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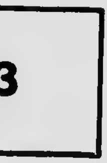

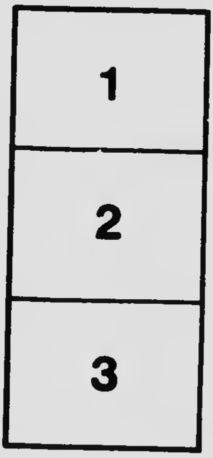

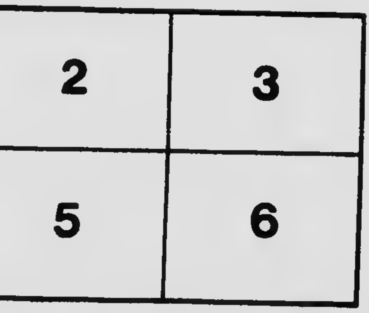

EDUCATIONAL : WORD LESSONS

BY C. BAILLAIRGÉ.

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EDUCATIONAL: WORD LESSONS

by C. Baillairgé.

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The reading aloud to me, by one of my little ones of some 9 years of age, of "Life on a South Sea Whaler" at page 818 of the last volume of the esteemed "Popular Science Monthly", and the fact of my having to stop her at almost every other sentence, to rectify her pronunciation of a word, and explain its meaning; has reminded me of how beneficial such a course has proved to be in my own family for years past, in the tuition of my children in word lore; and of the necessity of suggesting the same process in all educational n. ds, and of every variety of subject.

The little ones can be heard reading aloud on much or most of what they have learnt at school, without having to correct them, or very seldom so, as to pronunciation, or to inquire into their knowledge of the meaning of a term, either in ancient or modern history, geography, ordinary literature, catechism, etc.; because it is seldom or never that a technical word occurs in such reading; and I have noticed with satisfaction that this ordinary [illegible] -riculum fits them for the reading right through [illegible] novel or story of the ordinary type with but very [illegible] mistakes of any kind.

But when it comes to the reading or interpreting of an ordinary news-paper article, replete with terms more or less technical to a child, or an article on a special subjet, as of sea-faring life, ballooning or aerial navigation, — the arts, sciences and manufactures,—commercial subjects,—civic matters—legislative, parliamentary, etc.,—articles relating to our peace or war relations with neighbouring or foreign countries—social topics—cosmography—meteorology, etc.; it is quite another thing : the child has to be stopped every now and then and in fact very frequently, as to its appreciation of the meaning of a word, the signification of a host of abbreviations and so forth.

I have seen graduates from our convents, well up in a sufficiency of botany, conchology, and several of the other ologies, who had not the least idea of what a *ward* of a city means—what an *alderman*—having the most indefinite idea of the meaning of the word *taxes* or *assessment*—as to where the money comes from and how raised to pay for city gas or electric lighting, fire or other service, paving, cleaning, etc.—of why and how the country is divided into states or provinces and counties, townships and the like—of the extent of civic, state or legislative, congressional or parliamentary jurisdiction,—of the prerogatives of a Monarch, President, Governor General, Lieut. Governor, Senate, House of Commons, House of Lords, Privy Council, Council of Ministers, etc. ; of the difference between a Circuit, a Superior or a Supreme Court, a Court of Revision, an Exchequer Court, etc. In an other sphere : what difference there is between a boat, a skiff, a schooner, a yacht, a brig, bark, ship, etc.—what a pontoon, a slip, a landing stage,—what the meaning of an ocean greyhound, of the abbreviation S. S. as for steamship—a compartment in an ocean liner, a bulk-head, a scuttle, a coal-bunker, a locker, and the hundred and one terms of nautical phraseology—the "crows nest" as allowing, on account of the sphericity of the earth, of a more extended field of view from the mast head of a vessel—the terms employed in whaling, "sealing" sailing, fishing in general, hunting, sporting, etc.

It is surprising and may be it should not be, that a child otherwise well informed for its age, can not tell the consecutive days of the week, months of the year, the number of days in each, the hours in a day, how to read the hour on the dial of a clock or watch—possibly because the teacher happening to know it, imagines the pupil does, or that things like these are to be taught and learnt at home. And there are many "object lessons" which in reality are but "word lessons" of things that can be explained or understood without the object, or when the object can not be had nor seen, or the seeing of which would add nothing to the facility of comprehension of it by the pupil. A child may thus be told or made to understand that an armored vessel, is one lined with iron or steel plates to keep the enemy's bullets from piercing it—that a compartment vessel is one divided into sections by so many, so called "bulk heads," so that when after a collision at sea, or fouling on a crag of rock, one compartment is burst into, and when the bulk head doors are closed, the disrupted section may fill with water, without endangering the safety of the vessel—that even the double skin is a protection, in, that the outer skin may be pierced without the inner suffering; and occasion may here be taken to tell the child that if the *Victoria* keeled over and went down, after being struck by the *Camperdown* — the *Bourgogne* by the other vessel; it is because there was a longitudinal bulk head or division along the centre of the vessel, whereby the water flowing in at the breech, instead of spreading to the opposite side of the vessel and thus leaving it in a state of equilibrium—displaced the centre of gravity, or made the vessel side-heavy, which caused it to tilt over until the water rushed in at the side scuttles, ports or openings, thus upsettidg the vessel and making a total wreck of it by causing it to founder.

It is surprising in this respect how much can be told or explained in a very few words. It adds nothing to any one's knowledge of how glass is made of molten sand, to have a piece of the material by you, when it is to be seen in every window of the house; and in a very few words can be explained, how plate glass is cast on a steel or iron table, rolled into equality of thickness and polished off; aud how sheet glass is made by dipping up some of the molten stuff on ne end of a tube or hollow bar of iron, blowing and swinging it the while, into the shape of a cylinder or muff; cutting away the ends, splitting, and how, along its length, flattening out and cutting into squares. Brick is easily explained as puddled or triturated clay, pressed into a mold, pressed out again, laid in the sun to dry for weeks, and then baked, and how piled and fired for the purpose. Coal can be exp ained to be not a manufactured article; but indigenous—or manufactured at God Almighty's bidding or in obedience to His laws of nature, from forest growths and how, in successive layers with strata of stone between; and how, this stone got there, is told in a few words of how the Sun evaporates the sea, these vapours, clouds—the clouds, rain—the rain, rills and rivulets—these last becoming rivers, washing down sand and debris of frost disintegrated rock, into estuaries, lakes and seas, forming sediment deposits, thereafter chemically, physically and mechanically hardened into stone—and thus the intermittent beds of stone and coal in the coal measures, by successive submergence and upheaval of the earth's crust under the effects of internal heat and steam and other seismic action.

How coton is from a plant or grows, furs from animals, worsted as seen hanging from the ovines—how tissues are made like wicker work by being woven—how into fabrics by woof and warp and shuttle—how metals as lead and iron and copper are made liquid by heat and cast into moulds—the moulds how made with sand and in two or more parts to allow the models to draw—how cores are made and held in place for hollow ware.

How light travels instantaneous, how of sound (roughly 1000 ft. per second) and how thus distances can be computed in certain cases—how the earth is surrounded by an atmospher of air and how this air presses at its surface—feathers being a proper simile to show how there is no pressure, no weight at top, while 15lb below—and how this pressure is illustrated by a saucer or dish of water with a tumbler in it up side down, the air displacing the water, while by burning out its component oxygen, its quantity is reduced and the water then forced up into the tumbler by the preponderating outside pressure on the water in the dish.

How water is composed of oxygen and hydrogen in quantities or bulk as one to two as evidenced in its decomposition by the electric current, and how again together exploded into water. How air is made up of oxygen and nitrogen, and how, through the lungs, this oxygen is brought into contact on one side with the blood from the other side and brightens and revivifies it on its way back to the heart, whence it is pumped into the arteries and reaches every part of the animal system, whence it returns black or blue by the veins to the heart and thence sent off again on its mission of revivification towards the lungs, and this process continually repeated throughout life. The functions of the digestive organs; the nervous system in its analogies to electricity and galvanism—the touch being telegraphed to the brain through the nerves of motion, and from the brain back, producing the sensation at the point of contact.

How pictures of what we see are photoed on the retina and superposed in thousands in their extreme tenuity of thinness; and are on can be evoked again in the mind's eye or through the action of the brain, by the stratum being seen through, and the picture thus reproduced, as if by the X ray or Rœntgen system. Nor need this tenuity be doubted when we know that the amplitude of gold leaf is but one thousandth that of paper which makes it thus conceivable to us how the picture might be only the thousanth or the millionth part of that.—How sounds are or may be phonographed on the epithelium or eveloping membrane of the brain, and thus made capable of being reproduced in our minds or memories by some, to us, mysterious process, and then by the vocal organs again rendered audible to the ear.

How the reflection back from a mirror of a ray of light, at an equal angle, is analogous to that of a ray or wave of sound, and both like the billiard ball that rebounds from the cushion; or, bringing it home to the child: like the marble, rebounds or returns from the wall against which it is thrown. What a vacuum is, and how formed in a barometer, or thermometer tube, and this by being kept closed by the finger until plunged beneath the surface of the mercury; the pressure of the air thus fills it and to a depth or height indicative of pounds per inch; and how when its surface rises to fine weather it is convex; and concave or the contrary of convex when descending to foul or rainy weather. The same with the thermometer: when the mercury fills or descends into the bulb upon contraction by cold and rises in the tube by expansion under heat—the zero point, as in the centigrade, indicative of the temperature of melting ice is thus attained and so marked on the tube; the upper point or that of boiling water by plunging the instrument therein, and the degrees of heat from 0 to 100 divided and registered on the tube. How of a small one, the bulb placed and held beneath the tongue with closed lips shows the temperature of the blood. The differences betwen the thermometers: the Centigrads, the Rheaumur, the Farenheit.

How these instruments are used or utilized: the barometer as indicative of heights or altitudes in a balloon or on ascending a mountain, by the lowering of the mercury, as the pressure decreases on ascending—and how in a similar way heights may be told by the thermometer, by the temperature at which water boils at successive elevations—the boiling point being 100 centigrade, or 212 Fahrenheit at sea level and would be zero at the outskirts of the atmosphere; and how thus eggs, etc., can not be boiled nor boiling water had for tea or coffee on a mountain top, unless in a closed and riveted or otherwise hermetically sealed vessel, when any temperature could be had in course of time.

How the sphericity of the Earth is evidenced by having been travelled around repeatedly in all directions by Magellan, Cook and others without coming across any angles or corners; also by its shadow on the moon, during and eclipse; also by every portion of it, around any point, receding from a level line drawn in any and in every direction from that point, and crescendo the more the farther from the point, and in a ratio shown by geometry to be a sphere or nearly so. How being originally soft or fluid or in a molten state and revolving as it does upon its axis, it has become protuberant at the equator, and how by measurement of a portion of its arc of curvature, and the versed sine of arc being computed, its radius and diameter have become known and we are thus informed that its diameter is about 8,000 miles—using the childs bow and arrow or the semblance of it on a black-board or a piece of paper to bring it home to him. How, to locate a point upon its surface, it is conceived to be divided, its circumference into 360 degrees, the degrees into minutes and each minute called a mile: a nautical or geographical or marine mile or a knot as sailors call it, about one sixth longer than an ordinary mile. How the angle of elevation of the pole is equal to the latitude or distance from the equator, and how people need not wonder in what manner an arctic traveller will know when he has reached the pole; by his then having the so called pole star right over his head or in his zenith, making due allowance for its slight distance of about a degre and a half therefrom.

How the rotation of the Earth can be shown by merely holding out at arm's length your watch and chain, setting it to oscillate in a plane paralled to one side of a room or table, then twisting the chain around between your fingers, which can not change the plane of oscillation, and how nevertheless, after an hour or less, the plane of motion of the pendulum will be found to be oblique to the line, to which you started parallel.

Take hold of a paper triangle and cut off its three apices or corners and placing them together, along a straight line, show how they fit and touch and form two right angles, and that therefore when two angles of a triangle are known, the third is known; thus illustrative of how inaccessible distances are arrived at, and when the base is equal to the diameter of the earth, or even less, the moon's distance or the sun's can be therefrom predicated by sighting to it from either, that is from each end of it or both ends, simultaneously; or when the base is that of the diameter of the earth's orbit, and angles taken therefrom at six months interval to a star, the star's whereabouts can be told or how far off it is. And just here the teacher must be reminded that it suffices that some plausible way of doing the thing be intimated to the pupil, even if it be not one of the actual or practical modes of doing the thing—as it might be greek to him to talk about the transit of Venus, which would lead to a much longer explanation; while the base and angles system is brought home to him in a few minutes by a mere pen or pencil sketch on paper or on a black board with chalk.

Show how every triangle is the half of a corresponding parallelogram and thus how its area is equal to its base into half its height or vice-versa; and how thus by dividing any, figure into triangles its area can be made up of its components; and how, of a circle, a similar division into triangles by lines drawn from its centre shows at once that the sum of bases, or the circumference, into half the radius, gives the area.

Show how, if the heat while descending into the bowels of the earth increases as it does by say one degree in 50 ft., the temperature at 80 miles would be such that all its components would be in a state of fusion or incandescence and how thus it is supposed of the earth, that it was at one time in a molten or fluid condition, as stiil evidenced by volcanoes or by its protuberance at the equator, and how the surface has cooled down into a crust, and that crust thrust up and down into hills and hollows as a pie-crust is by the action of the steam beneath it. How an atmosphere, which may primarily have been of vapor, due to the earths incandescence, condensed itself into water when the earth's crust had cooled down sufficiently to allow of it and how, as already stated, the sun has acted and still acts, pumping or sucking up the water of the sea and lakes and rivers, which driven by the wind to colder mountain heights is there condensed back into rain and by its action, forming channels for itself along the depths of valleys, has eroded, hollowed out mountainous areas into various and deep channels and how the stuff from these has been carried along and deposited on the flats and hollows of the earth and formed beds of stone or strata which now constitude the geological crust of our planet; and how animal and vegetable growth has been thus buried under, and now revealed again to us after centuries, by new channels being dug in these very strata, or in burrowing into the earth for coal and salt and metals, gold and silver and the like and lead and iron, or in boring for artersian wells, tunnelling through mountains for railways and canals and drainage purposes.

The child of proper age can be taught how to appreciate the fraction of a second, by being made to let pass between its thumb and finger the leaves of a book, which, as they fly past, can be seen and felt; and however incredulous that it requires 200,000 sheets of gold leaf to make up an inch, can not but admit and be convinced of it, on being told that a ⅜" cube of gold can be beaten and thinned out until it reaches an area equal to 20 × 20 feet or 400 feet superficial.

It can be taught to understand the motion of the earth around the sun, and of the moon simultaneously around the earth, by such a simile as that of a bicycle supposed to travel around a circular area, enclosed or not, with say a light or any object at its centre, to represent the orb of day — where, once around the course will be the year, while every turn of the wheel in going around will be a day, and the smaller or steering wheel, and because smaller and revolving quicker on its axis, and thus presenting itself in succession to every portion of the larger wheel or earth, simulate the moon in its motion around our planet.

Now all this my children know, and have been taught in a series of successive lessons, and only as a word came along in their readings to me, suggestive of the necessity of an explanation. Yes, they know thus much of astronomy without ever having had it taught to them at school or convent or at college, though they may have been taught it when more advanced ; but knew it all from me before that, and if not so thoroughly, at least, in so far as their inquisitive minds were hankering after the information. My girls and boys have as yet been taught no chemistry, no physics, no geology, no climatology ; but they have now the make up of the earth in their minds eye. They know that carbonic acid gas is expelled from the lungs and taken up by vegetable nature—that this gas is heavier than common air and lurks in wells and caverns and in cellars and now to tell of its existence by lowering a lighted taper ere they dare go down themselves—They know how a speaking trumpet acts, and how the rays from a light house go off together on their errand of humanity—how the simultaneous report from a whole regiment of rifles, is heard in successive detonations due to the time sound requires to reach the ear from further and still further off. They can be made to understand how the velocity of a shot can be computed even though unseen, by breaking, in its flight, or passing through a screen at given distance and thus making known the time of transit by electric or instantaneous registration of the fact.

And there are a thousand other things which can be taught and inculcated, and where the difficulty is not in doing but in awaiting the word suggestive of so doing, of an explanation : as that a steam or gas, or air engine is made to go by introducing steam into and at one end of a cylinder and at one side of a piston—after preluding by, what is a cylinder, and how made and what a piston, and the piston rod, and a word as to the force or pressure of steam as evidenced in its raising of the cover of the tea kettle—the piston thus blown or pushed towards and to the other end; and then by automatic (acting spontaneously or of itself) machinery closing the aperture by which the steam or compressed air entered at that end; opening the exit or outflow port at same end and simultaneously the adit or entrance at the other end, to blow the piston back again and so on—for this action is hidden and cannot be seen though easily imagined; while, as to the mode of communication by the piston rod to the machinery through one end of the cylinder or of its cover; you may have explained or may explain this to the child next time you are on board a ferry boat, where the piston rod and its connecting links to a cross head working back and forth or up and down in an opposite pair of guides, is seen to swing the working or the " walking beam " so called, about its pivot on the supporting shears or trestle; the other end following suit and with it the connecting rod revolving the single or double crank ,and this the axle or shaft; and this last, the paddle wheels; and these, by pressure against the water, moving the boat forward or backward when the action is reversed—and this action, as by the time you reach the boat, you may have forgotten all about the teaching, may be apprehended even without the seeing of the real thing, by the working of your arm in imitation of that of the connecting rod or crank.

And how much more may be imparted without the use of any of the scientific terms or illustrative models of mechanics, or the fatigning of the child's mind with technical or scientific terms until later on at college: Centre of gravity, balance a fork or tea spoon, or a knife's edge, and there is where the centre of weight is or the zero point, the weights equal on either side of it; and, balancing a pair of scizzors, show how the centre of weight or gravity is not at the middle of its length, that a gun or cannon is heavier at the brech than at the muzzle, and that of two men carrying a log of tapering timber, he bears the greater load who is at the bigger end of it and that to be fair, each man must take his turn at that.

The action of ordinary weighing scales is plain to any one, even to the youngest intelligence; that is when the arms are equal; and show the child, when balancing at the end of a board over a saw horse in the yard, how if his end of the board be twice the length the other, he can balance two of his own weight at the shorter end and thus the action of the lever scales; and how when he can weigh and knows the rule of three and is given a table of specific gravitties, (explaining that this is the weight of an of equal bulk of any thing as compared with that of as much water) any one can find the volume of such an irregular or unmeasurable thing as a statue or piece of bronze or of any carved work by weighing it and then the rule of three—And how in like manner, after finding the volume or cubical contents of a piece of statuary, of such an irregular thing as a chair, an ill-shaped log of wood, a piece of stone rough from the quary, it may be measured in a box by the sand or sawdust or water it displaces and its weight got at again by specific gravity and rule of three—that in the same way, in the absence of a pair of scales or other device for weighing, the weight of a tub of butter could be got at, and that to arrive at the proportion of voids or vacua, or hollows in a load of broken stone, by far the simplest way would be to weigh an equal bulk of solid stone and then of so much of the solid bulk as would fill the same space when broken and then compare the two.

And a thousand other things which do not suggest themselves to the writer's mind just now, and which, even if they did, need not here be enlarged on, may be taught at home as by the master or mistress as mere "word lessons" at school, devoting half an hour every day to this most useful task and thus your child become acquainted with, made to know a host of useful things and without its being said that he has been taught mechanics, physics, optics, phonics or phonetics, and other ics and giving him or her the air of knowing as much as those that have, or at any rate of such subjects as are talked of in ordinary conversation.

The ten years old can be advised of what wind power is and he knows it already in a way by having been blown about by it, and as to how measured by a board and spring; and he can be made to put his knowledge to the test by hauling on a spring, or pressing one back into the containing box of the so called "jumping jack"—or by trying the force of an elastic rubber band and he thus gets an idea of what the force of a cyclone may be. A child will see and does that a horse is stronger than a man; but to what extent, no more than you may known yourself without inquiry. Books tell you what a H. P. is 33,000 lbs. raised to the height of one foot in one minute of time; and this is the proper way to state the thing for the technologist who undestands and has to deal with it; it being made one term of a ratio as of 33,000 to I or to I to 33,000 where division by I or unity or multiplication by I reduces the rule of three to a mere operation in simple arithmetic; but to bring it home to the pupil, it must be put in another form; as: suppose a building to be going up and that brick or other materials have to be raised to a certain height of say 100 ft. Therefore the H. P. is equivalent to raising 330 lbs. weight of brick or stone or mortar to the height of 100 ft. in one minute of time. Now you can see and show the child that this is a true and practical view of the thing—because a horse tackled to a proper gearing or with a double pulley block, one above and one below, can raise such a weight, and as he will pace away 33 paces going and 33 paces returning or at the rate of two paces in one second of time, he will at the end of his minute be back to tackle another load and then another and during a 10 hours-a-day work he will thus raise 600 times (600 minutes in 10 hours) 330 lbs. or 198,000 lbs. during his day or about 160,000 if he is at it for only 8 hours.

Of course the pupil will not see at once how the power of water or of a water fall may be appreciated or arrived at; but this can be put to him in so simple a manner that he cannot fail to understand it. He or she surely knows and now at any rate that gymnastics are taught every where, that if you swing a rope over a cross head or bar, he or she who pulls the harder at it, will master the " tug of war "—that if forces are equal, the rope will not move or only, by a tug, to go and by another to go back again. The children see that two of themselves or would at any rate be ready to admit, even if the thing were only put to them in so many words, that two of themselves of equal weight would form a counterpoise.—Now you say to the little one, looking up and directing its attention to a curtain pole accross the head of a window, and let the gauze curtain or any other represent the descending sheet of water and if there be no curtain then you can imagine it just the same: suppose my boy this sheet of water falling loosely as it does and giving no adequate idea of the power it exerts at bottom, be gathered together as by a funnel at the head of the fall and to come down in a box or tub or a succession of them; do you not see that each of these if tackled by a rope over the roller to an equal weight of water on the other side would just counterbalance, as when you and your chum swing at the opposite ends of a board resting on a roller or pivot at the centre. Yes—You see therefore that the weight of water coming down from the one side could raise up or nearly so an equal weight on the other side; wherefore the power of a fall of water is, allowing for friction of machinery, equivalent to raising the same weight of water to the same height in the same time, and the time and weight being known the H. P. can be calculated by rule of three.

But the water that falls need not be weighed—its weight is known already as $62\frac{1}{2}$ lbs. to the cube foot is; but of course the quantity going over must be ascertained, and this, it is plain, can be done by the easy process of finding how quick it travels, as evidenced by a chip or stick thrown into a quiet and regular reach of the river above the fall, and as the breadth and average depth will give the area of section; this into the number of feet of its velocity per minute will do the rest, that is give the quantity of feet of water which if multiplied by $62\frac{1}{2}$ lbs. its weight, and this by the feet in height of the fall will give the so called foot-pounds and as the H. P. as seen is equal to 33,000 foot-lbs. per minute, the number of foot-lbs. divided by this 33,000 lbs. will give the H. P. of the fall or river.

And don't you Mr teacher ever be at your wits ends for an illustration or a simile. If it be winter, and the ferry boat not at hand, or the travelling season net yet inaugurated, and even if it were, and you have no time for that; any round thing as a tobacco box, or twist a piece of paper into one and stick or pin it and it will stand you in good stead of your engine cylinder for explanation of piston action back and forth—and as for levers, and even if the box or cylender be octagonal or square, that makes no odds as to the action you wish to illustrate—and if the saw horse lies buried beneath the snow or has been mislaid or loaned and this mode of elucidation not at hand; take hold of a round ruler or even of a bit of wood, or a book on edge, and now a flat ruler and load this at either end with paper weights, or books or what not and thus explain the lever, and while you'r at it, how it acts where the fulcrum is at one end of it with the power between weight and fulcrum, or the weight between the other two.

If you have no sphere at hand, or even if you have, an orange or an apple may suit the purpose just as well or better; put a pin or tack in it on one side, or the broken end of a match and let that be you, and one at the opposite side will be your antipode, and as to why you dont fall off, assimi'ate your weight and tendency towards the earth to an attraction which it is, the attraction of a magnet being a good simile—and why the fly falls not from' the ceiling, and how the boy lifts a stone, his leather sucker as it is called when stuck to the stone and then an attempt made to pull it off, its string at centre, as the fly's leg at the centre of his elastic foot, causing it, when pulled on to rise at centre and thus leave a vacuum against which the pressure of the atmosphere reacts to hold the fly in place, and so solidly the stone that the boy can left it adhering to his disc of leather.

Again, to exemplify day and night, thrust a bodkin through your apple or your orange, or a knitting needle, or a pen handle, allowing it to protrude a little at the ends; and on your table have a lamp or light of some kind, and let a corner of the ceiling be the pole of the heavens or the pole star; and hold your tiny sphere in a way that its axis (the pen handle) point towards the star, and incline it in a way that the light do strike it at the equator or thereabouts, or half way between the poles; and then revolve it in your fingers, and you thus show the lighted and unlighted or the lit and unlit sides of your tiny earth, and the succession of day and night in any latitude or at any distance from the equator—days and nights equal when the sun is directly over the equator or its rays to earth at right angles to the axis. And now move around the light or sun as the earth does in its annual revolution about the sun, and so you get the seasons and in one position the day longer than the night, and in the other the night longer than the day.

And for the phases of the moon, let another pupil armed with another and smaller orange or apple, stand opposite to you or between you and the sun, and hold his ball in a line with the light and earth ; and there you have the " no moon" phase, and by sending the child with it to the other side of the light, the all or whole or full moon phase, and then moving half way back, the half moon phase and that : waxing or waning or facing East or West according to the side on which the sun light strikes it.

Now there is no use in further illustration of these simple modes of demonstration ; for those given are suggestive of others and let me again insist in conclusion, on the advisability and necessity of these " word lessons ", and as the words will not come of themselves, or if they do crop out, may do so in a way unsuggestive of the necessity of an explanation ; let me insist on these reading lessons of every day, and on various subjects, with the very object of conjuring up the words for explanation ; as when they thus occur in the body of a phrase, and are pertinent to the sense thereof, the necessity of their being understood is much more forcibly brought home to the child, than if you merely fish for them in a dictionary ; in the same way that the solution of a problem in geometry is made more pertinent, more interesting when we know that it has some necessary relation to an engineering or architectural problem which can not be worked without it.