panied by dark lines on their more refrangible sides. With the 10-inch refractor and Maclean spectroscope, C was seen to be very brilliant, and there were four very conspicuous lines in the green. Several fainter lines were also seen, and a dark line was suspected in the orange. Mr. Lockyer noticed that some of the lines, especially the bright ones near *F* on the less refrangible side, appeared to change rapidly in relative brightness, and this was confirmed by Mr. Fowler. All the lines in the spectrum of the Nora are broad, although in a photograph of the spectrum of Arcturus, taken with the same instrumental conditions, the lines were perfectly sharp. It is also important to note that the broadening of the lines is not accompanied by any falling off of intensity at the edges, as in the case of the hydrogen lines in such a star as Sirius.

Judging from the testimony here given, it is undoubtedly true that a new star has appeared to our vision, and given astronomers an opportunity to study its make-up. It cannot, however, be said that the object has suddenly come out to its present magnitude. The probability points to the fact that the new star is a variable of long period, and one that at its minimum sinks to invisibility. The verification of this statement must rest upon future observations. We have no record that indicates that a star as bright as the tenth magnitude has ever occupied the place in which the new star has been found. All speculation as to its future history is valueless, because we know nothing of its past history.

The star is now being constantly watched by all the powerful telescopes and spectroscopes of the world, its image is almost nightly caught upon the photographic plate handled by men of experience, and it will not sink back into invisibility without leaving behind a record of great value.

GEO. A. HILL.

Washington, D.C., March 9.

THE TIMBER TREES OF WEST VIRGINIA.

THE Guyandot Coal Land Association, which is the owner of over 200,000 acres of land in the basins of the Guyandot and Twelve-Pole Rivers, in the Counties of Wayne, Logan, and Lincoln, near the south-west corner of West Virginia, has recently had the large timber trees on about 9,000 acres of land counted and measured, thus securing reliable information as to the actual present condition of the Trans-appalachian forests of that region. The diameter of the trees was taken, with calipers, at about four feet above the ground; then the length of the trunks suitable for cutting into logs or for long timber was carefully estimated by the eye of the skilful timber measurer. No trees were measured that were less than eighteen inches in diameter, except the hickories and locusts, which were measured from ten inches and upward. The detailed tables of this counting and measuring have been furnished me for inspection. I think that a summary of the detailed count of the results of the measurements on one single tract will be of interest to the readers of *Science*. For this purpose I select a tract of 655 acres on the top of the dividing ridge between the waters of the east and the west forks of Twelve-Pole River, two miles north-east of the new mining town of Dunlow on the Ohio extension of the Norfolk and Western Railroad, about forty miles by rail south-east from the Ohio River at the new town of Kenova, one named from the abbreviation names of the three States that are there adjacent.

About one-half of this particular tract of land, say 325 acres, lies on the east side of the dividing ridge, slopes from the divide and faces to the north of east, and drains into East Twelve-Pole River. The other 325 acres lies on the west side of the divide, slopes to the south of west and drains into West Twelve-Pole River. The crest of the divide is not far from 1,000 feet above the level of the sea. The following statement shows the whole number of large timber trees now growing on this tract of 655 acres, by kinds and exposures. This tract was found to have growing on it, 16,989 trees; an average of about 26 large timber trees to the acre.

Kinds of Trees.	Western Slope.	Eastern Slope.	Trees of Each Kind.
White oaks	1,256	730	1,986
Chestnut oaks	3,803	2,083	5,886
Black oaks	734	366	1,100
Red oaks	494	242	736
Hickories	1,556	991	2,547
Chestnuts	1,203	697	1,900
Locusts	148	59	207
Maples	224	106	330
Birches	159	174	333
Tulip-poplars	386	472	858
Pines	563	376	939
Lindens	93	74	167
Totals	10,619	6,370	16,989

The proportionate percentage of the hardwood trees of the above table, all those named except the tulip-poplars, pines, and lindens, is quite remarkable. The softwood trees are: 1,042 on the westward slope and 922 on the eastward slope, a total of 1,964, or less than ten per cent of the whole number of trees on the western slope, over fourteen per cent of those on the eastern slope, and nearly twelve per cent of the whole number of trees, leaving over ninety per cent of the westward slope trees and near eighty-six per cent of the eastward slope ones as hardwoods. So these hardwood trees constitute eighty-nine per cent of all the large counted and measured trees now growing on this tract of land. The figures of the table indicate that the large hardwood trees are more abundant on the westward exposure of the dividing ridge.

The record of the diameter and length of each of the trees embraced in the above list, that now lies before me, shows that most of these trees are of large size, the oaks ranging in diameter from eighteen to sixty inches, and in trunk length from twenty to sixty feet. The hickories range from ten to twenty-seven inches in diameter, and from fifteen to sixty feet in trunk length; the pines from eighteen to forty inches in diameter, and twenty to seventy feet in trunk length; and the tulip-poplars from twenty to sixty-six inches in diameter, and from thirty to eighty feet in trunk length.

JED. HOTCHKISS.

Staunton, Va.

THE SPECIALIST.[1]

"MANY scientific men of excellent reputation are to-day guilty of the crime of unnecessary and often premeditated and deliberately planned mystification; in fact, almost by common consent this fault is overlooked in men of distinguished ability, if, indeed, it does not add a lustre to the brilliancy of their attainments. It is usually regarded as a

[1] A few thoughts suggested by the address of the retiring president of the American Association for the Advancement of Science, delivered at the Indianapolis meeting, August, 1890, from which the quotations here given are taken.

high compliment to say of A, that when he read his paper in the mathematical section no one present was able to understand what it was about; or of B and his book, that there are only three men in the world who can read it." . . . "There is a strange and unwholesome prejudice against making science intelligible, for fear that science may become popular." . . . "There is an unfortunate and perhaps a growing tendency among scientific men to despise the useful and the practical in science, and it finds expression in the by no means uncommon feeling of offended dignity when an innocent layman asks what is the use of some new discovery."

The progress of science during the last half-century has been especially remarkable. We are enjoying the product of the mental endeavor of all the past; one forward step has been followed by another, until, in scientific attainments, we are far in advance of the broadest views held a century ago. The age of the earth, its motion and gravitation no longer cause excited controversies. The existence of fossils now occasions no alarm; whether found upon the mountain-top or in the depths of the sea, the explanation is equally satisfactory.

Geology, like the fabled giants of old, has taken wonderful strides; has stepped off, as it were, a thousand years at a pace, and the sermons inscribed on nature's tablets have quickened the understanding and broadened human concep tions. Our knowledge of astronomy and geology has enabled us to cast out the coiled serpent of superstition, and given us truth in its stead. Can the most fertile imagination conceive of loftier heights than chemistry has reached when it is able to measure the five-millionth part of a grain of our far distant sun?

The use of anæsthetics is almost entirely a growth of the last fifty years; like a beneficent angel, conquering pain, annihilating as with magic breath the sufferings of thousands of human beings. Witness now the electric light, and think in comparison of the feeble glimmer of tallow candles. Not many years ago even the lonely light-house tower afforded nothing better than tallow candles to guide the traveller on the storm tossed sea. Until recently electricity has been like a wild ungovernable force, but skilful hands are bringing it more and more under subjection. It is taking the place of brawn and muscle. The courier is no longer needed to despatch our messages on land or by sea. Here and there it has been harnessed to the street railway, and its practical applications are numberless.

It is but a few years since we have had any definite knowledge of bacteria, but who now is not familiar with at least the depredations of these insidious foes? Foes we may well call them when it is estimated that four-fifths of all diseases of humanity are caused by these pathogenic microbes, and that they destroy more lives than war or famine, fire or shipwreck.

Who has enabled science, this second Hercules, to open nature's doors and bring forth her treasures? Who is it that has gleaned her truths and read her laws, but he who has made a special study of them? There is not a practical application of a force of nature and scarcely a material substance that we use which has not resulted from the experimental researches of specialists. Is it not the geologist who has told us the story of the earth? Is it not the chemist who analyzes the sun, the biologist who unfolds for us the life histories of our invisible foes?

It is obvious that a geologist must have worked in geology, that a botanist must have done special work in botany; and in order to have taken up special work they must necessarily have done elementary work. There must be a foundation laid before the super-structure of special work can be reared. There is no royal road to knowledge, and there is no short cut to special work. The disciplinary work which leads up to special work must be done by each individual for himself; skill in manipulation cannot be acquired at second-hand, and judgment is gained through experience alone. The specialist does not simply devote a few years to his chosen work and imagine his investigations cease when he takes his Ph.D.; not at all; the devotion of a lifetime is bestowed on his speciality, which broadens out before him, luring him on with the mysterious charm of unexplored labyrinths. The work of the specialist is to investigate, to find out the truth. He must divest himself of all prejudice, and with unbiased mind "read from the manuscripts of God" the truths there written, whether found on the granite rock or in the story of embryonic life

In the simplest forms of life there is no specialization of organs. Take, for example, the amœba, which is but a tiny speck of protoplasm — an undifferentiated mass; having no organs of locomotion, no mouth, no stomach, it yet moves about, finds its own food, appropriates and digests it. How does it accomplish these complex operations? It moves by pushing out a tiny slimy thread of protoplasm, and the whole mass flowing after it; when it comes in contact with an object which will serve it as food, it flows over it, wraps itself around it, absorbs the nutritious parts, and flows away from the *débris*. Thus this little animal is at times all legs, again all mouth, and still again all stomach, but possesses no differentiated specialized organs This we call the lowest type of animal life; the higher we ascend, the greater the specialization, reaching its culmination in man. The stomach prepares the food, the blood distributes it, the lungs take charge of ventilation, the liver looks to sanitation; the heart is general manager, and the brain, if you please, cultivates "social science." It is plain to everyone that the work done by the amœba is extremely rudimentary compared with that accomplished by man. The amœba fulfils the two essential purposes of life, maintenance and reproduction; mankind does the same, but who can measure the difference in degree?

Is not the work of the general student and that of the specialist in a measure comparable to that of the lowest and highest types of life? The general student who claims an equal familiarity with all branches of knowledge possesses but the rudiments of each. And mark the interdependence of the most specialized organs! No one of them can carry on the work alone; and it is thus with the sciences, advancement in any one of them means general advancement of the whole commonwealth.

All organic life is built up of cells; take any herb, shrub or tree; its tissues are made up of individual cells: each cell is filled with protoplasm, and though the cell walls are apparently continuous, having no visible openings even under high powers of the microscope, it has nevertheless been found that infinitesmal streams of protoplasm extend from cell to cell, connecting the entire plant as with a sympathetic nerve into one continuous whole. And so there is an invisible cord which binds all nature into one harmonious unity. There is a kinship, a brotherhood, a great sympathetic nerve which runs through all branches of natural science. To the general student they may appear independent of each other, but the specialist digs down beneath the surface where the roots are found ramifying in all directions; meeting, overlaping, interlocking with each other.

What can the specialist in physiology do without some knowledge of physics and chemistry? Geology, zoology and botany are hedged with problems whose solution are interdependent. If the sciences are united as with a network, a specialist in any one of them must have some knowledge of those which claim near kinship with his own.

But the specialist is accused of couching his discoveries in language which is unintelligible, of being unpractical; of trying as it were to hide his light under a bushel. Are these accusations well-founded? Are they true? Is it reasonable to suppose that one who studies in nature's laboratories a lifetime should think it desirable to erect a wall about science lest it become popular? Are not specialists numbered among the world's great leaders? To whom is due the great advancement in medical science but to specialists, who in their laboratories patiently sought for answers to problems of whose importance the common mind has no conception? A few years ago a war of words waged high over the theory of spontaneous generation; who but the specialist was able to settle forever this formidable question. Did the world imagine for one moment that the investigations which resulted in the establishment of the "germ theory" would lead to practical results? Physicians, surgeons and boards of health but apply the principles elucidated by the specialist. Enter a laboratory and behold a specialist in the midst of his bacteriological investigations. Would the observation be likely to call forth predictions of practical results? You would see "cultures" under bell-jars, microscopes, and various apparatus; "but," you exclaim, "what bearing do they have on human welfare?" Under the supervision of the bacteriologist they touch the very heart of humanity, bidding it look to its drains and sewers, to its drinking water, to the air it breathes and the purity of its food. Our knowledge of disinfection comes from the same source; who can measure the practical results? Practical applications of investigations in *fungi* reach out to the horticulturist and the farmer, who anxiously look to the specialist for remedies against their microscopic enemies. When the results of the investigations of specialists radiate like the rays of the sun to all humanity, offering balm for its wounds, remedies for its ills, shall they themselves be deemed unpractical, having no concern for human welfare? When they stand face to face with nature and read the histories she has written on shell and stone, on land and sea; when they recognize the bond of union in the division of labor, shall they be charged with "deliberately planned mystification" of the truths they would gladly sow broadcast over the land? Specialization is a law of nature which is stamped on every blade of grass, and on every flower that blooms. Heredity emphasizes this law in every phase and form of life. If it were not so, no individuality would exist. The oak tree does not take upon itself the production of roses, apples or grapes, nor does the rose ever dream of producing acorns or of elaborating material which will ultimately form an oak tree. Each individual cell in every plant contributes to the building up of its own special tissue.

Suppose we take the musical notes of some grand symphony, and scatter them at random on the musical staff; rendition would create but jarring discords. Let a Mozart or a Beethoven place each note where it belongs, and the resulting harmony "wakens in the soul a feeling earthly speech can ne'er declare." May not mankind be compared to these musical notes, creating discord in society because the individuals are not so placed as to enable them to gratify their best and highest aspirations, to do their special work? Is it utopian to hope that each individual, like each note in a musical conception, may some day swell the grand choral of the universe?

MRS. W. A. KELLERMAN.
Columbus, O.

ON A RECENT DISCOVERY OF THE REMAINS OF EXTINCT BIRDS IN NEW ZEALAND.[1]

A DEPOSIT of moa bones, larger than has been found for many years, has just been discovered near the town of Oamaru, in the province of Otago, in the South Island of this colony. Their presence was indicated by the disinterring of a bone during the ploughing of a field, by the proprietor of which the circumstance was communicated to Dr. H. de Lautour of Oamaru. This gentleman, who is well known through his papers on the diatomaceous deposits discovered by him in his district, at once inspected the spot. Finding that the deposit was large, he first secured, through the kindness of the proprietor, the inviolability of the ground, and then telegraphed the information to the Canterbury Museum. I lost no time in proceeding to Oamaru with one of my assistants, and superintended the digging out of the bones in a systematic manner. The site of the deposit was at Enfield, some ten miles to the north-west of the town, on ground elevated several hundred feet above the level of the sea, in a shallow bayleted hollow, into which the unbroken surface of the expansive slope gently descending from the Kurow hills to the open vale of the Waireka (a stream that rises further to the west) has sunk here for some seven to eight feet below the general level, and which, proceeding with a gentle gradient valleywards, becomes a ditch-like conduit for a tributary of the Waireka. In the centre of this depression, which does not exceed ten or twelve yards in width, the ground was of a dark brown color, damp and peaty. On removing the upper layer of soil for a depth of three to four inches round where the bones had first been brought to the surface, and whereon was strewn abundance of small crop-stones, a bed of very solid peat was reached, and firmly imbedded in it were seen the extremities of numerous Dinornis bones, most of them in excellent preservation, though dyed almost black. Further digging showed that certainly many of the skeletons were complete, and had been but slightly, if at all, disturbed since the birds had decayed. Owing, however, to the close manner in which they were packed together, and especially in which the limbs were intertwined, it was rarely possible to extricate the bones in the order of their relations, or to identify with certainty the various bones of the same skeleton, each bone having to be extracted as the circumstances of the moment directed. In many cases, again, only the pelvis and femora could be traced *in situ*, the vertebræ and remaining leg-bones being indistinguishable in the general agglomeration. It seemed evident that the birds had not died in an erect posture, but more probably with their limbs bent under them or in the same plane with the body. In some instances, beneath the sternum were found, lying quite undisturbed, the contents of the stomach, consisting of more or less triturated grass mingled with crop-stones. The quantity of these smooth, rounded (chiefly white quartz) pebbles — in size from that of a bean to that of a plum — mingled with the bones was enormous, and would, if collected, have formed more than a cart-load. Except where the bones were, there were no pebbles of any sort, no small stones, nor even sand, anywhere around. The nearest place where pebbles of the same composition are to be found is, I was informed, several miles distant.

[1] From Nature.