T H E

NOTTINGHAM ASTRONOMICAL SOCIETY

B U L L E T I N

NO. 6. JANUARY 1947

COMMENT

Although this issue of 'The Bulletin' is rather late, it is the first number to be published in 1947 and the Editor re-iterates his sincere wishes for good luck and happiness throughout the year to all members.

May the Nottingham Astronomical Society continue to prosper and attract new members to the astronomical fraternity.

With regard to the talk on 'The Star of Bethlehem' last month, it was interesting to witness the phenomenon of the actual 'Star' - Venus and Jupiter jointly - together with the crescent moon in morning skies just before Christmas. The three objects so close together formed an attractive and seasonal spectacle.

The Christmas period also afforded an opportunity to see some naked-eye sunspots. One or two days were marked by sufficient fog and mist to remove the glare without hiding the Sun altogether and on looking directly at the Solar surface, one could see a large sunspot quite clearly.

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CURRENT EVENTS IN THE SKY

The Julian Date for January 0 is 243 2186. For other dates add the date.

The Sun

Solar activity continues, and a very large group appeared before Christmas. Solar Rotation No. 1248 began on Dec. 25th and No. 1249 begins on Jan. 21st. Careful drawings for sunspot positions should be made on a two inch disk.

The Planets

Jupiter is drawing away from Venus and is well placed in the early morning sky. Eclipses, transits, etc. of the main four satellites are too frequent for prediction, but identification of the satellites can always be made from a careful sketch, with the time noted correct to one-tenth of an hour.

Saturn is visible all night between Gemini and Leo, (very near Delta Cancri) and may be identified by its first magnitude brightness. Titan, the principal satellite, can be seen in a small telescope, and has a 16 day revolution period. It is East of Saturn on Jan 5th and 21st, and on Feb. 6th., and is North, West and South at successive 4-day intervals, always well clear of the rings.

Occultations

There are no bright stars occulted during the month of January. There is a grazing occultation of Xi Arietis on Jan. 29th at about 8h.20m.GMAT., but a 'near miss' seems more likely than a short

occulation at Nottingham.

Algol

Convenient minima occur on :-
Feb 5th, at 10h.1 GMAT.
Feb 8th, at 6h.9 GMAT.

Mira Ceti

Mira Ceti should remain a naked-eye star for some weeks. The 30° chart will serve for a long time yet. The star is fading and is now about the 5th magnitude.

A. W. Lane Hall.

THE CALENDAR

by

Arthur K. Bennett,
President, Nottingham Astronomical Society

A Calendar is a method of combining days into periods adapted to the purposes of civil life and religious observances, or to the requirements of scientific precision, such as weeks, months and years. Three of the periods used in Calendars, namely days, months and years are based on those astronomical periods that have the greatest importance for the conditions of human life - Flood-time, seed-time and harvest.

Light from the Sun and the Moon is governed by what astronomers call the Solar Day and the Synodic month, while the return of the seasons depends on the Tropical Year. The length of the Synodic Month is 29.530587 days, while that of the Tropical Year is 365.24219 days, or 365¼ days minus 11m. 12.43s.

The first Calendar of any real pretensions was, as far as we know, introduced by the Egyptians. Their year, from an extremely remote date, consisted of 12 months of 30 days each followed by 5 'added' days making 365 days altogether. The 30 day period was based obviously on the phases of the moon. The used to check the relation of the natural year, i.e. Flood-time, Seed-time, Harvest-time, not by the Solstices and Equinoxes, but by the heliacal rising of Sirius, which returned in the latitude of Memphis at a mean interval of 365.2507 days. The Egyptians taking the length of the natural year as 365.25 days, formed a cycle of 1461 Calendar years, which they equated to 1460 natural years, and which was known by the name of the Sothic or Dog Star Cycle. The Egyptian Calendar was, up to the time of Julius Caesar's reform of the Roman Calendar in 46 B.C., and the only Civil Calendar in which the length of each month and of each year was fixed by rule, instead of being determined by the discretion of officials or by observation. In the 2nd Century B.C. an Athenian observation of 432 B.C. was found reduced to the Egyptian Calendar on an inscription found at Miletus, which appears to represent the work of the astronomer Epigenes. Both the Greeks and the Romans took the basis of their Calendar then from the Egyptians. All Greek Calendars were lunar until the Roman period.

The Roman Calendar which is now used throughout the whole world has its origin in the local Calendar of the City of Rome. For our purpose at present, I will deal with the Roman Calendar as commencing at or about the 'Christian Era'

Years 'Ab Urbe Condita' - A.U.C. - are years counted out from the supposed date of the foundation of the City of Rome. The old Calendar of the Romans fitted the years like a bad clock fits the time. The Calendar was sometimes too fast, sometimes too slow, and it was adjusted by the political factions of that time to facilitate their electioneering tricks, with only a secondary regard for keeping the Calendar in beat with the course of the Seasons.

Some 47 years before Christ, Julius Caesar, the then Dictator of Rome, had his attention called to the vast inconvenience of this state of the Calendar which was then some three months too fast, and indicated the time of Spring when the season was really mid-winter. He added 90 days to the Calendar for the year 46 B.C. and made that year of the Calendar to extend over 445 days, which, in effect, put back the Calendar some 90 days. Julius Caesar then made the year 45 B.C. or, as it was to him, 709 A.U.C. to commence on the 1st January, on the day of a new moon. In order also to make the Calendar keep better time, he took up the odd quarter of a day by making every 4th year into what we now call a leap-year. This was one of the greatest services done by Julius Caesar to the world and the Calendar thus defined with a year of 365 days, but with every 4th year of 366 days, was called the Julian Calendar. The 7th month of the year was named Julius in honour of Caesar.

The precise length of the real year was not then known but subsequently, the continual revolution of the seasons showed that the Julian Calendar was a little too slow. This was because, as we now know, the length of the year is 365¼ days minus 11m. 12s.43. Every recurring leap-year, therefore, left the Julian Calendar nearly 45m. behind time. But the Julian Year was very nearly the real year and it was so vast an improvement upon the former Calendar, that the years from the 1st January of the 1st Julian Year (45 B.C.) were regarded as the Julian Era.

The end of the 45th Julian Year was the date adopted by the Monk Dionysius Exiguus in the year A.D.527 as the commencement of the Christian Era. It therefore follows that the 45th Julian year was the first year before the commencement of the Christian Era, and that the 46th Julian year was the first year after the commencement of the Christian Era. The decade of years of the Julian Era from 41 to 50 inclusive, was thus contemporaneous with the first five years before Christ - B.C. - and the first five years after Christ - A.D.

The putting in of the leap-years of the Julian Era fell into the hands of the Priests. They blundered over it and for the first 36 years of the Julian Calendar, they put in a Leap Year every third year instead of every fourth year. The Priests managed this by something like the method of a person who discovers that whether he has ten fingers on his two hands - or nine - or eleven - depend solely upon whether he counts his fingers forwards or backwards, and where he left off before he summed them up. The result was, that in the 37th Julian year, the Emperor Caesar Augustus discovered that the Calendar was too slow by 3 days, and he then ordered that the next 3 Leap-years would be omitted. The next 3 Leap-years would have been 40,44, and 48 of the Julian era and these were all reduced to 365 days each. It was not until the 4th Leap-year, 52 of the Julian era and the 7th of the Christian era, that another year of 366 days was let into the Calendar. Thus it came about that Leap-years were non-existent in the Julian Calendar at the beginning of the Christian era.

Owing to the Julian Calendar, with its Leap-years proving too slow for the year by the annual interval of 11m. 12s.43 -- 44 m.49s72 or nearly 45 minutes every Leap-year, the Calendar had got 12 days behind the true season of the year in the time of Pope Gregory (1582). By that time the true length of the year was more accurately known and Pope Gregory then put the Calendar on 10 days, so as to correct it for the days it had fallen behind, while, in order to make the Calendar in the future keep better time with the revolutions of the Earth round the Sun, he ordained that all the Centurial Leap-years, except such as were divisable by 400, should be left out. This was in 1582. The Julian Calendar thus further corrected, thenceforth was very unfairly called the Gregorian Calendar. What the Monk Dionysius Exiguus had done in 527 was simply to steel the Julian Era.

Its first 45 A.D. years he cut off and its 46th year he called the 1st of the Christian era, otherwise it remained the Julian Calendar. All that Pope Gregory had done was partly to make these further corrections in the number of Leap-years that the Julian Calendar in its Working for centuries had shown to be necessary.

The Catholic countries, generally, at once adopted the new style - N.S. - of Pope Gregory. This reformed Calendar was 10 days in advance of other nations, and the unreformed Calendar, for the sake of distinction, had to be denoted Old Style - O.S.

England, being a Protestant country, did not then adopt Pope Gregory's New Style, nor his omitted Leap-years, It was not until 1752 that England did this by Act of Parliament. Russia, being under the sway of the Greek or Eastern Church, went so far as to reject the reformed Calendar up to comparatively recent times. Christmas Day which we hold on our December 25th, was therefore, in Russia, on the 13th December. Owing to the 1900th year with us having its Leap-year omitted, while in Russia it was still a Leap-year as ordained by Julius Caesar, their Calendar at that time was 13 days behind time on their 1st March 1900. Anglo-Russian documents of that time had to carry two dates in order to avoid confusion. The dates appeared thus:-

Thursday 1900 March $\frac{2\ OS}{15\ NS}$

J. J. Scaliger (born 1540, died 1609), in order facilitate a comparison of dates, introduced a period of 7980 years, beginning at a distant epoch from all historical events and termed it the Julian 'Period', either because it was composed of Julian years or in honour of his father Julius Caesar Scaliger. By means of this period, it is possible to compare dates which refer to different eras, so that it is only necessary to know the absolute number of each era, that is, the number of days comprised between the beginning of the Julian Period and the beginning of the era in question. If we accept the computations of the early chronologists and Church writers of the 6th century for the supposed date of the Nativity of Christ, we arrive at the date December 25th,4713 of the J.P. The year immediately following, 4714 of the J.P., was then called the year One of Christ or 1 A.D., while the entire year4713 J.P. was called the year 1 B.C. Thus the old chronologists fixed upon the 25th December 4713 J.P. as the commencement of the Christian era. Astronomers, for greater convenience and simplicity of calculation, put back this commencement by about a year to O.Jan.4713 J.P. This date is none other than the 31st Dec. 4712 J.P. and the J.P. years are Julian ones with an intercalation of one day every 4 years, the 4712, when all completed, is comprised of 1178 quadrennial periods of 1461 days each (4 x 365 + 1): that is, taking the whole from the beginning of the J.P. to 4712, we count 1,721,058 days. This number, which determines the astronomical commencement of the era in the J.P., is called the Absolute Number of the Christian Era. It corresponds to the civil date 0.1.0., namely, to O.Jan. of the year zero. The supposed date of the Nativity of Christ, or the beginning of our civil era, occurred on the 359th day of this zero year; therefore, it is evident that between the two commencements - viz, the civil and the astronomical, there is a difference, of one year less the few days from 25th to 31st Dec. This difference, however, need cause no confusion in the designations of the years A.D. because astronomers call zero the year - 1 so that + 1 is the same for both calculations, and both proceed with the same denomication for the years after Christ.

According to civil calculation, therefore, the expression 'One A.D.' implies the year that was next begun and completed after the birth of Christ, so that the words 'Nineteen hundred' signify that

1900 years of 19 centuries have been completed since the birth of Christ; thus the 31st Dec., 1900 was the end of the 19th century A.D., and the commencement of the 20th century.

If astronomers, starting from the absolute number, were to compute time by centuries, they would necessarily say that 19 centuries had elapsed on 31st Dec., 1899, or that on this day, which corresponds to 0 Jan. 1900, the 20th century had begun. Thus every beginning of a 100 years expressed in Arabic numerals would be the beginning of a century and precisely of that century which takes its name from the Roman numeral greater than a unit from the Arabic.

But in astronomy, the unit 'Century' does not exist, the greater intervals of time being computed by days. For this reason, there was in the Nautical Almanac, a Table of the Julian Period, which gave the number of days of the J.P. for whatever date, beginning 0 Jan of the year Zero, which as we have seen, corresponds to - 1 of the old chronologists, or to 4713 of the J.P.

In front of the zero is the Absolute Number, then under the first head came the successive quadrennial periods, and under the second, numbers which gradually exceed 1461 days, excepting the quadrennial period 1580-84 where the difference is only 1451 days, owing to the Gregorian Reform of the Julian Calendar, and excepting the bissextile years, where the difference is 1460 owing to the same reform.

Zero, the sign or Arabic cipher, which stands for nought or the beginning of something, is also a sign denoting position or place, that is, the empty place indicated by ciphers. In the case of the civil date 0.1.0. (equivalent to 0 Jan. 4713 J.P.) Zero, standing in the place of the days indicates the beginning of the year, as well as the missing or uncompleted days, and, standing in the place of the year, indicates the missing or still uncompleted years.

Now, writing this date in decimal fractions of the year up to the 4th figure, we have 0y.0000, and writing the other date, 25th Dec. 4713 J.P., the date of Christ's Nativity, we have 0y.9847. The first fraction indicates the astronomical commencement of the Common Era, while the second one, indicates the Civil commencement, counted from the first - namely from the beginning of the year Zero. It is easy to see that the second fraction also indicates the exact difference between the two commencements, a difference but little short of a whole (0y.0153 - 6 days), namely, of the year which separates the two commencements.

It may be appreciated then, from the foregoing, that a complete and regular chronological system was perfected by Joseph Justus Scaliger, which has contributed very considerably to the computations which are made in astronomy, and that he may be regarded as having played an important role as contributor to that science.

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GLOSSARY

ALTAZIMUTH
A type of telescope mounting requiring movements in two directions to enable the telescope to follow the heavenly bodies accross the sky. Vertical motion for altitude and horizontal motion for azimuth.

ALTITUDE
The scale of distance from horizon to zenith (overhead point), measured in degrees, minutes and seconds of arc.

AZIMUTH

The scale of distance parallel to the horizon, measured in degrees, minutes and seconds of arc eastwards or westwards from North point.

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OBSERVING SECTION

At the meeting of the Committee held on January 2nd, 1947, it was decided to forn an observing section for the purpose of co-ordinating the practical work of the Society and producing some really useful results.

It is hoped that all members who can, and will, undertake practical astronomical work in any branch of the subject, will join the section.

The observing Section will be under the capable direction of Mr. A. W. Lane Hall, and any member interested in taking part in the Section's activities, or who wishes to assist in a more modest way such as undertaking computing work, etc., should communicate with Mr. Lane Hall.

The Committee are desirous of ascertaining, in this connection, the amount and type of equipment in the hands of members, and request, therefore, that any members in possession of astronomical equipment should forward particulars to Mr. Lane Hall, who will thus be able to compile a list which will be of great value as a means of reference.

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NOTES AND ANNOUNCEMENTS

NEW MEMBERS

A sincere welcome is extended to the following new members, who were elected on January 2nd, 1947:-

Miss B. Brown
Mr. D. Bowen-Harrison

ASSISTANT SECRETARY

Miss B. Chambers has kindly agreed to serve in the office of Assistant Secretary, and will deputise for your Secretary, Mr. A. J. Ashmore, whose business engagement prevent him from attending the next two meetings, and who will shortly be leaving Nottingham for a period of twelve months.

GIFT

Mr. Howard Stirling has kindly presented the Society with a book entitled 'A Textbook of Elementary Astronomy' written by E.A.Beet, which has been added to Library.

This and other books may be borrowed by members at each meeting on application to the Secretary.

AFFILIATION TO THE BRITISH ASTRONOMICAL ASSOCIATION

On the recommendation of the Committee, your Secretary submitted an application for affiliation to the British Astronomical Association recently.

A communication has now been received intimating that the application has been granted and that the Nottingham Astronomical Society is now affiliated to the B.A.A. with all the advantages that it entails.

Amongst other things, the Society will receive the periodical Journal of the B.A.A. together with the Handbook and Memoirs, when they are published, and these publications will be available at the meetings.

NEXT MEETING

The next meeting of the Society will take place in the Mechanics Institution on Thursday, February 6th, 1947, at 7.30 p.m.

Mr. Howard Stirling will give a talk on 'How to make a Telescope' and hopes to bring with him a sample of the telescope mirrors he has been making without any special or expensive equipment in his spare time.

Mr. Lane Hall will be present to give his talk on 'The Night Sky in February'.

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NOTTINGHAM
21 Jan 47.