TO FORTIFY A HOUSE.

Barricade doors and windows, loophole barricades, walls and partitions, and the upper floors, so as to be able to fire down through them; cut away the staircases, keeping up the communication by ladders. Place vessels of water in each room to extinguish fires. Remove thatched or wooden roofs adjoining the house. Sink ditches opposite the doors and windows, and place obstacles in front of them, give a flanking defence where it is required over a window, (Plate II., fig. *e*), or at an angle of the house. Lastly, if there is time, loop-hole the garden walls, and remove any thing that may afford cover for the enemy within musket range.

(Manuscript note to R. M. College Course.)

XIII.—*On the Science of Astronomy amongst the Ancient Jews.*

By Mr. Phineas Moss.

Trusting that the subject may not be thought entirely out of place in the Transactions of the Royal Society of Tasmania, or altogether uninteresting to its members, I have ventured to throw together a few brief notices of the Science of Astronomy as known amongst the ancient Jews, taking encouragement from the circumstance, that as a lineal descendant of that people I may possess readier access to their records than a stranger could have. At the same time I experience some diffidence, from the feeling that the time and attention of the Society might be claimed for matters of higher importance and of greater practical utility.

The earliest notice we meet with of the stars and of the

constellations in the Zodiac is by Job, who, according to Hebrew chronology, lived in the year of the world 2362, or about 1400 years before the Christian era,—contemporary with, or at least very few years antecedent to, Moses. In chap. ix. verse 9 of Job, the words *ousai ush k'sil v'cheemo* occur, in reference to Arcturus, a star of the first magnitude in Bootes,—Orion, a brilliant constellation,—and Pleiades, a group in the neck or shoulder of Taurus.

Again, in the 31st and 32nd verses of the 38th chapter, Job mentions them in connection with Nazzareth, a Hebrew word, which literally means Zodiacal constellation, and might have been rendered by the well understood term signs. In the Vulgate it is given in the expression "duodecim signis." The Hebrew words *hauskaushyr mauadownous kemo*—in the 31st verse translated "canst thou bind the sweet influence of Pleiades," might with greater propriety be read thus,—*canst thou restrain the subtle influence,* that is, *the attractive force,* of the Pleiades—the word influence being understood as a directive or impulsive power, such as the attraction of gravitation. Job appears in this to convey his knowledge of our whole Astral system revolving round that group,—or rather one of the stars therein. The profound researches of the modern German Astronomer and Geometrician Mædler having established as a fact the hypothesis that our system does certainly revolve round Alcyone, a star of the third magnitude in the Pleiades, a sufficiently convincing proof that the Heavens had been carefully observed, and the movements and revolutions of the celestial bodies consecutively noticed in the remotest ages.

It is evident that Job was well aware that the globe of the earth was suspended in space, for in speaking of the Divine architect, in chap. xxvi., verse 7, he uses the words

Toulai airetz ol b'lemo, which in the English Bible are rendered, "he hangeth the earth upon nothing," literally, he suspendeth the earth in a vacuum, the Hebrew word *B'lemo,* meaning in English *Space.* In Genesis, chap. vii., verse 11, where the deluge, which, according to Jewish chronologists, occurred Anno Mundi 1654, (the present year (1854) being reckoned by them 5614 of the creation), is described as covering the face of the earth, it is spoken of as having begun on the seventh day of the second month.

I shall only adduce one or two more instances, from the numerous references made in the Bible to astronomical facts, in proof of the antiquity of the science amongst the Jewish people.

The commemoration of the deliverance from Egypt (or *Mitzroyim,* so termed in Hebrew from the name of its founder, Mizraim, the son of Ham), was ordered to be kept in the first full moon after the vernal equinox, when the sun had entered the Zodiacal sign Aries, on or from the first day of the lunar month in which the occurrence took place, (termed in Hebrew *Neesan),* from which the Jewish ecclesiastical year began, and by which all their festivals were regulated.

Before concluding I will give the Hebrew names of the months, with the corresponding periods of their connection with the Zodiacal signs, merely observing that the rules for compiling the yearly calendar at present in use amongst the Jews are chiefly from the direction of the learned Maimonides, who flourished about the year 1150 of the present era, and, following the system adopted by some sages who preceded him, divided the hour into 1080 parts, so as to facilitate their calculations of time, this number being divisible without remainder by any of the units except seven.

The Jewish year, from the earliest time, is what may be termed luni solar: that is, the months being lunar, their calculations were all made in reference to the lunar cycle—the cycle containing 235 lunations, which were divided into twelve years of twelve months, and seven (termed embolismic) years of thirteen months; every nineteenth year, therefore, they came to the same date in the solar or common year. That their months for the earliest time have been lunar is likewise shown in the 1st Book of Kings, chap. vi., verse 38, where the words are: *Oovaushono oauchoss esri l'yoriauch Bul hoo auchoudesh haushmenee:* "and in the eleventh year in the month of Bul, which is the eighth month." In the Hebrew text the two words thus translated "month" vary, the first being derived from *yoriauch*, moon, and the last from *choudesh*, new, or innovation.

The celebrated mathematician Meton of Athens, who flourished 432 years before the Christian Era (in the reign of the king Zedekiah), made a similar division of time; but the first mention of the calendar is by the learned philosopher Rab Judah, surnamed the Prince, in the Mishna written by him about 140 years before the present era, and in which he speaks of embolismic years.

It is recorded of Rab Samuel, an astronomer of Babylon about the same period, who was well acquainted with the science as known in his day, that the paths of the Heavens were as familiar to him as the streets of Nahardea, where he resided; he calculated the solar year to consist of 365 days and 6 hours,—the same as the Julian, which is incorrect. Pope Gregory in 1582 altered it by deducting from October 10 days, making that month in the same year to consist of 21 days only; and in order to prevent the occurrence of discrepancies in future, he then ordered every fourth, instead of every centenary, year to be Bissextile.

Cotemporary with Rab Samuel was Rab Ada, born in Babylon in the 188th year of the common era, and who wrote a century at least before the convocation of the Council of Nice: his calculations are still in use by the Jews; he computed the solar year to consist of,—

	Days.	*Hours.*	*Minutes.*	*Seconds.*
	365	5	55	$25\frac{2}{5}\frac{5}{7}$
The lunar year from one conjunction to the other	29	12	44	$3\frac{1}{3}$
And the lunar cycle of nineteen years	6939	16	33	$3\frac{1}{3}$

From this calculation in 353 C.Æ., about 170 years afterwards, Rabbi Hillel formed the tables for the calendars now in use amongst the Jews. The difference between the Hebrew year according to Rabbi Ada, and the same number according to the Gregorian system, in four centuries will be about one and three quarters of a day, or exactly 1 day, 17 hours, 29 minutes, $35\frac{2}{5}\frac{5}{7}$ seconds less. This will occur in the year 2000 of the Christian Era, 5760 of the Jews, and 146 years from the present time.

I have omitted to notice that the astronomer Rabbi Samuel calculated the precise time of the commencement of the *T'koofous* about 243 years before the current era; and it is certain that a knowledge of the Heavens, as far as they could be viewed without the telescope, was familiar to the learned Jews at a remote period, references being made to each of the Zodiacal constellations or signs in succession in the ritual composed about the 10th or 11th century, a copy of which I possess, and which is still in use in their places of worship in various parts of the earth.

At the commencement of the vernal and autumnal equinoxes, each month with the Hebrew name is mentioned separately therein, with reference to the sign of the Zodiac in which the sun is at the time, commencing with Tishri

in the months of September and October. They are as follows :—

Hebrew Month.	Hebrew Sign.	Sign.	English Month.
Esauneem or *Tishri*	*M'auzneem*	Libra	Sept. and Oct.
Bul or *Cheshvan*	*Ekrauv*	Scorpio	Oct. and Nov.
Kisluv	*Kayshess*	Sagittarius	Nov. and Dec.
Tivess	*G'dee*	Capricornus	Dec. and Jan.
Sh'vaut	*D'lee*	Aquarius	Jan. and Feb.
Odur	*Dogim*	Pisces	Feb. and March.
Ovio or *Nees'n*	*T'lee*	Aries	March and April.
Ear	*Shoor*	Taurus	April and May.
Sivin	*Tioumim*	Gemini	May and June.
Tomuz	*Sort'n*	Cancer	June and July.
Auv	*Aureoh*	Leo	July and Aug.
Elul	*B'soolah*	Virgo	Aug. and Sept.

In conclusion, I cannot but observe how much a critical knowledge of the Hebrew language might be made subservient to scientific and literary researches; as not only the names included therein, but even the very words composing the language, appear to have been originally framed on strictly philosophical principles. I will adduce two or three instances :—The word in Hebrew applied to the Terrestrial Globe (our earth) is *airetz*, three letters derived from the simple root *Rutz*, consisting of only two signifying literally a running or rapid motion, proving, as far as analogy of language can prove, that in the most remote period of human history the Jews possessed such a degree of acquaintance with the science of astronomy, as to be in possession of the fact that the earth revolved round her axis most rapidly, independent of her movements in her orbit. At an early period of history, it is said by Job, chap. xxvi., verse 7, as already cited, *Toulai airetz ol b'lemo*, that the earth hangeth on nothing,—or rather, as it ought to have been rendered, *in* a *vacuum*—the word *B'lemo* signifying literally *space*. Again, there are three words in the Hebrew

language incorrectly rendered in English by a single word, namely, Sun: one is *shaimesh*, the orb or body of that luminary; the other *chaumo*, its heat, the last *Tsaur*, its light; whilst there are two for the moon, one *yoriauch*, signifying the orb, the other *L'vono*, her pale or white light; but there is not any implying her heat; the word *choudesh* is sometimes given in English as the moon, but this literally signifies new, in reference to her change only. Thus the knowledge of Philosophy amongst the Jews appears to have been coeval with their very existence as a people; and the instances I have brought to your notice are but a drop in the ocean of similar cases occurring in the language.

XIV.—*On Two Alpine Eurybiæ of the Australian Continent.* *By* Dr. Ferdinand Mueller, *Government Botanist of Victoria, &c.*

The present splendid elaboration of the Tasmanian Flora by Dr. Joseph Hooker, together with the light thrown by this laborious and learned botanist on the vegetation of New Zealand and the Antarctic Islands, render the knowledge of the *Alpine Flora* of these Islands, which was formerly but so scantily investigated, now nearly complete.

In three successive seasons I attempted to ascertain the analogies and the differences of the alp-plants of the Australian continent compared with those of the adjacent Islands, and in the transactions of the Philosophical Society of the