be used to (1) transform any HDF-EOS 5 file into an XML file or vice versa or (2) convert, into an HDF-EOS 5 file, any XML file that conforms to the DTD or schemas.

This program was written by Richard Ullman of Goddard Space Flight Center; Jingli Yang of Earth Resources Technology, Inc.; and Muhammad Rabi of Global Science & Technology, Inc. Further information is contained in a TSP (see page 1). GSC-15016-1

Converting From XML to HDF-EOS

A computer program recreates an HDF-EOS file from an Extensible Markup Language (XML) representation of the contents of that file. ("HDF-EOS" and variants thereof are defined in the first of five related articles that immediately precede this article.) This program is one of two programs written to enable testing of the schemas described in the immediately preceding article to determine whether the schemas capture all details of HDF-EOS files. (The other program converts an HDF-EOS file into an XML file.) This program uses a General Purpose Language (GPL) parser called "expat" to parse XML and control extraction of data from an input XML file.

This program was written by Richard Ullman of Goddard Space Flight Center; Bob Bane of Global Science & Technology, Inc.; and Jingli Yang of Earth Resources Technology, Inc. Further information is contained in a TSP (see page 1). GSC-15017-1

Simulating Attitudes and Trajectories of Multiple Spacecraft

A computer program called "42" simulates the attitudes and trajectories of multiple spacecraft flying in formation anywhere in the Solar System. The rotational dynamics are represented by high-fidelity models of spacecraft, each comprising as many as three connected rigid bodies and containing as many as four flywheel mechanisms for storing angular momentum for controlling attitude. The translational dynamics are represented partly by Encke's method of orbit perturbation, which enables the use of a reference trajectory shared by multiple spacecraft and, in so doing, enables separation of gigameter-scale trajectory features from nanometer-scale formation adjustments to preserve the numerical accuracy needed for simulating precise multi-spacecraft formations.

Other models include planetary ephemerides and models for solar-radiation pressure, effects of the terrestrial magnetic field, effects of the terrestrial atmosphere, and non-spherical components of the geopotential. The program provides a graphical display that facilitates visualization of individual behaviors of, and interactions among, the spacecraft in a formation. Models of spacecraft sensors, control laws, and control-actuator dynamics are included; these models can be customized (this can include linking to real flight software) to enable high-fidelity simulation.

This program was written by Eric Stoneking of Goddard Space Flight Center. Further information is contained in a TSP (see page 1). GSC-14817-1

Specialized Color Function for Display of Signed Data

This Mathematica script defines a color function to be used with Mathematica's plotting modules for differentiating data attaining both positive and negative values. Positive values are shown as shades of blue, and negative values are shown in red. The intensity of the color reflects the absolute value of the data value.

The quantization is the same for both positive and negative values, so that comparable intensities accurately reflect comparable data magnitudes. Customization is done through several software switches. The number of color bins to be used is selected by "nshades." "Linear" is set to 1 for a linear mapping of data magnitudes to color, and set to 0 for nonlinear mapping. The nonlinear choice uses a cube root data-mapping to encompass a large data range while accentuating the smaller data values. This innovation allows nonlinear stretching of data to enhance visualization at the low end of the scale while still viewing the entire data range (the data range set by the user).

This work was done by Virginia Kalb of Goddard Space Flight Center. For further information, contact the Goddard Innovative Partnerships Office at (301) 286-5810. GSC-15128-1

Delivering Alert Messages to Members of a Work Force

Global Alert Resolution Network (GARNET) is a software system for delivering emergency alerts as well as less-urgent messages to members of the Goddard Space Flight Center work force via an intranet or the Internet, and can be adapted to similar use in other large organizations. Messages can be presented in visible and audible forms on such diverse terminals as desktop computers, portable alphanumeric pagers, telephones, fire alarms, and closed-circuit television. GARNET includes client components running on workers' desktop computers, and server components running on redundant computers behind firewalls.

An authorized user enters a message, selecting its degree of urgency and the group of intended recipients. The message is then disseminated to the recipients along with a link to more-detailed information. GARNET can deliver a message by server push (in which it interrupts a user's work to present the message on the user's computer or other device) or client pull (in which a user's computer polls the server periodically). GARNET determines whether a given client receives alerts via client pull or server push when the client logs onto the server. To reduce network traffic, GARNET gives preference to server push.

This program was written by Julia Loftis and Stephanie Nickens of Goddard Space Flight Center and Melissa Pell and Vince Pell of Science Systems and Applications, Inc. Further information is contained in a TSP (see page 1). GSC-14927-1

Delivering Images for Mars Rover Science Planning

A methodology has been developed for delivering, via the Internet, images transmitted to Earth from cameras on the Mars Explorer Rovers, the Phoenix Mars Lander, the Mars Science Laboratory, and the Mars Reconnaissance Orbiter spacecraft. The images in question are used by geographically dispersed scientists and engineers in planning Rover scientific activities and Rover maneuvers pertinent thereto.

The methodology, which effects a compromise among levels of image detail, fidelity, and delivery speed, combines image compression with an adaptive level-of-detail image-delivery strategy that scales very well up to larger images that can include mosaic and high-resolution orbital images. In this methodology, images are tiled at multiple levels of detail. An image-browsing application program makes requests for tiles instead of entire images, thereby greatly accelerating delivery of images. At one extreme, a tile could contain a low-resolution representation of what originated as a large mosaic or high-resolution image. At the other extreme, a