Gibraltar in 1782, the lines of Torres Vedras and the sieges in Spain, the attack on Sevastopol and the capture of Delhi, and many others. Varied as these operations were, they had this in common—the men who carried them out made every possible use of local resources and utilised as fully as possible any civilian talent that might be available. In the Great War, which in its magnitude eclipsed all the other operations put together, and in which the entire resources of the country were made available, the talent of the civil engineering profession was utilised to the fullest extent, albeit we had not carefully foreseen the need nor estimated its value. Civil engineering is, said the speaker who replied to the toast of the evening, a young profession, only a century or two old at most. Military engineers have been associated with war ever since wars began. But now in the matter of national defence both have learnt to stand shoulder to shoulder, and the civil engineer has won the right to recognition in national conflict not by the arts of advertisement but by great deeds worthily performed.

GEORGE K. SCOTT MONCRIEFF.

A NEW DISEASE IN ARCHITECTURE

"In the proposed re-erection of the north colonnade of the Parthenon, a compound of limestone and cement is to be substituted for the missing blocks of marble." (*Reuter's message in* The Times *of January* 17, 1922.)

A LINE can be divided into two parts in a great many ways; one way is known as the Golden Section. Euclid gave several methods by which the Golden Section could be obtained. My readers can easily do it for themselves. If AB is the line to be thus divided, draw BC at right angles to AB and exactly half its length. Complete the right-angled triangle by joining AC. With C as centre and CB as distance, describe a circle cutting AC at G; with A as centre and AG as distance, describe a circle cutting the line AB at D This point D gives you the Golden Section. In measurements, BD is ·381966, etc., and DA is ·618033, etc., when AB is unity.

In the *Daily Telegraph* for January 21, 1911, Mr. William Schooling (as he then was) mentioned a 'very wonderful number which may be called by the Greek letter *Phi*, of which nobody has heard much as yet, but of which, perhaps, a great deal is likely to be heard in course of time. Among other things, it may explain to architects and sculptors and painters, and to everybody interested in their work, the true law which underlies beauty of form.' Mr. Mark Barr chose the name for *Phi* (1·618033, etc.) which was first briefly described in the *Field* for December 14, 1912; and to that description I shall have to return later on. But I wish at once to emphasise Mr. Schooling's suggestive phrase about a number being applied to architecture, and to point out that the use of the Golden Section (which may be called the origin of *Phi*) has apparently burst out into a sudden and devastating disease which shows no signs of stopping, and has reached its culminating point (for the present) in two very large and profusely illustrated volumes: '"*Ad Quadratum:*" *A Study of the Geometrical Bases of Classic and Mediæval Religious Architecture.* By Fredrik Macody Lund. Printed by order of the Norwegian Parliament.'

The articles I mentioned in the *Field* for 1912 were republished in revised and greatly improved form in *The Curves of Life* in 1914, and the author records that just as he was reading his proofs he was sent a book called *Nature's Harmonic Unity: A Treatise on its Relation to Proportional Form*, written by Samuel Colman, edited by C. Arthur Coan. The preface of this latter work is dated December, 1911, and it enlarges on the marvels of the Golden Section, another name for which is the Extreme and Mean Proportion, for if you speak in terms of the line AB, the smaller part (BD) is to the larger part (DA) as this larger part is to the whole. The authors of *Nature's Harmonic Unity* proceeded to find the Golden Section all over architecture and Nature, and gave drawings of buildings and shells almost obscured by a network of geometry. They tried, in fact, to prove too much by going very much further than Zeising or Fechner had already gone in the same direction.

We shall see that nearly everyone who makes for himself the fresh discovery of this very ancient and simple proportion invariably thinks that he has hit on the key to every mystery. He talks of it as if nobody else had ever analysed it before. He uses it as if it had never occurred to anybody else to apply a very simple set of mathematical relationships to various well-known buildings. If they will not fit, he says it is the fault of the buildings, and not of his application of an arbitrary measure; as if the buildings were made for measurement and not for our delight! 'Disease' I have called this growing tendency, and my readers will agree with me, I am sure, before I have gone much further. For the Golden Section is not merely as old as the sixteenth century: it is older than the thirteenth century Fibonacci series (1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, etc.); it is older than Pythagoras or the most ancient Greeks; it was used in the construction of the Great Pyramid of Ghizeh, built, I am told, about 4700 B.C., and therefore it is older still. Remember, I am considering it for the present simply as the special division of a line into two parts, with the very obvious geometrical corollaries which follow from that division. It is thus that Messrs. Colman and Coan considered it. It is thus that Dr. Lund considers it in *Ad Quadratum*. It is thus (to take an instance between the two) that the peculiarly aggravating Mr. Jay Hambidge considered it, and no doubt continues so to do.

Mr. Hambidge has an especially virulent form of the disease. He applies the ancient proportion, with its simple geometrical derivatives, to questions of area (as distinct from line and measurement); and in the first number of the first volume of his monthly magazine, *The Diagonal* (November 1919, Yale University Press), we actually read, concerning one of these areas, that 'this root-five rectangle is the basic shape of vegetable and animal architecture, and is *the form which has solved the mystery of the perfection of classical Greek art*' (p. 15). The italics express my own continuing surprise. He took the poor old Parthenon (they all do!) and drew the usual mazes of geometry all over it, and claimed that by his formula he had solved the mystery of its perfection; as if the precise measurements of the Parthenon had not been perfectly well known for seventy years, and as if every one of the scholars who had studied them so often would not have instantly detected such obvious elements of schoolroom Euclid had they existed! There was Francis Cranmer Penrose (1851); there was T. L. Donaldson; there was D. R. Hay (1852); there were Pennithorne, Goodyear, Perring: I could find a dozen more. The elements are not there to see, and that is the fact of the matter.

I have often been anxious to ask Mr. Hambidge to let us all know, in *The Times* or where he pleases, why he has never (to my knowledge) used the number 2,784 in his calculations, or, if I have overlooked it, why he has used it. No one with any pretensions to be an authority on the forms of beauty could very well neglect these magic figures, for, with the addition of the equally mystic word 'Gerrard,' they provide the telephone number of the Gaiety Theatre (stage-door); and they are as much a key to the mystery of Greek art as any one of Mr. Hambidge's rectangles. But I must not be frivolous in approaching Dr. Lund, the latest and most industrious of this happy band, for they are not only contented, but happy; and one reason why I think some remedy should be found for them is that they begin to grow tedious, if not dangerous, to others. So contagious are the materialistic obsessions of their physical tests that they will no doubt soon insist on our discovering the quality of a Greek coin by biting it. Their disease is not merely spreading. It becomes expensive, much more expensive—'complete in two volumes, price £5 nett,' and in four languages.

According to Dr. Lund, the Greek temple being 'the material image of the mystery of existence,' was given its proportions 'according to an irrational measure, in an ascending, harmonic, geometrical progression, as appears in the Pentagram, which for the Pythagoreans was the symbol of the harmonious system in the Cosmos, the masterpiece of the universe.' There is an attitude of mind here which reminds me at once of the late Dr. J. Bell Pettigrew, F.R.S., an amazingly industrious worker, whose collection of facts is of permanent and valuable interest. But he marshalled and stated them 'in support of a First Cause and Design' with the object of proving the existence of 'design, order and purpose in the inorganic and organic systems.' In asking us to believe that these facts 'can only be explained by the existence of an intelligent Creator, Designer, and Upholder,' he urges that 'this, on the whole, is the most comforting and sensible view to take of creation, as it guarantees to plants and animals a home, food, and constant supervision, and to man security both as regards the here and the hereafter' (*Design in Nature*, three volumes). This, it seems to me, involves a certain forcing of interpretations from his own mind into that of the innocent phenomena he examines, which results in his seeing mathematical formations where they do not really exist; but, at any rate, he did not go farther and apply his formulas to architecture.

Mr. Samuel Colman, however, never sufficiently restrained by the disciplined mathematics of his editor, Mr. C. Arthur Coan, after announcing that Nature continually employs the Pentagon, Hexagon, and Octagon in conjunction, gives this as the reason why 'the great architects of antiquity selected these polygons as fundamental elements in the composition of their temples, churches, and other buildings; but more than all else they proclaim that "Order is heaven's first law," *revealing in a large measure the hand of Divinity*.' Dr. Lund is in much the same way convinced that he has rediscovered a Divine mystery, and that his revelation of its forgotten rules 'will have a fertilising influence upon the science of building as a whole.' So in Vol. I., Chapter VIII., p. 129, he begins his own sonorous and extended pæan on the same extremely antiquated Golden Section (continued to p. 197). He disclaims, like all his predecessors, any knowledge of the work of anybody else on his pet subject. And it is perfectly obvious that, each and all, they come upon this Section as a fascinating novelty and instantly proceed, with the utmost sincerity and ingenuousness, to apply it, as their own discovery, to every difficulty that has baffled every previous inquirer. Dr. Lund's particular symptoms of the disease are the Square and the Pentagon, just as Mr. Hambidge's were rectangles. Dr. Lund laboriously reproduces all that is known (or at least I suppose there was no room for more) about the Section, and its application through the Pentagon and the Square to classical architecture. He shows its multiform existence (by the usual geometrical tracings over the plan) in the Temple of Concordia at Girgenti (the ancient Acragas), and analyses this at great length, having been led to do so by the statement of the famous mathematician, Jules Tannery, that this temple's 'length is equal to accurately four times the side of a decagon inscribed in a circle the radius of which is equal to the width of the temple's front.' Readers of *The Curves of Life* will be reminded by this sentence of the fact therein recorded (a well-known fact) that 'if the side of a decagon is unity the radius of the circumscribed circle is *Phi*.' Dr. Lund, therefore, gets a good start at once. He does not spare the

Parthenon, of course. He proceeds gaily on to the great French cathedrals. He ends with the cathedral of Nidaros, or Trondjehm, with the reconstruction of which every English reader will be in full sympathy. It is with Dr. Lund's methods that I disagree, for the same reason as I object to those of his predecessors.

The translation of Dr. Lund's work must have been extraordinarily difficult. His letters and figures are occasionally (and admittedly) misprinted. So I will not press him upon any points of mere accuracy; and if he will allow it, I should like to praise him very heartily for his undefeated enthusiasm and industry. But I cannot accept his theory. The constant catastrophe of the Patent Office is the appearance of admirable inventions by new and ardent discoverers who never realise that other people found out the same things long ago. It looks as if the Golden Measure was on its way to originating a tragedy of a similar kind; and I must here interpolate the true method by which this Measure can be of some use to-day.

In the *Field* for December 14, 1912, and more completely in *The Curves of Life*, 1914, it was demonstrated, with the help of Mr. Mark Barr and others, that the numbers of the Golden Section, namely, ·381966 and ·618034 (I give only six decimal places), did not merely represent the division of a line (unity), but were two terms of an infinite series in which the Golden Ratio held to the end, and each term of which was obtained by adding the two previous terms together. The first term was unity; the second term (called *Phi*) was 1·618034; the third was 2·618034, and so onwards, the values of the ratio being $(1 + \sqrt{5}) \div 2$ or $(1 - \sqrt{5}) \div 2$. The thirteenth century Fibonacci series (1, 1, 2, 3, 5, 8, 13, 21, 34, etc.) is a similar series. It was used long ago by Mr. Church, the distinguished Oxford botanist, in his brilliant investigation of the arrangement of a sunflower's seeds. All such two-step additive series have by Mr. Mark Barr been generalised as $a, b, a + b, a + 2b, 2a + 3b, 3a + 5b, 5a + 8b$, etc., a statement which indicates the curious significance of the Fibonacci numbers. The two *Phi* values $(1 + \sqrt{5}) \div 2$ and $(1 - \sqrt{5}) \div 2$ are, it was shown, the two roots of the quadratic equation which states the conditions of any two-step additive series, namely: $x^n = x^{n-1} + x^{n-2}$. The higher numbers of the Fibonacci series approximate more and more closely to the ratio 1 to 1·618034, but never reach it. In fact, the *Phi* ratio is the ideal which all additive series of the Fibonacci type tend to reach, but never attain; and the *Phi* series is the only series which can be formed either by addition, as above, or by taking successive powers of *Phi*, as in the usual geometrical progression.

But mathematics are not an end in themselves, as Mr. Hambidge and his friends seem to think when they read into architectural phenomena the exuberant geometry buzzing in their own heads. Mathematics provide a very delicate instrument by means of which the human mind can face any investigation; but, as Mr. A. B. Walkley pointed out in *The Times* (see *Pastiche and Prejudice*, page 192), 'whatever rectangles Mr. Hambidge may discover in Greek works of art, he will not thereby have revealed the secret of Greek art. For rectangles are physical facts (when they are not mere abstractions) and art is not a physical fact, but a spiritual activity. It is in the mind of the artist, it is his vision, the expression of his intuition, and beauty is only another name for perfect expression.' It may also be true that there is no phenomenon within our knowledge which could not be described by some more or less complicated mathematical formulas, if we were good enough to frame them. But the excessively delicate phenomena of beauty can never be either defined or reproduced by such ancient and childlike simplicities as the Golden Measure, the Root-five Rectangle, or the Square; and life is no more susceptible of simple measurement than beauty is. One of the chief characteristics of living things in Nature is that they are individual and differ from standard, and one of the strongest appeals which beauty makes to us in art is that it is full of delicate divergences from any simple mathematical formula. Mr. Colman, Mr. Jay Hambidge, and Dr. Lund say that beauty (and life) *are* suspectible of exact (and very simple) measurements, and that these measurements provide a key to the mystery of each; they assert that the secret of producing beauty is the obedience to simple and exact proportions, exact rectangles, exact pentagons or squares. I say they are entirely wrong in theory, and that they have failed to prove any facts on which that theory can be based. I say that the exactly mathematical Pyramid is a mere triangular mass of stones, whereas in the beautiful Parthenon there is not a single simple and exact measurement to be found; it is as full of variations as a live flower or a shell is full of delicate divergences from dull or dead exactitude.

The sole use of the Golden Measure in either category is that it has been shown to provide the key ratio of many series visible in natural arrangements; and it therefore gives us a new standard which we can apply to beautiful buildings or to lovely shells, and natural growths. It would be useless to have so rough a standard as the Fibonacci series, divergences from which might be so large as to imply very little meaning. It is only when a standard is sufficiently delicate to detect the invaluable variations, which are invariably small, that such a standard is of any real use. Nature and art are not 'mathematical.' But mathematics can provide us (as in the *Phi* series) with an instrument by which to appreciate those variations from obvious rule and natural rhythm

which in one set of conditions seem to accompany the phenomena of life in nature, and in another set seem to enter into our appreciation of beauty in art.

It is no exaggeration to say that there are no simple and exact measurements in the Parthenon whatever, for it contains something far more delicate than a number of agreements with a simple formula; it exhibits constant differences from rectilinear or angular exactitude, partly owing to the curves introduced for definite optical reasons, partly owing to some even more subtle understanding of the value of a slight divergence from 'expected' measurements. If the new *Phi* proportion has sometimes been nearly exactly realised in the works of such wonderful artists as Pheidias, that is because it expresses certain natural rhythms which the greatest of the creators have almost always unconsciously and instinctively appreciated. But it is utterly impossible to use either the *Phi* proportion or any other simple formula as a rule of thumb by which beautiful forms can be created.

Let us remember this when we read (*Times*, January 17 and 18, 1922) that the north colonnade of the Parthenon is about to be 'restored.' The disciples of Mr. Hambidge and Dr. Lund have their formulas all ready for the rebuilding of that temple of Athena which was the reflection, as it is still the revelation, of the age of Pericles. *Chimæræ bombinantes in vacuo*; it may be thought that they can never 'drag Diana from her car or drive the Hamadryad from the wood.' But give them just one chance, and they will rule their preposterous pentagons and squares all round the ruined shrine no longer guarded by the virgin goddess. Although no longer in the city of the violet crown dwell fellow-countrymen or friends of Pheidias, some fragments of the imperishable beauty he created still remain. That world-wide heritage it is our spiritual birthright to protect. It can never be 'restored,' nor can our day repeat it, for its 'secret' is the golden spell of old Egean sunsets on forgotten seas. Let us at least be very sure that no one shall be permitted to deface it with unabashed and platitudinous rectangles.

The effort to find a formula in ancient architecture is almost as exasperating as the search for ciphers in the plays of Shakespeare, or the recent craze for hidden rhymes and mysteries in the hexameters of Homer or of Virgil. If the Greeks had used mathematics, they would have used—and they knew—far more difficult forms than those put forward by Mr. Hambidge or Dr. Lund, who do not seem to appreciate how far the Greeks had really gone. The actual records of Greek mathematics begin with Thales, who preserved practically all that was useful in Egyptian knowledge of that kind. The developments of Pythagorean mathematics are described by Nicomachus, Iamblichus, and

Theon of Smyrna. One of these developments explained the construction of a regular pentagon, involving the cutting of a straight line in the Golden Section (Euclid, II., 11, and VI., 30), which is a particular case of the method known as the application of areas. An earnest student of the name of Pappus, in the third century A.D., made a great 'collection' which included almost as much Greek mathematics as can ever be discovered in the originals. From these and similar authorities we may realise that in about 350 years (a period including the date of the Parthenon) the Greeks began geometry and brought it up to a point equivalent to the integral calculus. If only Mr. Hambidge and Dr. Lund would go to Athens and visit the Parthenon themselves, or if they would study the original Greek texts, they might not make such glib assertions about either. One proof that the builders of the Parthenon (who knew the theory of optics) cared nothing whatever for such simple mathematics as the Golden Section is to be found in the whole lay-out and ground-plan of the Acropolis, on which the various buildings are placed (no doubt intentionally in some cases) without the least regard for axial lines or rectangular measurements of any sort.

Even more striking is the fact that neither Mr. Hambidge nor Dr. Lund seems to take proper account of the curves and deliberate asymmetries introduced by the designer of the Parthenon because he understood that this great creation was to be looked at by human eyes, with all the imperfection of those human organs. He deliberately chose the finest marble in the world. The cutting of it (I speak not of sculpture, but of construction) was so delicately exact that many of the drums of the columns and joints of the steps have 'grown together.' Every tiny curve and angle in the whole was accurately made as its designer wished it, and there is as little room for argument about 'unintentional error' as there was, when Penrose measured it, for the 'natural decay of ancient buildings.' The architect of the Parthenon knew enough of optical theory to be aware that if the lines of his huge steps had been mathematically straight, they would have 'looked' as if they sagged in the middle. He knew that if his fluted pillars had been accurate cylinders, they would have 'looked' too weak to hold the weight above. So he curved his steps upwards in the middle, and he gave entasis to his swelling columns. Neither of these additions can be called essential to the strength of the construction; neither of them can (to my knowledge) be found in the paraphernalia of Mr. Hambidge or of Dr. Lund. Yet these two gentlemen calmly announce that their formulas will solve the secrets of the beauty of the Parthenon. They do not apparently know (and one of my chief criticisms is that they neglect the bearing of so much previous work) that an attempt has already been made to reproduce a Greek

temple by the kind of mathematics they recommend. The Madeleine in Paris was built by enlarging the plan for the Maison Carrée at Nimes. Not only did the modern architect apparently forget that proportions fit for a small building on a certain site could not be successfully reproduced on a much larger scale for a different site, but he also entirely neglected those optical refinements which are the chief source of the satisfaction given us by the sight of a great Greek design. So he entirely failed. And all the formulas of Mr. Hambidge or of Dr. Lund would fail, when put to a practical test, by reason of similar omissions.

Not only does the Madeleine remain as a terrifying example of such architecture as Mr. Hambidge seems to recommend, but Vitruvius stands out as an even more vivid warning against taking standards for architecture from the human body or from mathematics. Vitruvius, who flourished under Cæsar and Augustus, was one of the worst architects ever known, and his ten books are almost the worst written in the long succession which ends (for the present) in Dr. Lund. The first edition was published in Italy in 1489, and it was first translated for French readers in 1547 by Jean Martin, with illustrations and an introduction by Jean Goujon. Between those dates more harm had been done by his slipshod statements about 'proportions' and 'perfect numbers' than it is possible to calculate. His idea was merely to give a few so-called 'rules' to Roman architects in their practical task of 'reproducing' Greek architecture. Since Vitruvius failed in guessing the Greek 'secret' just as hopelessly as Mr. Hambidge, the results of his becoming fashionable in ancient Rome and in Renaissance Italy and France can be more easily imagined than described. It is no exaggerated prudishness which prompts me to warn a public even more careless than any of its predecessors in the Christian era against the danger of precisely similar errors reappearing under the guise of new discoveries by modern writers. Dr. Lund is no nearer the chimerical formula for the Parthenon than was Vitruvius, and he claims a far wider application for it, besides enjoying an infinitely larger circulation for his heresies.

Even more unfounded is Dr. Lund's suggestion that the Parthenon builders were prevented by some mystic priestcraft from revealing any methods they employed, for the fact is that the Greeks had no priestly government, in that sense, whatever. Their recognised mysteries, like those of Eleusis, had nothing to do with architecture at all. It is also a palpable error to say that the cathedral builders inherited anything from the artists of the Parthenon. The French Gothic style was developed from the Norman because it became necessary to vault over an oblong space with pointed arches instead of a square space with round arches. The French Gothic system of thrust and balance, inspired by the same emotional activity it arouses, was as far removed as possible from the weighted system of the Greek lintel, which is the essence of a perfect and impersonal serenity. Dr. Lund is even more misguided in his theory that Greece handed on any architectural ideas of any sort to those who made the plans for Chartres or Amiens. Even in Provence, where Hellenistic buildings as beautiful as any in Italy were before the eyes of the cathedral builders, the architects of St. Gilles or St. Trophime and the rest took nothing structural or mathematical, priestly or otherwise, from the Greek temples, theatres and monuments at their very gates. These ancient buildings, in most cases, still exist, and I recommend Dr. Lund to compare them with the Parthenon and to satisfy himself that even if the Provençal Hellenists were still able to reproduce something of the spirit of the great designs of classical antiquity, they handed on nothing to the cathedral builders of a later date on the same soil.

Not only have we the Provençal churches to set against Dr. Lund's assertion that Gothic builders took their formulas from the ancient Greeks. There is a manuscript of thirty-three leaves in the Bibliothèque Nationale in Paris (*S. G. Latin*, I., 104) which came from the Abbey of St. Germain des Près. It was written and profusely illustrated by Wilars de Honecourt, who was making sketches for his design of Cambrai Cathedral in 1243, and visited Rheims for that purpose. He had also travelled to Laon, Chartres, Meaux, and as far as Hungary. Few architects of his time can have seen so much, and few would be more likely to tell us about any classical Greek secrets which might be of use to Gothic builders. There have been various editions in French of his work; but the best in English is that by Robert Willis, published by J. H. and J. Parker, London, 1859, which embodies the comments of the famous French architect J. B. A. Lassus.

Wilars de Honecourt belonged to the great school of art of the period of Philip Augustus, when the Gothic system was brought to its highest perfection; and I know of no other similar record of that system which has survived from the hand of any other contemporary architect. He devotes three whole plates to masonry and practical geometry (viz., pp. 38, 39, and 40, with portions of pp. 29 and 62). He actually gives a rough mode of laying down a square and a pentagon, and if Dr. Lund will kindly examine these he will find nothing classical (or even mathematically exact) about them. The excellent Wilars, in fact, reveals no 'secrets,' Greek or otherwise. He transforms both Nature and architecture into the styles familiar to himself, after the manner of most artists before the nineteenth century who attempted to delineate matters much older than their memories. Not only did he 'draw' buildings after the fashion in which he desired to make use of them in new designs of his own, but he evidently did not enjoy sufficient skill or knowledge to draw any building so that it could be exactly reproduced in masonry from his details after its effect upon his eyes and heart had been forgotten. Yet if there was anybody who would have been likely to give a hint of Dr. Lund's mysteries, it was Wilars. He is as silent as his unknown comrades. There was nothing of the kind for them to say. For there is no short cut to the beautiful, no formula for the creation of the perfect. Developments progress as natural needs and the growth of civilisation make their call, and upon those developments the man of genius frames his own expression of the fittest for the life he knows.

Again and again the search for the subtle and elusive causes of beauty has been taken up. Men so different as Hume, Bernouilli, Burke, Winckelmann, Hogarth, have been attracted by it. But when the scientific investigator (if I may flatter Mr. Hambidge and Dr. Lund with that epithet) attempts to express beauty in terms of measurement, he is only brought to the same stopping-place as that which faces him when he tries to define a living thing in terms of mathematics. In both there comes a point at which his knowledge of the involved factors ceases. There is a transformation of energy involved by the operations of the brain and will, which is beyond all formulas. The baffling factor in organic objects is their life. The baffling factor in masterpieces of creative art is their beauty—a quality which depends no more than growth depends upon mechanical reproduction or exact copying; a quality as essential and intangible as life, and exhibiting all those subtle variations, those individual divergences from type, upon which Charles Darwin largely founded his great interpretation of the origin of species and the survival of the fittest.

'Speak not of exact rules in regard to beauty.' These are indeed difficult matters to express at all, well-nigh impossible to express briefly. But I must add that, of course, it would be just as erroneous to say that divergences from law are the real cause of beauty in art as it would be to assert (with the new Philistines) that the secret of beauty is the exact obedience to simple rules. I hold no such anarchical opinions. I do suggest, however, that our appreciation of a work of art is far more influenced by our recognition of the artist's effort towards some elemental harmony than it is by any assertion of his slavery to some simple formula. For there is a tenderness, deep-rooted in our common humanity, which sympathetically accepts those variations from rule and measure that are, in fact, the personal traces of the artist's individual struggle for perfection. It is the hot chase that matters, not the dying quarry nor the coldness of achieved reward.

If we could see again the hand of Giotto sweeping round the canvas, we should realise that he just missed the perfect circle because he was a man, as we are, and not a pair of compasses, and by the delicacy of his divergence we should measure and applaud the greatness of his skill.

Even if you were to join the happy band now led by Dr. Lund, and were to elevate the Golden Section into the majesty of a natural law, you would get no further. For such a law only expresses and sums up what is already known; it only crystallises previous knowledge. Its real use is that it enables us to discover the exception, or, if we speak of standards, the divergence. For it is the exception that leads on to new discovery; the exception is the spark, flashing out of the unknown, to light our path to fresh knowledge and to wider heavens.

Exact Science is the result of orderly thought over long periods of time; it provides no justification whatever for the machine-made simulacra of Mr. Hambidge's disciples; and Art, as Plotinus wrote long ago, 'deals with things for ever incapable of definition and that belong to love, beauty, joy, and worship; the shapes, powers, and glory of which are for ever building, unbuilding, and rebuilding, in each man's soul, and in the soul of the whole world.'

There is a wonderful passage in Dante (*Inferno*, IV., 142) where Virgil guides the poet to that noble castle on the verge of hell where dwelt the famous men who were born before the birth of Christ:

> . . . . *Euclide geometra e Tolommeo,*
> *Ippocrate, Avicenna e Galieno,*
> *Averrois, che il gran comento feo.* . . . .

Dante will not tell us of his conversation with these mighty spirits, 'whereof it is seemly to say naught.' Let me suggest that Mr. Hambidge and Dr. Lund would be well advised to remember the great Italian's modesty.

THEODORE A. COOK.

THE SOUL'S DISPENSARY, LONDON

It is recorded by Diodorus Siculus in his *Historical Library in Fifteen Books* that when the great city known to the Greeks as Thebes and to the Egyptians as the City of the Sun was at the height of its glory it contained, among other buildings of like magnificence, a library above whose portal ran the inscription 'The Soul's Dispensary,' a title which has been alternatively rendered 'The Medicine of the Mind.' In this library were images of all the gods of Egypt, and also that of King Simandius or Ozymandius (whom Shelley's fine sonnet has rescued from oblivion), in act to offer oblations to the assembled deities, 'shewing that Osiris and his successors had contributed very much to the instruction of the people.' That antique storehouse of knowledge no longer garners the works of theology and philosophy on which the early Thebans so highly vaunted themselves, but the name bestowed upon it is worthy of remembrance.

Throughout the darkest ages of the world's history the dispensaries of learning have increased and prospered, and in spite of fire and sword, bigotry and despotism, have treasured up refreshment and solace for the Soul of Man.

The kingdom of Assyria fell, but thousands of the inscribed tablets which formed the Library of Assurbanipal are preserved in the British Museum and the Louvre; the papyri of ancient Egypt have survived the last of the Ptolemies; the Christian monasteries, dating from the most troubled periods of European history and beset by every species of violence, have bequeathed to us a precious literary inheritance. Throwing a rapid glance across the ages that separate us from the greatness of Babylon and Egypt, the question arises, 'Of what value to the mass of mankind were the libraries of antiquity?' And, to pursue the inquiry to its logical conclusion, 'To what extent has the process of time widened the originally restricted area of literary activity and rendered the library of to-day an essential factor in modern civilisation?' To supply an adequate answer to these questions would entail the labour of a lifetime. It would appear, from the statements of classic authorities, that the famous libraries of