Course Coordinator: Dr. Mary Ortiz (718-368-5724; MOrtiz@kbcc.cuny.edu)

Course Description: Science 1 explores scientific issues through integration of concepts and techniques from the biological, physical and health sciences. Issues examined include humankind's place in the universe, in which the structure and origin of the universe, solar system, Earth and life are considered; humankind's attempts at mastery of the world, which focuses on space and undersea exploration, genetics research and engineering, bio/computer technology and energy/pollution challenges; and humankind's development of self-knowledge as studied through research on aging, the human mind, fertility, immunity, nutrition and alternative medicine.

Catalog Description: Students study concepts and methodologies used to investigate issues dominating current thought in physical, biological and health sciences. Topic examples include brain research, sleep, aging, fertility, immunity, extinction, pollution and disease.

Course Rationale: Most college-level science courses involve in-depth study of details of specific disciplines (e.g., genetics) within the biological and physical sciences. However, Science 1 is a multidisciplinary survey of modern science with a major goal being the exciting presentation of current areas of scientific research utilizing traditional and Internet-based approaches. Background theory is presented as needed, with the understanding that most students in the course have completed a year of both high school level earth science and biology and that many have completed a year of high school chemistry. The hope is that students will become better informed citizens in an ever-more technologically advancing civilization, and that they might see themselves as becoming part of the scientific effort through their eventual career choices.

Academic Integrity: Academic integrity means that all the work you do in this course (exams, quizzes, reports, papers, etc.) is your OWN work and no one else’s. It includes not cheating on exams or quizzes in any way, as well as avoiding plagiarism in your writing. Plagiarism is using anyone else’s work or ideas without proper attribution. This means that if you quote, paraphrase, or even describe in your own words, an idea that comes from someone else’s writing, you MUST acknowledge that author in parentheses at the end of the sentence or sentences in which you have summarized his or her idea. Plagiarism, whether intentional or not, is taken seriously and can result in a failing grade. It is almost always very obvious if you do it, so don’t risk it. If you are
not sure how to reference a source, ask the instructor for help. Your instructor adheres to CUNY policy on academic integrity, which can be found in your student handbook or online at http://www.kingborough.edu/Academic_Integrity_Policy.pdf. These sources explain the policy in detail and give examples. Please be aware that academic dishonesty may result in a failing grade on the exam or in the course, as well as dismissal from the college. Additional websites that may be of use include: turnitin.com, citationmachine.com and plagiarism.org. (Polizzotto, K., personal communication, 2008).

**Course Outcomes:** Upon completion of this course, the students will be able to:

1. Demonstrate scientific thinking by designing an experiment.
2. Identify the ways science affects everyday life.
3. Demonstrate understanding of the interdisciplinary dependence between scientific fields.

**Topical Course Outline**

I. **Humankind’s place in the universe.**
   A. The origin of the universe.
      1. The size and age of the universe.
      2. The Big Bang and other theories of universal origins.
      3. Astronomy: past and present; Hubble Space Telescope (HST), radio and X-ray astronomy.
   B. Composition of the universe.
      1. Sub-atomic physics – how small can matter be subdivided; are there ultimately small particles?
      2. What is matter? Origin and evolution of the elements. What is dark matter?
      3. What is energy? What is dark energy? Gravity vs. an expanding universe; What is Einstein’s cosmological constant?
      5. Near-Earth objects and their implications for Earth and humankind’s history and ultimate fate: comets, asteroids, meteors. Exploration of the planets and moons of the solar system.
   C. What is the nature of our planet?
      1. The age and theories of formation of Earth.
      2. Shapes and position of continents: drift, plate tectonics.
   D. Life and its origins.
      1. Defining life’s characteristics – those unique to life and those shared by non-living things.
      2. Life’s diversity – the 6 kingdoms of life on Earth.
      3. The interrelationships among all life on planet Earth.
      4. Life and the oceans; our internal fluidic oceans as life colonizes the lands.
      5. Life elsewhere in the universe – SETI, UFOs.
E. Evolutionary theory.
   1. Explaining life's diversity.
   2. Explaining fossils, extinctions, vestigial structures, embryology.
   3. Darwinism, neo-Darwinism. Creationism and Lamarchism as belief, not science.
   4. Evolution of populations, not individuals.

F. How we are formed: Developmental biology and genetics.
   1. Development before birth and the mechanism of birth.
   2. Genetics: classical concepts and recent research - the elucidation and implications of the human genome and the complete genomes of other organisms.
   3. Genetic engineering - cloning any plant or animal, including humans; genetically altered foods and microorganisms.
   4. Totipotent cells from embryos; stem cells from adult human and animal bodies as alternates to politically/ethically charged human embryo studies.

II. Our Attempts at Mastery of the Universe.

A. Flight.
   1. Principles of flight - powered planes, gliders, birds.
   2. Supersonic flight - advantages, hazards.
   3. Space exploration - manned and unmanned rocket flight; space stations.

B. Computers.
   1. At home and school - literacy and skills development for workplace advancement.
   2. Miniaturization and nanotechnology.
   3. Access to worldwide information through the Internet, and building and accessing Web sites.

C. Light.
   1. The electromagnetic spectrum from cosmic rays to radio waves.
   2. Lasers and their expanding role in medicine and industry.
   3. Holography and holographic images.

D. Energy.
   1. Sources - wood, coal, oil, gas, wind, solar, tidal, nuclear.
   2. Problems and controversies concerning sources, especially nuclear.

E. Technology's price - human-made plagues and pollution.
   2. Are oceans an ultimate dumping ground for all types of waste?
   4. Pesticides and their relationship to endocrine disruption, biodegradability and animal extinctions.
   5. Oil transport, spills and effects on the environment.
   7. Do we need to worry about saving Earth? Should we be concerned about
saving ourselves as Earth and the biosphere evolve without us?

III. Our Exploration of Ourselves.
   A. Exploring the brain.
      1. Neurotransmitters and drugs to prolong or terminate their effects (e.g., serotonin-uptake inhibitors like Prozac).
      2. Control of neurological disorders: Parkinson’s, schizophrenia, Alzheimer’s.
      3. Recreational drugs – new drugs to meet steady demands.
      4. Nerve and brain regeneration based on cell division of brain cells and stem cell research.
   B. Healing - many paths.
      1. Modern, western physician in a lab coat - allopathic medicine. The pervasive use of pharmaceuticals - drugs, vaccines, synthetic hormones; their uses and abuses.
      2. Eastern medicine’s style - acupuncture, herbs.
      3. Other alternatives: homeopathic, naturopathic, chiropractic.
   C. Immunology.
      1. Advances in organ transplants utilizing immunosuppression.
      2. Understanding autoimmune disease: e.g., Type I Diabetes Mellitus, Multiple Sclerosis.
   D. Fertility.
      1. In vitro fertilization.
      2. Laparoscopy and fiber optics.
      3. In utero surgery for correction of some birth defects.
   E. Nutrition.
      1. Tailoring diet to individual metabolic patterns.
      2. Supplements - their value and pitfalls.
      3. Weight loss diets vs. fat loss diets; can weight loss be healthily maintained over the long run?
   F. Maturity and aging.
      1. Aging as an inevitability (for now) and theories of how we age: free radical theory, glucose and aging, mutational theory.
      2. Aging and evolutionary theory - why mammals age whereas many other organisms do not.
      3. Aging and disease - their relationship and influence on each other.
      4. Role of nutrition, exercise and other lifestyle aspects on the aging body.
      5. Transplanted, artificial, or cloned organs and other replacement parts.
   G. Bioethics.
2. Science and truth - changing paradigms. Science as a modern religion -
dogmatic belief in one way of thinking.
3. Science and human values - does anything go, especially if you can make
money? Human cloning and human and animal experimentation. Do
animals have rights? Do newborn babies feel pain?
4. Science and scientific contribution of men and women, and all cultures,
now and throughout history.

Methods of Teaching: This course emphasizes personal exploration. Teaching methods
include:
1. Traditional class discussion and lectures where appropriate.
2. Carefully prepared in-class oral, individual and group reports on topics chosen by both
the instructor and the students.
3. Student research through Internet access and traditional library research, resulting in a
term paper and also an e-mailed topical report to the instructor.
4. Student dissections and other laboratory experimentation.
5. Guided trips to the American Museum of Natural History, Hayden Planetarium and
other field sites.
6. Utilization of specialized instructional tools at the instructor’s discretion and based on
availability.

Assignments
1. One written report based on traditional library research - to be graded and returned to
the student.
2. One Internet-researched report e-mailed to the instructor; grades and comments
transmitted to the student through e-mail.
3. One oral individual or group report based on a current controversial scientific topic
researched by any means appropriate.
4. One laboratory report.
5. One report based on a field trip (e.g., AMNH, Planetarium).

Method of Evaluation - Although there is much leeway, the following is a typical grading
pattern:

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<thead>
<tr>
<th>Assignment</th>
<th>Percentage of Grade</th>
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<tr>
<td>2 or 3 examinations at 15% or 10% each</td>
<td>30</td>
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<tr>
<td>1 library research paper</td>
<td>10</td>
</tr>
<tr>
<td>1 Internet research paper</td>
<td>10</td>
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<tr>
<td>1 oral presentation</td>
<td>10</td>
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<tr>
<td>1 laboratory report</td>
<td>10</td>
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<tr>
<td>1 report from field trip</td>
<td>10</td>
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<tr>
<td>Final examination, cumulative (KCC requirement)</td>
<td>20</td>
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<td>100%</td>
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Textbook Concept: Textbooks are out-of-date at their moment of publication. Consequently, since 1984, when the College Now program began, hardbound textbooks have been optional for this course. However, each instructor is required to put together readings based on current materials from newspapers (e.g., Tuesday Science Times), and scientific periodicals (e.g., Discover, Scientific American, Natural History). These sources may vary as the instructor's interests and focus change from semester to semester. The constant is that the course syllabus is the ultimate reference for content, sequence and continuity in the course.

Teacher Resource Materials: College Now instructors, as adjuncts in the KCC Department of Biological Sciences, have access to materials and supplies used by the Department of Biological Sciences of Kingsborough Community College. This includes use of dissecting supplies (e.g., brains, hearts, eyes), multimedia supplies and duplicating and library services. Special requests may be honored and should be addressed to the Science I Course Coordinator: Dr. Mary Ortiz (718-368-5724, or mortiz@kbcc.cuny.edu).

Selected Bibliography: Newer references are available through any current book providers and ISBN numbers are provided. Older references are excellent also (many are classics) and are available through libraries or, possibly, on loan from the Science I Course Coordinator.

Humankind's Place in the Universe

Our Attempts at Mastery of the Universe


Our Exploration of Ourselves

Davies, K., *Cracking the Genome*, The Free Press, NY 2001. 0-7432-0479-4
White, M., Acid Tongues and Tranquil Dreamers, William Morran, NY 2001 0-380-97754-0

**DVD/VHS** – The following films are available through the College Now office:
  - October Sky
  - The Andromeda Strain
  - The Perfect Storm
  - The Day After Tomorrow