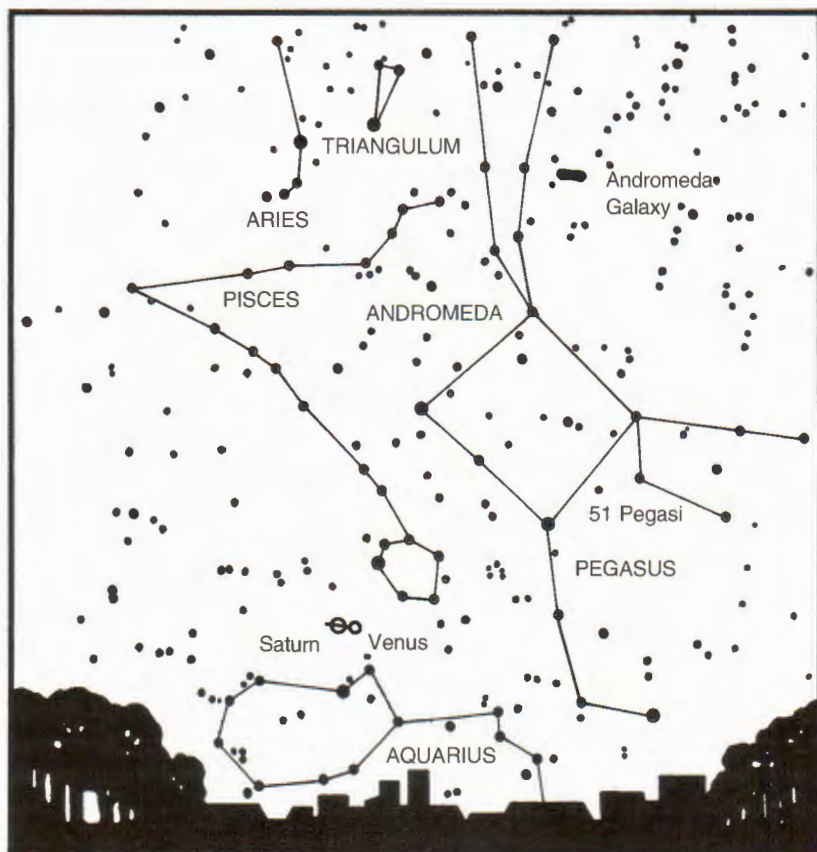


## The evolving calendar



LOOKING WEST-SOUTHWEST AT 7 P.M. ON JANUARY 31, 1996.

Welcome to both a new month and calendar year. The calendar, as we know it today, evolved over the course of many centuries. The word *calendar* comes from the Latin, *calo*, meaning "a call to assemble," and was used by the early Roman cultures. Like many other cultures of the era, the Romans used the lunar cycle of phases as the system for keeping track of the passage of time throughout the solar year. The occurrence of a new moon signaled the first day of a new month, which the Romans called *calends*.

Our current calendar system probably developed from ancient cultures' use of the lunar cycle of phases to mark the passage of time throughout

the solar year. This type of calendar appeared sometime around 4000 to 3000 B.C. and was used by Babylonian, Jewish, Chinese, and Muslim peoples. The lunar cycle consists of approximately 29.5 days; therefore, many cultures used a system that alternated a 29-day month with a 30-day month. However, a calendar composed of 12 lunar cycles will very quickly fall out of synch with the solar year; over time, the discrepancy between the lunar-based calendar and solar year can become quite significant.

The ancient Egyptians used the Sun as the basis for their calendar system with twelve 30-day months, giving them a 360-day solar calendar.

The Egyptians made up the extra five days by adding them to the end of the year as religious days, which were named after the children of Geb, the god of Earth, and Nut, the goddess of the sky.

The Jewish and Muslim calendars, both of which are lunar based, have a total of 354 days and therefore needed to be adjusted 11 days to match the solar year. For example, the Jewish calendar system, based on 12 lunar cycles, started on the first day of Tishri, known as Rosh Hashana or the Jewish New Year. The new year begins on the day of the first new moon after the autumnal equinox.

### Hail Caesar

The Roman calendar had a 355-day solar year that began in the month of Martius, which we now call March, during the vernal equinox. The word *vernal* derives from *vernalis*, Latin for "of spring." For many other cultures as well, the Sun's vernal equinox position signaled the start of the new year because of the new life the season brings.

Under the rule of Julius Caesar, many changes were made to the calendar system. Caesar inserted an extra day in the month of Februarius, thus starting the practice of adding a leap day, a precedent for our current leap-year system. Names of months were changed during Caesar's rule and after his death. The month of the two-faced god Janus (one face looking forward, the other face looking behind), for example, became the first month of the year, Januarius.

Two of Julius Caesar's successors, Augustus Caesar and Constantine, made some additional changes to the Julian calendar. Augustus Caesar changed the lengths of several months by adding or subtracting days, while Constantine, the first emperor to convert to Christianity, established the seven-day week and declared that Sunday be a day of rest.

### Late spring, short October

The success of the Julian calendar was evident by the nearly 16 centuries that it survived. Not only was it widely accepted, it was also amazingly accurate, to within 11 minutes and 14 seconds each year. However, given enough years, even minutes can add up, and they did.

Over the centuries that followed, these minutes accumulated, at a rate of about one day per 128 years, into a ten-day difference. The difference was apparent in the discrepancy between the start of spring according to the calendar (March 21) and its actual start (March 11) based on the Sun's position relative to the constellations.

As a result of this discrepancy and upon the urging of many people, Pope Gregory XIII shortened the calendar in 1582 by removing ten days from October. The pope's intervention brought the date of the vernal equinox back to March 21. Additionally, Pope Gregory established the practice of a four-year leap-day cycle to keep the vernal equinox in synch with its calendar date. Also, Pope Gregory kept the lunar and solar cycles in better synch because of improved measurement of the length of the Earth's orbit. The Gregorian calendar was adopted by most Catholic countries following the Pope's decree. Many other countries gradually adopted the system over the next few centuries.

### October correction

The first paragraph in the October Scope on the Skies describes evening viewing of Saturn. According to one reader, the description in the second sentence is all wet! The sentence should refer to "Piscis Austrinus, the Southern Fish," not "Aquarius," as it appears. We apologize for the error.

*Bob Riddle is the planetarium director of the Kansas City School District at Southwest Magnet Math & Science High School.*

### Planet watch

Another planet has recently been discovered by two astronomers, Michel Mayor and Didier Queloz, at the Geneva observatory. Their discovery suggests that planet formation is more common than previously thought. Astronomers studying stars for evidence of orbiting bodies around them had identified as 51 Pegasi as one such likely candidate. The planet was discovered during a routine study of the star. Astronomers have estimated the planet to have half the mass of Jupiter and to orbit the star at a distance of only seven million kilometers. A body this close to a star would have to have a surface tem-

perature somewhere between 2,000° and 3,000° C. 51 Pegasi is visible to the naked eye and easily seen through binoculars.

### Planetary approach

During the latter half of January, Venus will start to close in on Saturn, passing closest to it on February 2. On this date, the two planets will be less than 1° apart (about the width of two fingers held at arm's length). As an inner planet, Venus' motion from night to night will be considerably more perceptible than Saturn's. Each day, Venus moves nearly 1° further east, while Saturn moves about that much each month.

# ACCESS 10,000 ideas.



### IDEAAAS™ Sourcebook for Science, Mathematics and Technology Education

Published by the American Association for the Advancement of Science (AAAS) and The Learning Team. IDEAAAS lists over 10,000 resources in classroom materials, workshops, summer programs and outreach activities, offered by 1600 organizations for K-12 teachers, students and parents.  
Only \$24.95

To order or receive more information call:  
1-800-793-TEAM (Dept. NST)  
Ask about our multi-purchase discounts

10 Long Pond Rd., Armonk NY 10504 914-273-2226 FAX 914-273-2227



CIRCLE NO. 15 ON READERS SERVICE CARD