- using ideas or direct, verbatim quotations, or paraphrased material, concepts, or ideas without appropriate acknowledgment in any academic assignment;
- using another’s data or research findings;
- failing to acknowledge sources through the use of proper citations when using another’s works and/or failing to use quotation marks;
- handing in “*substantially the same piece of work for academic credit more than once without prior written permission of the course instructor in which the submission occurs.*”

Plagiarism is a serious offence which cannot be resolved directly with the course’s instructor. The Associate Deans of the Faculty conduct a rigorous investigation, including an interview with the student, when an instructor suspects a piece of work has been plagiarized. Penalties are not trivial. They can include a final grade of “F” for the course

GRADING SYSTEM

Letter grades assigned in this course will have the following percentage equivalents:

A+ = 90-100 (12)	B = 73-76 (8)	C - = 60-62 (4)
A = 85-89 (11)	B- = 70-72 (7)	D+ = 57-59 (3)
A- = 80-84 (10)	C+ = 67-69 (6)	D = 53-56 (2)
B+ = 77-79 (9)	C = 63-66 (5)	D - = 50-52 (1)

F	Failure. Assigned 0.0 grade points
ABS	Absent from final examination, equivalent to F
DEF	Official deferral (see “Petitions to Defer”)
FND	Failure with no deferred exam allowed -- assigned only when the student has failed the course on the basis of inadequate term work as specified in the course outline.

Standing in a course is determined by the course instructor subject to the approval of the Faculty Dean.

WITHDRAWAL WITHOUT ACADEMIC PENALTY

The last date to withdraw from **FALL TERM** courses is **DEC. 6, 2010**. The last day to withdraw from **FALL/WINTER (Full Term)** and **WINTER** term courses is **APRIL 5, 2011**.

REQUESTS FOR ACADEMIC ACCOMMODATION

You may need special arrangements to meet your academic obligations during the term because of disability, pregnancy or religious obligations. Please review the course outline promptly and write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at: carleton.ca/equity/accommodation/

Students with disabilities requiring academic accommodations in this course must register with the Paul Menton Centre for Students with Disabilities (PMC) for a formal evaluation of disability-related needs. Documented disabilities could include but not limited to mobility/physical impairments, specific Learning Disabilities (LD), psychiatric/psychological disabilities, sensory disabilities, Attention Deficit Hyperactivity Disorder (ADHD), and chronic medical conditions. Registered PMC students are required to contact the PMC, 613-520-6608, every term to ensure that your Instructor receives your Letter of Accommodation, no later than two weeks before the first assignment is due or the first in-class test/midterm requiring accommodations. If you only require accommodations for your formally scheduled exam(s) in this course, please submit your request for accommodations to PMC by the last official day to withdraw from classes in each term. For more details visit the PMC website: carleton.ca/pmc/accommodations/

PETITIONS TO DEFER

If you miss a final examination and/or fail to submit a **FINAL** assignment by the due date because of circumstances beyond your control, you may apply a deferral of examination/assignment. If you are applying for a deferral due to illness you will be required to see a physician in order to confirm illness and obtain a medical certificate dated no later than one working day after the examination or assignment deadline. This supporting documentation must specify the date of onset of the illness, the degree of incapacitation, and the expected date of recovery.

If you are applying for a deferral for reasons other than personal illness, please **contact** the Registrar’s Office directly for information on other forms of documentation that we accept.

Deferrals of assignments must be supported by confirmation of the assignment due date, for example a copy of the course outline specifying the due date and any documented extensions from the course instructor.

Deferral applications for examination or assignments must be submitted within **5 working days** of the original final exam.

ADDRESSES: (Area Code 613)

College of the Humanities 520-2809	300 Paterson
Greek and Roman Studies Office 520-2809	300 Paterson
Religion Office 520-2100	2A39 Paterson
Registrar's Office 520-3500	300 Tory
Student Academic Success Centre 520-7850	302 Tory
Paul Menton Centre 520-6608/TTY 520-3937	501 Uni-Centre
Writing Tutorial Service 520-2600 Ext. 1125	4 th Floor Library
Learning Support Service 520-2600 Ext 1125	4 th Floor Library