Earth, Meteorites, and the Dynamic Solar System

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Text in presentation

Planetary Differentiation
- Planets were melted
- Metallic and rocky elements separated from each other
- Volatiles went to the surfaces of planets
- Many early formed planets were destroyed by impacts, leaving remnants as asteroids

Meteorite Types
- Total classified as of Dec 1999: 16,793
- Chondrites (undifferentiated; never melted in a planet): 91%
  - 94% ordinary chondrite, 4% carbonaceous, 1% other
- Differentiated stones (from planetary mantle or crust): 4%
  - includes about 25 from Mars, about 25 Lunar, about 390 from Vesta
- Iron and stony iron: 5%
- Total unclassified stones as of Dec 1999: 5,714

References and Links[i]

Texts:

Bevan, A. and J. DeLaeter, *Meteorites: A Journey Through Space and Time*. Smithsonian Institution Press (2002). Hardcover, 256 pages, ~$40. (very accessible)

Hartmann, W.K. (2003) *A Traveler's Guide to Mars: The Mysterious Landscapes of the Red Planet*. Workman Publishing. Paperback, $19. (very accessible)

Hutchison R. (2004) Meteorites: *A Petrologic, Chemical and Isotopic Synthesis*. Cambridge U. Press, Cambridge, U.K. 506pp. (college level)

Mathez, E. and J. Webster (2004) *The Earth Machine*, Columbia U. Press. Hardcover, 334pp. (very accessible)

Zanda, B. and M. Rotaru (2001) *Meteorites: Their Impact on Science and History*, Cambridge U. Press. Paperback, 128 pages, ~ $16. (very accessible; good introduction)

Exhibit Halls: Ross Hall of Meteorites
- http://www.amnh.org/exhibitions/permanent/meteorites/
- http://www.amnh.org/education/resources/halls/meteorites/
- http://www.amnh.org/education/resources/rfl/web/meteoriteguide

Cullman Hall of the Universe
- http://www.amnh.org/rose/
- http://www.amnh.org/exhibitions/permanent/rose/

Harry Frank Guggenheim Hall of Minerals & Morgan Hall of Gems

Web Links[ii]*:*

Research home page, D.S. Ebel, AMNH: http://research.amnh.org/users/debel/
Deep Impact mission education/outreach (comet activities):
http://deepimpact.jpl.nasa.gov/educ/index.html
NASA Solar System Exploration: Planets and Asteroids (missions)
http://solarsystem.nasa.gov/planets/index.cfm
Cretaceous/Tertiary (K/T) boundary impact (65 M years ago; dinosaurs disappear mostly):
http://www.geo.vu.nl/~smit/indexjansmit/jansmitindex.htm
Antarctic Meteorite Collection
http://geology.cwru.edu/~ansmet/
Near-Earth-Object program (orbit simulations, hazard info, etc)
http://neo.jpl.nasa.gov/
Minor Planet Center (they keep track of objects in space)
http://cfa-www.harvard.edu/iau/mpc.html
The Meteoritical Society (international organization of meteorite scholars)
http://meteoriticalsociety.org/
National Institute of Polar Research (Japan's Antarctic collection, and more)
http://www.nipr.ac.jp/
National Space Science Data Center
http://nssdc.gsfc.nasa.gov/
Meteors, comets, etc. (Gary Kronk's excellent resource)
http://comets.amsmeteors.org/
Advocates for space exploration, each with a different focus:
http://www.marssociety.org/
http://www.planetarysociety.org/
http://www.nss.org/
Segment of Orion Nebula video from AMNH space show
http://hubblesite.org/newscenter/archive/2001/13/video/a
www.sciencemag.org/feature/data/vis2003
(see also 2003 *Science* 301, p. 1475)
Chart of the Nuclides (wall or book chart of isotopes)
http://www.chartofthenuclides.com/ (where to get one)
http://wwwndc.tokai.jaeri.go.jp/CN04/ (web-based version)
More on isotope chemistry
http://ie.lbl.gov/education/isotopes.htm (excellent tutorials & info)

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[i] *This list does not constitute a blanket endorsement of all content over all time for all the sites listed. There are many worthy sites that are not listed here.*

[ii] This list of links was current as of July 2005. Some may have migrated.