THE SQUARE ROOT OF 2

No One Has Yet Succeeded In Extracting It Accurately.

SOME IMPOSSIBLE PROBLEMS

The Effort to Cultivate a Blue Rose, the Search For Absolute Zero, the Perpetual Motion Phantom and the Squaring of the Circle.

There died in the year 1902 in St Felix, a small village in the department of Haute Garonne, in France, a wealthy octogenarian horticulturist, who spent the last forty-five years of his life and a sum variously estimated at from £12,000 to £15,000 in attempting to produce by artificial cultivation a blue rose.

He failed, and for the best of reasons—the task is one impossible of accomplishment. As De Candolle, a great authority on this subject, has pointed out, yellow and blue are the fundamental types of color in flowers, and these colors are antagonistic, mutually excluding each other. Yellow by culture may be changed into red or white, but never into blue. On the other hand, blue will pass into red, but never into yellow. We have a yellow rose; hence there is no blue.

The pursuit of the absolute zero point is to chemists what the discovery of the north pole is to geographers. Ever since Fahrenheit in 1724 broached the problem scientists innumerable have striven to reach the goal in vain, although each, in turn, has succeeded in outdistancing the other.

Thus Fahrenheit boasted that no one could ever attain artificially to a greater degree of cold than he produced with salt and ice—seven degrees below zero—although, of course, he did not suppose that cold ended there. Yet, within a few years of his death, over 100 degrees below had been obtained, and Professor James Dewar, whose researches in the field of low temperatures have brought out so many new and startling facts, succeeded by cooling down the rare gas helium by the aid of liquefied hydrogen in registering the almost inconceivable temperature of 422 degrees below zero F. But this is not absolute zero, and the problem remains unsolved.

Here and there, in odd corners of the earth, gray, bent men still pore over crucibles seeking the philosopher's stone—that mysterious and wonderful substance which will, they believe, when found change the baser metals into gold. It never will be found, of course, for such a substance, in the nature of things, can have no concrete existence. Nevertheless for hundreds of years the best brains and keenest intellects in Christendom sought it early and late.

Nor were their labors wholly wasted, for it was while searching for this mythical treasure that Bottcher stumbled on the secret of the manufacture of porcelain; Roger Bacon on that of the composition of gunpowder; Geber on the properties of acids; Van Helmont on the nature of gas, and Dr. Glauber on the "salts" which bear his name. After a similar fashion, too, the three century long hunt for the elixir of life bequeathed to us a whole host of valuable remedial drugs and was the means indirectly of saving or, at all events, prolonging literally millions of lives.

So also, as the result of the vain search after perpetual motion, there was evolved the greatest of all the generalizations of modern physical science, the principle of the conservation of energy, and even now more or less important discoveries are being constantly stumbled on by seekers after the same perennial will-o'-the-wisp. For let it be by no means imagined that the perpetual motion cranks are all dead and gone. On the contrary, they are probably fully as numerous and as sanguine today as they were in the time of Leibnitz or Newton.

Of course the thing is impossible and has been proved so over and over again, but that does not deter them. Only the other day a man turned up at the office of a well known patent agent with a model of a perpetual motion machine which depended for its proper working upon the interception of gravitational attraction.

The principle of the invention, the inventor was good enough to explain, was simplicity itself. The only thing that remained to be done, he ingenuously remarked, was to find the proper material for an interceptor. Is it possible to conceive of human folly going further than this?

Among mathematicians the two most famous unsolvable problems are the trisection of the angle and the duplication of the cube. Men have toiled at one or the other, sometimes at both, of these for fifteen, twenty, thirty years, only to retire at last baffled and beaten. Their calculations and methods of work have in many instances been published to the world, but the subject is too abstruse to attempt to do more than merely touch upon it in a popular article of this kind.

It is somewhat startling, however, to find that even figures, just plain, ordinary arithmetical figures such as are easily understandable by any modern board school boy, have given rise to problems quite as incapable of solution as any of those springing out of the higher mathematics.

No one, for instance, has yet succeeded in extracting the square root of 2, although Dr. W. H. Colvill, a civil surgeon of Bagdad, succeeded in working it out to no fewer than 110 places of decimals, and, moreover, his titanic sum has been proved to be absolutely correct, so far as it goes. Here is the result, in case some reader should be seized with an irresistible desire to carry it a stage or two further:

1.414213562373095048801688724209698078569671875376948073176679737990732478462107038850387534327641572735 01384623.

Undoubtedly, however, of all the now admittedly unsolvable figure problems which have from time to time occupied the attention of mathematicians the most famous is that generally known as squaring the circle. The time and energy thrown away upon it in days gone by are simply amazing. A Dutch professor, Jacob Marcelis by name, worked at it for forty-three years and came at last to the conclusion that the circumference contained the diameter exactly

$$3\frac{1008449087377541679894282184894}{6997183637540819440025239271702}$$

times. He was wrong. Another notable computer, one Ludolph van Ceulen, continued his calculations as long as he lived and at his death had the result inscribed on his tombstone at St. Peter's church, Leyden.

Yet a third enthusiast worked out the calculation to more than 700 places of decimals and even then did not get so near as Peter Metius, who guessed at his answer. This latter lucky gentleman asserted that the diameter is to the circumference as 113 is to 355. This is so nearly right that the error would be less than a foot in a circle with a 2,000 mile radius.

For a long time this approximation was as near as any one got, but in 1863 a lady mathematician went one better. Here is her formula: "From three diameters deduct eight thousandths and seven millionths of a diameter, and to the result add 5 per cent." We have then not quite enough, but the shortage is only at the rate of about an inch and a sixteenth of an inch in 14,000 miles. Finally, an Englishman named Shanks succeeded in reducing by more than one-half even this well nigh infinitesimal error, and there for the present the matter rests.

It may be of interest to note, however, that some little while back a man made a great hubbub in London because he had not obtained the reward which he alleged had been offered for the discovery of the correct solution, although he claimed to have arrived at it. He said he did it by actual measurement, and it was found on investigation that he had constructed a boxwood disk of twelve inches in diameter which he rolled along a straight rail. The man was a joiner by trade and evidently knew well what he was about when he measured, for his answer, 3.140625, is wrong by less than one in 3,000.—Pearson's Weekly.

INDIA'S WHITE ANTS.

Only One Kind of Wood, Sandal, Can Withstand Their Attacks.

Insects of various kinds are a perennial plague to Indian dwellers, tea growers and others.

The tea bushes in the Assam gardens have no less than four destructive enemies, from which no means of escape has yet been devised by man. These are the bark eating borer, the sandwich caterpillar, the mosquito and the white ant, all of which attack the bush and do immense damage.

By far the worst of these plagues is the white ant, the mosquito merely attacking the leaves and causing a blight. The ants, however, begin at the roots and eat upward, reducing the wood to powder and leaving only the bark to support the top, which soon topples over by reason of its own weight.

There is no Indian wood which would resist the ants' insidious attack except sandal. It delights in reducing pine and white wood to a powder. It cannot work in the light, but must get at the wood from some dark recess and work within a shell.

In some mysterious way the white ant gets indoors and has a particular penchant for penetrating into a veneered or lacquered picture frame, and in a short time nothing will remain but the veneer or lacquer, nothing else being left but a small portion of the powder, the rest being consumed or removed.

The method of attack is by emitting a kind of acid, which destroys the wood. And this ant has been known to bore holes through the sheet iron bottoms of trunks. Several long, supporting joists in a consular building in Calcutta were eaten out so completely that they had to be replaced with steel ones.

While these destructive white ants do not seem to possess much literary taste, they sometimes attack books and destroy them by boring holes through leaves and cover from side to side.

An English resident in an Indian city had a fine set of upholstered furniture, which he protected by some covering as well as he could before leaving his home for an absence of some months on business, and when he returned he sat down in a chair, which collapsed under him like a framework of cardboard.—Westminster Gazette.