ANNIVERSARIES OF SCIENCE

The path of progress to the present estate of science is marked by dates, which though often lacking notice at the time, were in many cases turning points of civilization's history.

Each week there will appear in this space a brief calendar of scientific anniversaries. Perhaps this will help carry out an idea that Professor Michael Pupin thus expresses in his autobiography, "From Immigrant to Inventor."

"I often think of an old idea which I first conceived while a student at Cambridge. It is this: Our American colleges and universities should have days consecrated to the memories of what Maxwell called the fathers of the sciences, like Copernicus, Galileo, Newton, Faraday, Maxwell, Darwin, Helmholtz. I mention these names, having physical sciences in mind, but similar names can be mentioned in other departments of human knowledge. Why should not science follow the beautiful example of religion, which has its saints' days? On these memorial days, say Newton's birthday, an address on Newton and his work should tell the young student why Newton is the father of the science of dynamics. Dynamics is not a mere collection of inexorable physical laws which to a young student often sound like dry scientific facts and mute formulae. Many textbooks, unfortunately, represent it that way. It is a record of the life-work of men who lived human lives and became what my mother called 'saints of science,' because they devoted their life-efforts to the deciphering of divine messages which, through physical phenomena, God addresses to man. The young mind should know as early as possible that dynamics had its origin in the heavens, in the motions of heavenly bodies, and that it was brought to earth by Galileo and Newton when they had deciphered the meaning of the divine message conveyed to them by these celestial motions. The Greeks of old sacrificed to their gods a hecatomb of oxen whenever one of their philosophers discovered a new theorem in geometry, and the philosopher's memory was praised forever. The modern nations should not remain indifferent to the memory of the 'saints of science,' whose discoveries have advanced so much the physical and the spiritual welfare of man."

October 2, 1836.—Charles Darwin returned from his five-year cruise as a naturalist on board H. M. S. *Beagle*. As a result of the observations made upon this trip, Darwin decided to devote his life to zoological research.

Certainly, no fact in the long history of the world is so startling as the wide and repeated exterminations of its inhabitants. Nevertheless, if we consider the subject under another point of view, it will appear less perplexing. We do not steadily bear in mind, how profoundly ignorant we are of the conditions of existence of every animal; nor do we always remember, that some check is constantly preventing the too rapid increase of every organized being left in a state of nature.—Darwin: *Voyage of the Beagle,* Chapter VIII.

October 4, 1601.—Death of Tycho Brahe. Brahe studied the motions of the sun, moon and planets, and corrected the known value of the places of 777 fixed stars. He tried to reconcile the Ptolemaic and Copernican theories of the structure of the solar system.

"Your alchemy has turned more gold to lead
Than Denmark can approve. The uses now!
Show us the uses of this work of yours!"
Then Tycho showed his tables of the stars,
Seven hundred stars, each noted in its place
With exquisite precision, the result
Of watching heaven for five-and-twenty years.
"And is this all?" they said.

—Alfred Noyes: *Watchers of the Sky.*

October 5, 1582.—This day began the dating by the Gregorian calendar. The Julian calendar was founded when astronomical observations could not be made with great accuracy, since the measuring instruments were very crude, and the calendar had fallen behind, due to errors in the Julian reckoning, by ten days. October 5 was therefore, by order of Pope Gregory, declared to be October 15, New Style. The Old Style calendar continued to be used by peoples subject to the Greek Church until October 13, 1923, the error by that time amounting to 13 days.

The errors were (1) that the year contains exactly 365¼ days, and (2) that 235 lunations are precisely equal to 19 solar years.

The Gregorian calendar is in error by 26 seconds in the length of the year, which will make our calendar one day ahead in 3325 A. D.

October 6, 1769.—New Zealand first explored by Captain James Cook, of the English ship *Endeavor,* while searching for a great continent supposed to exist in the south Pacific.

By making almost the whole circuit of New Zealand, he (Capt. Cook) ascertained it to be two islands, with a strength of evidence which no prejudice could gainsay or resist. He obtained likewise a full acquaintance with the inhabitants of the different parts of the country, with regard to whom it was clearly proved that they are eaters of human flesh.

—Kippis: *Captain Cook's Voyages.*

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ASTRONOMY

Jupiter's Moons Face Planet

At least three of the moons of Jupiter, like the moon of the earth, rotate once on their axis in the same time that it takes them to make one revolution around their parent planet, is the statement of Dr. Joel Stebbins, professor of astronomy of the University of Wisconsin, working at the Lick Observatory, Mt. Hamilton, California.

Dr. Stebbins is making use of the 12-inch refracting telescope of the observatory, and a photoelectric photometer, by means of which the light from a star, planet or moon is focussed on a film of metallic potassium. This results in a minute electric current which can be measured with a delicate galvanometer, and so the brightness of the object can be accurately determined.

The chief difficulty is in keeping the brilliant light from Jupiter itself off the cell, but Dr. Stebbins has overcome this by the use of a small diaphragm with a hole through which the light from the satellite can shine, but not the planet. However, satellite I, the nearest to Jupiter, is too close to be measured even with this method.

Measurements have been made of II, III and IV. All of these satellites were discovered by Galileo in 1610, and can be seen with a small telescope. In addition there are five others, but these require a large instrument to make them visible.

Moons II, III and IV take 3 days, 13 hours; 7 days, 4 hours and 16 days, 18 hours respectively, to revolve around Jupiter and Dr. Stebbins finds that the variation of the light of the first two at least also follows these periods. This, he explains, is probably due to their being bodies like our moon, and unequally bright over their surface, so that as a greater or less area of the bright surface is exposed to the earth their light is greater or less, because this is largely reflected sunlight.

In order to check the photoelectric cell, Dr. Stebbins compares the light of the satellites with nearby stars, whose light is constant, and he suggests that this may be used as a possible check on the variation of sunlight. Direct measurements of sunlight vary greatly because of variations in atmospheric conditions, but since these would affect alike the brilliancy of the satellites and of the comparison stars, a variation in the difference between satellites and stars would indicate an actual variation of sunlight.

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