applying the gas from coal to economic purposes. Although the gas had been discovered and obtained both naturally and artificially more than half century before, nobody had thought of this application. He perfected the mechanism for such a gas light and described it in the *Philosophical transactions* of the Royal Society in 1808. This earned him the Rumford gold medal of the Society.

Pneumatic Inventions

Murdock had made many mechanical improvements in the equipment of the Soho Foundry. Prominent among them is the construction of the first pneumatic lift for the purpose of raising and lowering the castings from the boring mill to the level of the foundry. He was also the first to make use of compressed air to ring the bell in his house and in the office. He was the inventor of Cast-Iron Cement which is now so much used in the construction of engines and machinery. He invented a crown-screw by which marble and stone could be bored for use as water pipes.

His End

Murdock was also the first to invent central heating. While engaged on the erection of this apparatus at Leamington, he met with a severe accident by the fall of a ponderous cast-iron plate upon his leg above his ankle. He never recovered completely from the effects of this injury.

Murdock died November 15, 1839.

ASTRONOMICAL NOTES

Planets during December 1939.—Venus continues to be an evening star and will be visible low down in the western sky for about an hour and a half after sunset; Mercury will be at its greatest elongation from the Sun (21° 25'W.) on December 17 and can be seen for a short while before sunrise. Mars is rapidly moving eastwards in the constellation Aquarius and although decreasing in brightness, will still be a conspicuous object in the western sky in the early part of the night.

Jupiter will be on the meridian at about sunset and continues to be well placed for observation. Saturn moves slowly in a retrograde direction near the western border of Aries and becomes stationary on December 29. The rings can be seen fairly widened, the angular dimensions of the major and minor axes being 43″ and 10″ respectively about the middle of the month. Not far eastwards of this interesting planet, will be Uranus which can be easily located about 2° south of the star δ Arietis (magnitude 4·5). Neptune is in quadrature with the Sun on December 18, and is stationary on December 29. It is situated about a degree to the north of β Virginis and can be observed with some optical aid. A lunar occultation of some interest that will be visible in India is that of β Capricorni (magnitude 3·2)) on the evening of December 14.

Jupiter X.—Two extremely faint satellites (X and XI) of Jupiter were discovered last year by Dr. Nicholson at the Mt. Wilson Observatory. From the revised orbit of J. X published by R. H. Wilson (*P.A.S.P.*, August 1939), it is found that the mean distance is ·077 astronomical units and the period 252·8 days. The orbit of this satellite appears to be very close to those of J. VI and J. VII. T. P. B.

MAGNETIC NOTES FOR OCTOBER 1939

MAGNETIC ACTIVITY.—The terrestrial magnetic activity during October 1939 was larger than that in the previous month. There were 6 days of *moderate* disturbance, and 16 of *slight* disturbance. The number of days of *great* disturbance was only one while 8 *quiet* days occurred during the month.

It is interesting to note that the most disturbed day in the month that of 13th October occurred immediately after the 12th October which is the quietest day during the month. The distribution of the magnetic characters* of individual days is shown in the table below.

Dates of the month	Quiet days	Disturbed days		
		Slight	Moderate	Great
1939 Oct.	8, 12, 20, 24, 25, 27, 29 and 31	1, 2, 5 to 7, 10, 11, 16 to 19 21, 22, 26, 28 and 30	3 4. 9 14 15 and 23	13

Magnetic Storms.—A storm of great intensity with "sudden commencements" in H, D and Z, was recorded on the 13th and 3 moderate storms each with a gradual beginning occurred on 2nd, 9th and 14th respectively. The number of disturbances during October 1938 were three (one great on 7th, and 2 moderate on 23rd and 25th).

Monthly Characters.—The mean character figure for October 1939 is 0·97 as against 0·94 for the corresponding month of 1938.

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* For method of characterisation please see "Magnetic Notes for July, 1939," in *Curr. Sci.*, 1939, **8**, No. 9, 434.

Perspectives in Evolution*

A CORRECT understanding of the implications of the rapid discoveries being made in Zoology since the beginning of this century can only be had by an examination of these discoveries with reference to the long range view of the existence of life on this earth and this is the thesis examined by Prof. Ritchie in his address to the Zoology Section. The first of these long range views concerns the origin and nature of life. The author examines the mechanistic and vitalistic conceptions of life, the vortex theory, the equilibrium theory and also the bearing of enzyme actions on the understanding of life's processes but concludes that none of these ever offers a complete understanding of its mystery and secret. The characteristics of life are very different from the characteristics of lifeless things and in fact the processes governing the actions of the two are different and are probably completely opposite. The power exhibited by living organisms to abstract from the atmosphere, their medium and generally from their environment, materials that are found in very small quantities, is one which has no parallel in nonliving things, for physical laws tend towards a maximum dispersal of their particles instead of their segregation. But yet the actual mode of the origin of life on earth eludes us. It may be said that life originated as a result of a concourse of atoms but this is more a possibility than a probability. It is impossible too, to say what the first living thing looked like, whether it was a virus, a bacillus or just an undifferentiated mass of protoplasm capable of reacting to its environment. It therefore becomes necessary to take the origin of life as an axiom and once this is done, all the different biological phenomena become explicable.

There is still another concept of life which is as breath-taking as it is baffling. It is now estimated that life has existed on the earth for perhaps 1,200 million years and that the earth itself is about 2,000 million years old. Against this stupendous background of time has Evolution been progressing, slowly and with limitless patience. Against this background man appears but an insignificant thing, his part in evolution a microscopic one, his activities but a tenuous struggle. He appeared on the earth from 25,000 to 40,000 years ago but only very little of this period—in fact only the last 300 years—has witnessed any of his great transformations. As Prof. Ritchie picturesquely puts it, man's achievements have been crowded into less than one-tenths of a second of a twelve-hour past life of the earth.

There is yet a final question which Prof. Ritchie asks,—what of the future of Man? If we assume that life will continue on earth for as long as it has existed already, it must be admitted that evolution will continue. What will the human being at the end of earth's life look like? Nobody can tell. Science is unable to forecast the long future of evolution. It has often been said that man is the culmination of evolution and the future of evolution must only consist in a development of individuality of mental and intellectual ability and in the perfection of a great social order. But when the huge past of over a 1,000 million years has produced such a wealth of evolution, is the huge future of about the same period likely to produce nothing more or better than just a better man? It is on the other hand more probable that man is but a stage in life's progress, just as the dinosaurs were in the Triassic period. And what the future lines of this progress are, nobody can foretell, nor even imagine.

* Summary of the Presidential Address by Prof. J. Ritchie, Zoology Section—Brish Association for the Advancement of Science, Dundee, 1939.

The Assessment of Physical Fitness*

EVERY one talks glibly of Physical Fitness. Many are unaware of its implications. Diverse definitions are given and though we are generally aware of the many qualities that a fit person should possess, we are unable to test those qualities in the light of what is expected of them. Is it a good configuration of the body, is it physiological efficiency or is it the possession of a superior mental equipment that is the criterion of physical fitness? This question is examined by Prof. David Burns in his address to the Physiology Section. It must be admitted that data regarding the form and stature of the body are valueless in testing physical fitness and an undue emphasis on somatometric assessment alone is liable to mislead us. It is true certain initial advantages or disadvantages are conferred on subjects who are endowed with positive or negative qualities regarding form and stature of body but only when they are associated with other functional qualities are they of any value in assessing physical fitness. Physical fitness is primarily physiological. Of the different kinds of measures of physiological fitness indicated, the most important are the efficiency of the functioning of the cardio-respiratory mechanism, the rate of heat loss under different conditions and the value of muscle tone. On the other hand, the quality and state of mind are also of great importance in assessing physical fitness and there is really a close correlation between the state of one's mind and the amount as well as quality of functional activity one is able to put in. It may be true that man was asked to earn his bread by the sweat of his brow, but there was really no intention of precluding him from taking a joy in his work. In fact, in this the secret of efficiency lies. "Our natural strength lies in our men and women and not in the machines that they tend or the battleships that they man. To be really great a State must have citizens fit in body as well as in mind."

* Summary of the Presidential Address by Prof. David Burns, Physiology Section—British Association for the Advancement of Science, Dundee, 1939.