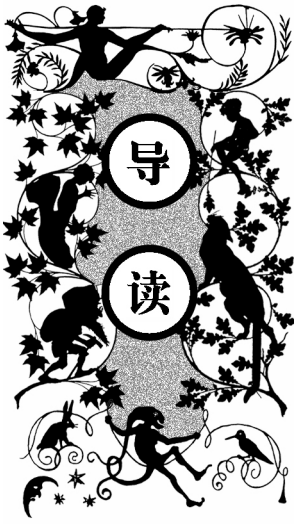
5. 季节以及它们是怎样变化的

The Seasons and How They happen



由于地球绕太阳旋转，直接造就了季节的产生。闰年有 366 天，每四年有一个闰年，除去以两个零结尾且不能被 400 整除的年份。地轴与赤道平行的平面不成直角，而是呈 66.5°角，这是全世界不同地区享受不同季节的直接原因。

四个重要的季节日期分别为 3 月 21 日、6 月 21 日、9 月 23 日和 12 月 21 日。根据 66.5°这个数据，我们可以分出五个地带。通过行星仪来模拟可以帮助理解。

OUR word season is of Latin origin and it comes from the verb "serere", which means "to sow". "Season" should therefore be used only to indicate the spring—the "sowing time". But very early in the Middle Ages "season" lost that exclusive connotation. Three other seasons were added to divide the year into four equal parts: the winter, or wet season; the autumn, the period of increase (the same root as in "augmentation" or "august" which is not only the "month of the increase" but also a "person of augmented importance"); and the summer, which was the old Sanskrit name for the entire year.

Aside from their practical and their romantic interest to the human race,

the four seasons have a most prosaic astronomical background, for they are the direct result of the earth's behavior on its yearly peregrination around the sun, as I shall tell you as briefly and as dully as the subject allows.

The earth turns around its own axis in 24 hours. The earth turns around the sun in about $365\frac{1}{4}$ days. To get rid of that 1/4 day and keep the calendar more or less pure (no, it is not correct, but it is extremely doubtful whether the nations just now would find time in which to agree upon a decent revision) we have a year of 366 days, or leap-year, every four years except in the years which end with two zeros, such as 900,1100,1300 or 1900. But the years which can be divided by 400 are an exception to this exception. The last exception was Anno Domini 1600. The next one will be the year of grace 2000.

The earth does not describe a perfect circle on its way around the sun, but an ellipse. It is not much of an ellipse, but enough to make the study of the earth on its course through space a great deal more complicated than if we had to deal with a perfect circle.

The axis of the earth does not stand at right angles to the plane which we could draw through the sun and our own planet, but at an angle of $66\frac{1}{2}°$.

But on its course around the sun the axis of the earth always remains at the same angle which is directly responsible for the variations in the seasons in different parts of the world.

On March 21st, the position of the earth in relation to the sun is such that the light of the sun illuminates exactly one-half of the surface of our planet. As a result, on that particular day, day and night are of equal length in every part of the world. Three months later, when the earth has finished one-fourth of her voyage around the sun, the North Pole is turned towards the sun and the South Pole is turned away from the sun. As a result, the North Pole is celebrating its yearly day of six months, while the South Pole is enjoying its yearly night of six months; and the northern hemisphere is partaking of the long, shining days of the summer, while the southern hemisphere is spending the long winter

evenings reading a good book by the fireside. Remember that when we go skating at Christmas, the people in the Argentine and Chile are dying of sun-stroke, and while we suffer from our annual heat-wave, it is time for them to get their skates sharpened.

The next day of seasonal importance is the 23rd of September, because then once more the days and nights are of equal length all over the world. Then we reach the 21st of December when the South Pole has turned its face towards the sun and the North Pole has turned its back upon our source of heat. Then the northern hemisphere is cold and the southern hemisphere is warm.

But the peculiar slant of the axis of the earth, together with the earth's rotation, is not alone responsible for the change in seasons. That $66\frac{1}{2}°$ angle also gives us our five zones. On both sides of the equator we have the tropical zone, where the rays of the sun hit the surface of the earth either vertically or almost vertically. The northern and southern temperate zones are those regions between the tropics and the polar regions where the sun's rays hit the earth a little less vertically and therefore have to warm a greater surface of soil or water than they do in the tropics. Until finally the two polar regions receive the rays of the sun at such an angle that even in summer each sixty-nine miles of sunlight is obliged to heat almost double that amount of land.

It is not easy to make these things clear on paper. There are planetariums where you can see all this and understand it too in much less time than you need to read this. But only very few of our cities have thought it necessary to establish such a planetarium. Go to the Board of Aldermen and tell them that you want one for a Christmas present. While they are looking this difficult word up in the dictionary (it may take them twenty or thirty years) you had better try your luck with oranges or apples and a candle and a little black ink to mark off the zones. A match will do for the North Pole and South Pole. And don't indulge in comparisons when a fly descends upon your little home-made planet. Don't say to yourself, "Suppose—just suppose—that we too should be only some sort of fly, crawling aimlessly across the surface of a gigantic orange,

a gigantic orange illuminated by a gigantic candle—both of them little playthings in the hands of some colossus who wanted an afternoon's entertainment!"

Imagination is a good thing.

But not in the realm of astronomy.