joined links with those complicated forms of animal life which are provided with special mechanisms for the most trifling of their wants.

"The dormant capabilities of this organless being are indirectly and interestingly shown by the shells which, in allied forms, are built up by the agency of similar homogeneous living matter, and which are in many cases 'structures of extraordinary complexity and most singular beauty.' Professor Huxley in his lectures most justly says:

"'That this particle of jelly is capable of combining physical forces in such a manner as to give rise to those exquisite and almost mathematically arranged structures—being itself structureless and without permanent distinction or separation of parts—is, to my mind, a fact of the profoundest significance.'"

AGE OF TREES AND SIZE OF TIMBER.

W. W. Spicer contributes to "Hardwicke's Science Gossip" an interesting article on the above subject. He says:

"The life of a plant is determined by its inner structure, by the laws of its growth, by its power of resisting external injuries, and by other circumstances, many of which are a mystery, and no doubt will ever remain so. But, bounded though it is within limits as narrow and precise as those which hedge round the life of man or the lower animals, there are cases on record of certain members of the vegetable kingdom whose existence has been prolonged for very extraordinary periods.

"The most celebrated of all old trees (and perhaps the most curious, from its belonging to the endogenous division, which does not generally boast of long-lived members) is the the Great Dragon tree, of Orotova, in Tenerriffe. This monstrous specimen, which came to an untimely end in a hurricane a few months ago, was well known and carefully looked after at the conquest of the island by De Bethencourt in the year 1402. It appears to have been of the same size and appearance then as now—namely, from 70 to 80 feet high, with a hollow trunk of about 20 feet in diameter—whence, judging from the slowness of growth in this family of plants, and the little change that has taken place in four centuries and a half, it is inferred that the tree could not have been less than 5,000 years old at the time of its death. Another giant among the pigmies of modern days is the Baobab (Adansonia), an African tree, specimens of which, growing on the banks of the Senegal river, 60 to 80 feet high, and 30 feet in diameter, were estimated by Adanson to be over 5,000 years old. The Portuguese, on their voyages of discovery, were in the habit of carving their names, etc., on conspicuous trees, as a memorial of their having been the first to visit the spot. Adanson arrived at the age of the trees by comparing the depth of the indentations with the number of 'rings' in the portion of wood overgrowing them. The names themselves bore a date which showed them to have been cut three centuries prior to his visit. It has been suggested that possibly in a tropical climate these rings may not be so good a test of age as in our more temperate clime, where they are really annual. Nevertheless, allowing that the Baobab forms two rings in each year, in lieu of one, it is still deserving of 'honorable mention.' Yews have a great reputation as long-livers. The care usually taken of them in church-yards and similar places, no doubt tends greatly to their preservation. Thus a yew in the church-yard of Brabourne, in Kent, has, it is believed, reached the enormous age of 3,000 years; another at Fortingal, in Scotland, is quoted at 2,600 years, and others at Crowhurst, in Surrey, and at Fountains Abbey, are put down at 1,400 years. The yew has some near relatives in the cypress, the Taxodium, and the Wellingtonia. Of the first there is a specimen at Grenada, which was a celebrated tree before the Moors were expelled from Spain by Ferdinand and Isabella, toward the end of the fifteenth century. A *Taxodium distichum* at Oaxaca, in Mexico, which in 1829 measured 120 feet in hight by 117 in circumference, is supposed to number forty centuries. It sheltered Hernan Cortez and his little band of adventurers under its wide-spreading boughs about the year 1520. Among the gigantic Wellingtonias (or Washingtonias, as our thin-skinned cousins across the Atlantic will persist in calling them, in spite of priority of title)—among these mammoth trees of California, which reach a hight of 300 or 400 feet, individuals have been observed which must have witnessed 3,000 summers.

"Two other American trees, both Brazilian, have been noticed for their size and probably long lease of life. The first is the Bertholetia, which supplies the 'Brazil nut' of commerce, specimens of which, growing on the banks of the Amazon, have been noticed with more than 1,000 distinct rings. The other is the Hymenæa, in connection with which I transcribe the following passage from 'Lindley's Vegetable Kingdom.' The size of the timber is sometimes prodigious. The locust trees of the west have long been celebrated for their gigantic stature, and other species are the colossi of South American forests. Martius represents a scene in Brazil, where some trees of this kind occurred of such enormous dimensions that fifteen Indians with outstretched arms could only just embrace one of them. At the bottom they were 84 feet in circumference, and 60 feet where the boles became cylindrical. By counting the concentric rings of such parts as were accessible, he arrived at the conclusion that they were of the age of Homer, and 332 years old in the days of Pythagoras; one estimate indeed reduced their antiquity to 2,052 years, while another carried it up to 4,104; from which he argues that the trees cannot but date far beyond the time of our Saviour.

"My remaining examples are European. Among them is a chestnut tree growing on Mount Etna, and generally known as *Castogna di cento cavalli*, on account of the immense space which it overshadows. It is 180 feet in circumference, and cannot be less than one thousand years old. A scarcely less celebrated tree is growing at Tortworth, in Gloucestershire It was a tree 'of mark' in the days of King John. The great lime tree of Neustadt on the Kocher, in Würtemburg, which as early as 1220 caused the town to be known as *Neustadt an der grossen Linde*, is believed to be not less than 800 years old. Its stem is 38 feet in circumference. At Worms, where there has been lately such a gathering of crowned and ducal heads to do honor to the memory of the great Reformer Luther, is an elm well known in Germany as the Lutherbaum, which measures 116 feet in hight, with a stem 35 feet in circumference, and has attained an age of not less than 700 years.

"A less venerable member of the vegetable kingdom, though still one that can look back through a tolerable vista of years, is a Judas tree (*Cercis siliquastrum*), in the Botanic Garden at Montpelier; it was planted in 1598, and consequently numbers 270 years. Its trunk a short time ago measured 12 feet round. In 'Science Gossip' of last year, p. 163, was given a short account of a rose, which covers one end of the principal church at Hildesheim, in Hanover. This remarkable climber was well known as 'a monument of the past' as early as 1054. Tradition assigns its origin to the year 814, under Louis the Pious, son and successor of Charlemagne.

"Another tree with a legendary history is a 'Gospel Oak' in my own neighborhood in Hampshire, standing in Avington Park. If we are to believe the stories told of it, and common there in every one's mouth, this 'old, old tree' was spared, at the earnest intercession of certain monks residing at Win chester, solely on account of its great age, when a brother of William the Conqueror leveled the whole of the surrounding forest of Hampage, about A. D. 1076. For some sixteen centuries, therefore, it has defied the storms of winter; but the latter have conquered at last. Ten years ago the old veteran made a final struggle to show some signs of life; and now it stands a hollow trunk, with two or three bare and withered arms, and only prevented from falling by a stout band of iron, with which it is encircled. A mere infant by the side of the Avington tree is the Great Oak of Pleischwitz, near Breslau, whose age is reckoned by Göppert at 700 years. It was blown down in 1857; its fall being due to a hollow within its huge stem, which could accommodate with ease twenty-five or thirty persons standing upright.

"Dr. A. B. Reichenbach, in his "Vollständige Naturgeschichte,' says: 'We know of limes in Lithuania with 815 annual rings, and a circumference of 82 feet; of oaks in the Polish forests in which one can count 710 perfect rings, and whose stems measured 49 feet round. There are elms whose age is known to be above 350 years, ivy 440, maples 516, larch 570, oranges 640, planes 720, cedars 800, walnut 900, limes 1,000, pines 1,200, oaks 1,400, olives 2,000.' From these numerous examples of extreme old age one may almost conclude that (provided the seed from which they spring be sound, the soil and climate favorable, and the means of nourishment abundant) the existence of many plants may be extended to an indefinite period, should they be fortunate enough to escape accidents from without."

Welding Copper.

Mr. Philip Rust, Bavarian Inspector of Salt Works, writes to *Dingler's Polytechnic Journal* as follows: "The great obstacle heretofore experienced in welding copper has been that the oxide formed is not fusible. Now, if any fusible compound of this oxide could be found, it would render such a weld possible. We find in mineralogy two copper salts of phosphoric acid—viz., libethenite and pseudo-malachite, each of which melts readily before the blow-pipe. It was therefore natural to suppose that a salt which contained free phosphoric acid, or which would yield the same at a red heat, would make the weld easy by removing the oxide as a fusible slag. The first trial was made with microcosmic salt (phosphate of soda and ammonia), and succeeded perfectly. As this salt was dear, it was found advisable to use a mixture of one part phosphate of soda and two parts boracic acid, which answered the same purpose as the original compound, with the exception that the slag formed was not quite as fusible as before. This welding powder should be strewn on the surface of the copper at a red heat; the pieces should then be heated up to a full cherry red or yellow heat, and brought immediately under the hammer, when they may be as readily welded as iron itself. For instance, it is possible to weld together a small rod of copper which has been broken; the ends should be beveled, laid on one another, seized by a pair of tongs, and placed together with the latter in the fire and heated; the welding powder should then be strewn on the ends, which, after a further heating, may be welded so soundly as to bend and stretch as if they had never been broken."

Mr. Rust states that as long as 1854, he welded strips of copper plate together and drew them into a rod; he also made a chain, the links of which had been made of pretty thick wire and welded. It is necessary to carefully observe two things in the course of the operation: 1st. The greatest care must be taken that no charcoal or other solid carbon comes into contact with the points to be welded, as, otherwise, phosphide of copper would be formed, which would cover the surface of the copper and effectually prevent a weld. In this case it is only by careful treatment in an oxidizing fire and plentiful application of the welding powder that the copper can again be welded. It is, therefore, advisable to heat the copper in in flame, as for instance a gas flame. 2d. As copper is a much softer metal than iron, it is much softer at the required heat than the latter at its welding heat, and the parts welded cannot offer any great resistance to the blows of the hammer. They must, therefore, be so shaped as to be enabled to resist such blows as well as may be, and it is also well to use a wooden hammer, which does not exercise so great a force on account of its lightness.

On the Inflaming Point of Vapors.

Various fluids occurring in the trade volatilize, as is well known, at ordinary temperatures, forming explosive mixtures with atmospheric air; others give off vapors at a somewhat higher, but still comparatively low temperature.

W. R. Hutton, of Glasgow, has recently determined the degree of heat at which the vapors of a number of liquids catch fire from a burning candle, when it is approached to the surface of the fluid at a distance of 1·5 in. or 0·5 inch. The results of these experiments are recorded in the subjoined table:

	Specific weight.	Inflaming point in degrees of Fah. At a distance of 1·5 in.	At a distance of 0·5 in.
Sulphuric ether	0·747	below 53°	—
Bisulphide of carbon	1·270	" 53°	—
Petroleum benzine	0·706	" 56°	—
Benzole from coal tar, 90 per cent.	0·861	" 74°	71°
Crude paraffine oil	0·849	" 74°	72°
Crude naphtha	0·884	" 78°	74°
Whisky	0·940	"	85°
Wood naphtha	0·840	" 87·8°	81°
Crude paraffine oil	0·891	" 88°	83·2°
Crude naphtha	0·881	" 89°	86°
Dutch gin	0·930	"	90°
Wood spirit	0·827	" 96·8°	84·2°
Illuminating naphtha	0·859	" 100°	91°
Wine spirit	0·817	" 104°	73°
Whisky, 15 overproof	0·893	" 109°	83°
" 11 overproof	0·905	" 110°	84·2°
Kerosene	0·801	" 118°	110°
Light oil from coal tar	0·920	" 119°	109°
Spirit from resin	0·822	" 122°	105·8°
Turpentine	0·875	" 130°	119°
Sherry wine	0·993	"	130°
Port wine	1·003	"	130°
Refined paraffine oil	0·809	" 134°	123°
"	0·814	" 138·2°	127°
Fusel oil	0·850	" 140°	120·2°
Oil from resin	0·987	above 212°	
Heavy tar oil	0·950	" 212°	—

From this table it may be seen at a glance that the specific weight has, on the average, no influence on the temperature at which the generation of vapors takes place. The cause of this property may be inferred from the fact that the fluids in question consist of mixtures of various compounds, of which the lighter generally escape first. This is the case with the two kinds of crude naphtha and the illuminating naphtha, from which the benzole had been separated by distillation. The crude naphtha of the specific gravity of nearly 0·89, contained considerable portions of tarry substances and napthaline, but it nevertheless took fire at a lower degree of heat than refined naphtha, the specific weight of which did not exceed 0·86. That a liquid which contains but a small amount of a very volatile fluid, may be very dangerous, is seen, for instance, in the experiment with the light oil from coal tar. This oil inflames by the light of a candle at 119° Fah. when approached to it within a distance of one and a half inches. When compared with the great inflammability of bisulphide of carbon or benzole, the tar oil may be considered as of little danger, but it is just as dangerous when it is taken into consideration that the great inflammability of bisulphide of carbon is well known, while the tar oil is looked upon as being comparatively harmless. In the preceding case, the liquid portion, which generated inflammable gases at 119° Fah., did not amount to two per cent of the whole, and after their separation, vapors were not given off below 179·5° Fah.

Buffaloes versus Telegraph Poles.

The *Telegrapher* is responsible for the following good story: "The buffaloes found in the telegraph poles of the overland line a new source of delight on the treeless prairie—the novelty of having something to scratch against. But it was expensive scratching for the telegraph company; and there, indeed, was the rub, for the bisons shook down miles of wire daily. A bright idea struck somebody to send to St. Louis and Chicago for all the brad-awls that could be purchased, and these were driven into the poles, with a view to wound the animals and check their rubbing propensity. Never was a greater mistake. The buffaloes were delighted. For the first time they came to the scratch sure of a sensation in their thick hides that thrilled them from horn to tail. They would go fifteen miles to find a brad-awl. They fought huge battles around the poles containing them, and the victor would proudly climb the mountainous heap of rump and hump of the fallen, and scratch himself into bliss, until the brad-awl broke or pole came down. There has been no demand for brad-awls from the Kansas region since the first invoice."

Action of Water on Lead.

Professor Parkes, F.R.S., calls attention to the fact that it has always been seen that the action or non-action of water on lead could not be entirely accounted for by the usual statements on the subject, and lately Dr. Frankland has made a curious observation, which may throw light on the matter. He found that water, which acted on lead, lost this power after passing a filter of animal charcoal. He discovered this to be owing to a minute quantity of phosphate of lime passing into the water from the charcoal; on comparing two natural waters, that of the river Kent, which acts violently on lead, and that of the river Vyrnwy, which, though very soft, has no action on lead, he found that the latter water contained an appreciable amount of phosphate of lime, while none could be detected in the Kent water. This observation, to which we have before alluded, may explain the discrepancy of evidence in respect of the action of soft water on lead.

GROWTH OF FUNGI IN CHLORIDE OF MAGNESIUM.—Mr. Slack recently noticed a quantity of flocculent matter in a strong solution of chloride of magnesium, which had been kept a long time in a dark cupboard. On examination it proved to be a gelatinous mass, in which innumerable fungoid threads were discernible. This may be added to the numerous cases of fungi growing in chemical solutions that might have been supposed unfavorable to their existence.