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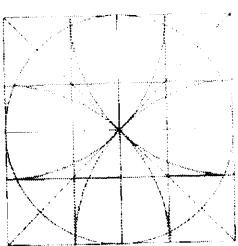
Ch 15: The golden section versus
the secret cut p 57-87

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Ch 22: Ancient geometry and
modern times p 241-252

Ancient Geometry

- AND ITS USE



VOLUME II

RHODOS

INTERNATIONAL SCIENCE PUBLISHERS, COPENHAGEN

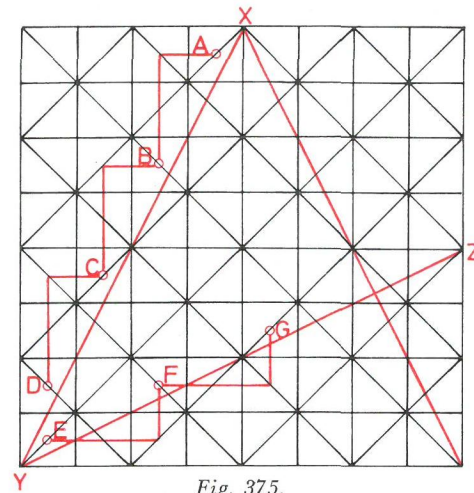


Fig. 375.

From the point of view of ancient geometry the movement of this piece is quite remarkable as it follows neither the visible nor the invisible lines we have hitherto discussed in connection with our chess investigation.

The movement of the knight is, from any given square, to move one to the side and two forward *or* two to the side and one forward *or* two forward and one to the side. And this rather interesting manoeuvre is based on the fact that the initial (given) square and the final square in which the knight comes to rest lie on the line or parallel lines of the acute-angled triangle in the main square.

We see this in Fig. 375 in which we have the chessboard complete with triangulation and squares—and in red the acute-angled triangles.

If to illustrate the geometric connection we place the knight at point A (the square normally occupied by a queen or king),

we see clearly that with a combination of one-side-two-forward the piece lands at point B. In other words in terms of direction from A to B it follows the side (xy) of the acute-angled triangle. And so on from B to C and C to D.

In moving back along the same line the knight makes use of another of its moves, two forward and one to the side. The third possibility, two-side-one-forward, follows the side (yz) of the transverse triangle: from point E to F and to G.

Thus the acute-angled triangle has covered all three possible combinations open to the knight.

When the complete set of 2×16 pieces is arranged in playing order on the board the knight is not directly connected with the acute-angled triangle. But two of its possible three moves bring it in direct contact with either xy or yz.

Although the knight is restricted in its movement to this 2-1 or 1-2 combination, it does not mean that it must at all times stay in immediate contact with the lines of the acute-angled triangle. The latter is not after all visible on the board. With the three possibilities at its disposal the knight is then "free" to roam the board.

The special characteristics of this chess-piece in my opinion place the game of chess securely within the speculative sphere of ancient geometry. With the other factors already discussed, it is extremely likely that chess originated in the ranks of initiated Temple brethren whence—like other cultural bricks used to build up society—it was passed through the veil of mystery, voluntarily or otherwise, into the hands of the people.

Ancient Geometry and Modern Times

WE HAVE followed a trail in the past two volumes, through history, on the track of ancient geometry and its use in a number of spheres from Early Egyptian art and architecture to a period that lies about 500 years before our own time.

The philosophical, mathematical and purely practical knowledge contained in the principles of ancient geometry, we saw, was kept a virtually unbroken secret by the Temple and later the Church as part of their esoteric wisdom. This secret was maintained despite the fact that the religious ideals of the respective civilisations underwent change, and that they presumably differed from nation to nation.

The application of the principles of this secret geometry left an unmistakable mark (for those able to interpret it) on the cultural development of early times up almost as far as our era. Having gathered some knowledge of the system's principles and their influence, one inevitably ponders on whether traces of the old science exist today.

Yes, certain aspects of ancient geometry are put to work even in our own time. At the time of writing I have been able to discern two spheres in which ancient geometry can be seen. One of these is in an essentially practical form, used every single day in drawing offices, typists' pools, engineering workshops, architects'

premises, and in most homes in Europe.

It is the means of measuring and dividing paper in sizes known as the A-format: A-2, A-3, A-4, etc. These pages measure width to length in the ratio $1:\sqrt{2}$. And this means that they involve the sacred cut!

The other sphere in which we can find traces not of ancient geometry itself in practical use but of the ritual aspect similar to that which existed in the ancient orders of builders, with whom we have made a passing acquaintance throughout this book, is the worldwide movement of Freemasonry. As far as I have been able to trace it originated in the old orders or clans of builders.

The A-format

ONE OF the most precious concepts valued by the ancient geometer was, as we have seen, the sacred cut. Its significance was immense within both geometry and construction.

It is thus at the same time amusing and remarkable to record that the sacred cut is applied to dimensions of paper today without anyone previously having connected it with ancient times. On the contrary, the paper sizes we know as A-3, A-4, etc., are regarded very much as a modern innovation, a rational action on the part of 20th century experts.

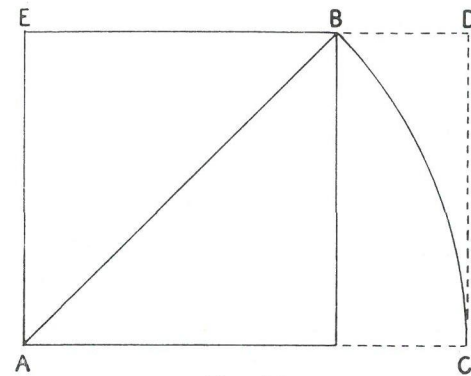


Fig. 376.

To say that the sides of the A-format page are in the ratio $1:\sqrt{2}$ tells the non-mathematician little about the shape of the page—if he is not already acquainted with it. (Although the A-format is in widespread use throughout the mainland of Europe, many British and American readers may not be familiar with it. It is only in the past year or two that there has been mention of introducing these standard sizes in Britain.)

To deepen our understanding of what is meant in effect by the A-format, we should perhaps translate the modern term into the language of ancient geometry.

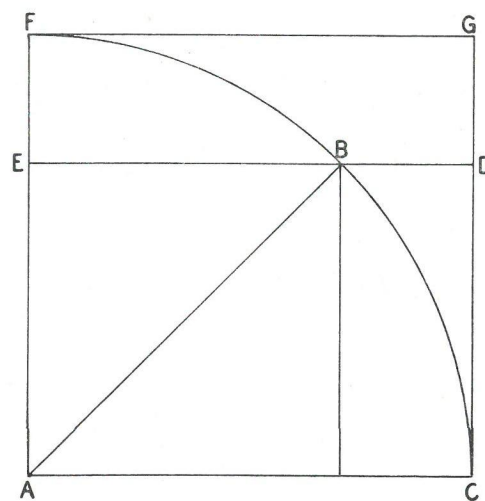


Fig. 377.

If we have a square, each of the sides of which measures 1 unit in length, the diagonal of that square measures $\sqrt{2}$.

In Fig. 376 we see the said square. The diagonal is AB.

The diagonal is laid out along the baseline to AC, permitting us to construct rectangle ACDE. The long side is AC, the short side is AE. This rectangle has thus the proportions of the A-format.

But we do not see the sacred cut until we enlarge the diagram by constructing the small square's double-size version. We see this in Fig. 377 in which the arc CB is extended to point F, after which the double-size version can be entered.

We see that line ED is the upper horizontal sacred cut in square FGCA.

The A-format is not one particular size. It is a ratio, represented by five basic sizes, each twice (or half) the size of its neighbour.

If we imagine that the construction in the preceding figure represents the smallest of the sizes, A-5, in rectangle ACDE, we move in the next illustration one size up to format A-4: Fig. 378.

Here, with radius AG, we have constructed another square, AKLJ, the upper horizontal sacred cut in which is FH. Thus format A-4 is the rectangle contained by the latter sacred cut, rectangle FHJA.

This is the same geometric construction as we discussed earlier in Fig. 40, with three squares inside each other. It is also the same figure as mentioned by Plato in his account of Timaeus's speech.

When we examine the diagram we find that the long side of the smallest format is identical in length to the short side of the next size. Thus we turn A-5 through 90° it fills exactly half of a sheet of A-4 format.

In Fig. 379 we have the four most commonly used sizes of the A-format series. The largest is A-1, the next A-2 and so

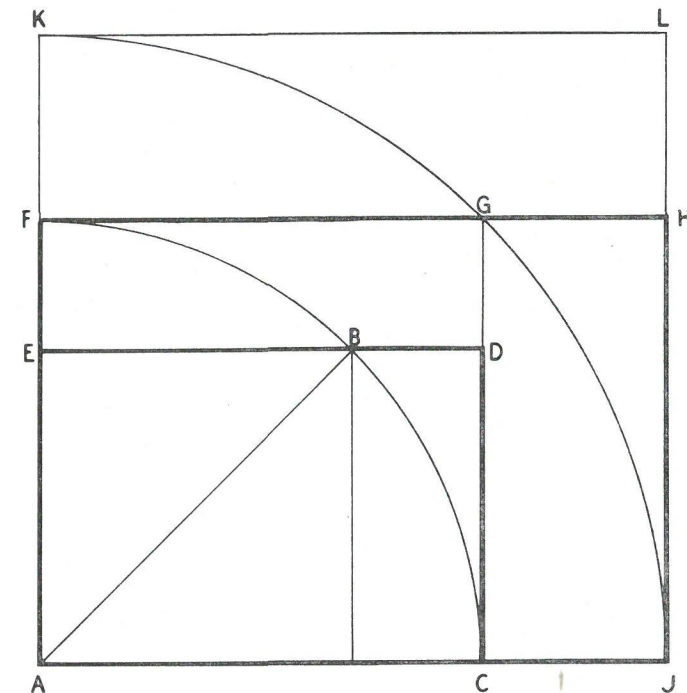


Fig. 378.

on. Thus we can have two sheets of A-4 from one of A-3, etc.

This series of page formats is extremely rational and economical in use. It has brought simplicity and good order to every stockist of paper who has practised the system. If he has a stock, for example of A-1 sheets, he is able quickly and without any waste whatsoever to cut a supply of any of the other sizes—an important factor in the busy printing industry of today.

The sizes allotted to the ratio must depend on whichever figures are accepted by a society.

This was, we saw, also true of the system of Egyptian capacity and area measure. It was a system of division and subdivision. We proved that we were able to work with the system without knowing the length or capacity of the approved standard unit.

So with the A-format. We need not

know the sizes in order to lay down the proportions, but for the record the respective sizes in use in Europe are as follows:

A-1	=	840 × 594 mm
A-2	=	594 × 420 mm
A-3	=	420 × 297 mm
A-4	=	297 × 210 mm
A-5	=	210 × 148.5 mm

Research into the history of the A-format leads to a misty wilderness.

It is possible to discover when a number of European countries began popular use of the format, but it is difficult to find out just where the format originally started—or what unit of measure was used to plan the series.

Today the A-format is mentioned usually in the same breath as the metric system of measure. But if the assumption that the two are associated is examined intensively, it is impossible (or rather I have found

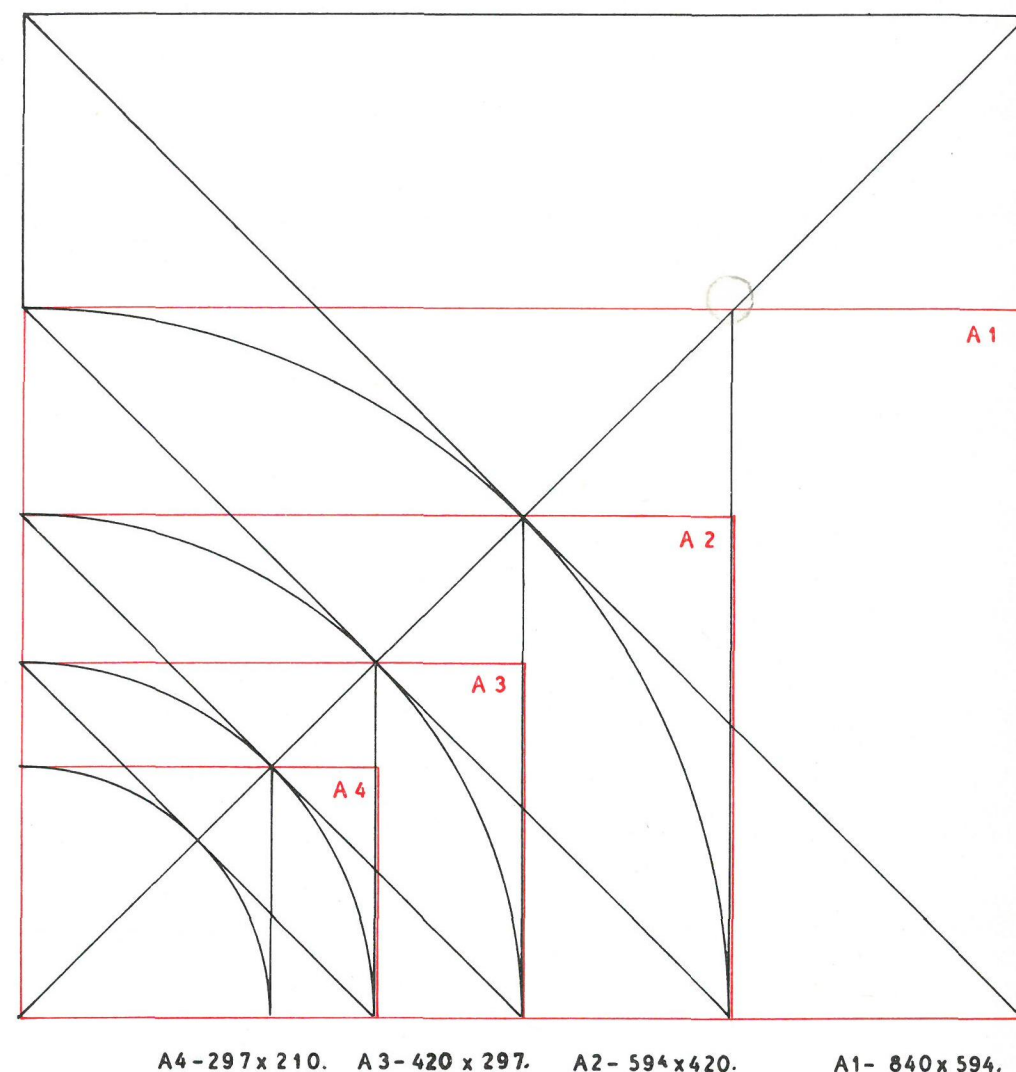


Fig. 379.

it impossible) to see what the connection really is.

In a special issue of the industrial publication *Industriidningen Norden*, dated 1948, one reads that as early as 1790 the A-format was in use in France, with pages being halved to provide the next smaller size. But it is not indicated whether the principle was an old one at that time.

The system is, as we have seen, based on

the division of a series of squares placed within each other. If we assume that it existed in the paper or printing industry prior to the introduction of the metric system, one of the squares—perhaps the smallest—had to be selected as the basic square.

If this was made to measure a *Roman foot* along each side, we would discover that this fitted exactly the present size of

the A-4 format since one side of the A-4 measures 297 mm, which equals the old standard Roman foot.

According to Carl Herning's *Ready Reference Tables*, New York, 1914, the old standard French foot measured approx. 325 mm—considerably more than the Roman measure.

Prior to 1750 France, like many other European countries had a number of different lengths for the unit "foot", including the Roman.

The French Church, and its subsidiaries, was very much under the influence of the Catholic citadel in Rome, and it is highly probable that the Church printing houses, under the same influence, operated with the Roman foot instead of a local version.

Indeed it is also possible that the French Church printers actually took over the system of dividing paper into the formats discussed above *direct from Rome*, which of course boasted printing facilities at a much earlier stage than France.

If this (the Roman foot) was applied as the unit of measure from the beginning, we can better understand the irregular dimensions of which the system consists.

When the decimal system with its meters and centimeters was introduced in France it was highly inconvenient to alter the paper formats since printing machinery, paper guillotines, and the printer's other tools and machinery were based on the already accepted sizes. Instead therefore of altering the paper sizes to "round" figures in the metric system, it was decided to express the old Roman foot dimensions in the appropriate number of millimeters and to retain the sizes unaltered.

As the previous chapters have shown, the system of sub-division itself is really ancient.

It is thus, as stated, entirely within the

limits of credibility that both the system of division and the unit of measure were imported at some early stage in France's printing history direct from Rome. Use of the format system and sizes spread from Church printing houses to other printers in France, until it became the established means of dividing and measuring paper.

From France the sizes and system gradually worked their way throughout the rest of Europe, each country accepting in turn the sizes in question on account of their rational proportions.

The rational part about the A-format of paper is not the actual size of the individual sheet but the system of division which produced the proportions.

The system was superior to all other sizes and shapes of paper, and—in any event in Europe—slowly ousted all competitors.

Thus a tiny aspect of ancient geometry found its way unobserved into our everyday life and filled a practical role—without anyone thinking of the concept's extremely significant history.

Freemasonry

FROM THE beginning of time, knowledge was assembled by Society's witch-doctors, medicine men, priests, Temple and Church. It was from these, Temple and Church, that learning and education stemmed.

There were no other centres of knowledge to which one could turn for learning. The Temple was the centre of all power.

Books have been written in our own time, based on historical and archaeological reports, of how the Temple, for example, in Egypt had various scientific branches the initiated brethren could frequent at the end of their obligatory seven-year training. We learn that the Temple built up an efficient system of medical research and team of doctors.

Medical instruments of excellent quality have been recovered from excavations in Egypt, surgical instruments, for instance, that had been employed for trepanation operations on the brain. These instruments have actually been tested by modern surgeons—and found perfect for the purpose.

From these literary sources therefore we can see that the Temple nourished, apart from ancient geometry, other scientific fields which developed and improved slowly with time, practice and application.

It is easy to visualise the picture of training in ancient Egypt. All brethren admitted to the Temple underwent a common training for a period of seven years. At the end of that period they split into different groups, each to receive a specialised further education.

Pythagoras was the first person history records as having broken with the ancient tradition. He opened a school in Greece around 600 B.C. at which he had only a form of preparatory school, followed by a more advanced study of statesmanship, philosophy and geometry.

Pythagoras educated ordinary men, with no Temple initiation, there being however a form of selection by the school of desirable and undesirable pupils at the end of a trial period.

The school was a tremendous success, but met resistance from the class of population who regarded it as a breach of etiquette and tradition.

A long time was to pass though before non-Temple schools became a common sight in civilisations of Europe and the East. The tendency had however started. Perhaps it was further inspired by the followers of Pythagoras, who opened "underground" schools in countries surrounding Greece after the banishment of their old master.

Development proceeded until the stage

when, in the early Middle Ages, the Church's powerful monastic orders assumed charge of education and professional training.

One or two monasteries distinguished themselves from others in their order by specialising in particular subjects or professions, a condition of admittance being that students had undergone the basic education available in the lower-rated monastic prep school, including reading and writing.

This was one of the first signs of the structure we recognise today, in which primary and junior schools are one part of education, and senior and more advanced schools a quite distinct and different part.

As a result of this developing tendency individual monasteries took on specialist arts and sciences and gradually excluded all others from their curriculum. In this way the subjects to which they devoted their attention were cultivated intensively—and benefited as a result. But the monasteries, educationally, drifted further and further from each other, as did the one-time linked sciences.

As regards the study of ancient geometry, it was irrevocably bound up with building and architecture, which as a subject had also been developed separately and been made the private province of one or two monastic orders, perhaps the science with the largest following of them all.

Historical literature informs us that as late as 1260 it was known that in Europe the massive building clans were amalgamations of specialist monasteries with headquarters in Cologne, Vienna, Berne and Magdeburg. These main centres established "branch offices" in other areas of Europe, and monasteries throughout the continent were linked (figuratively!) by a bridge of bricks. One of the leaders of this wieldy building union was Meister

Gerard, mentioned in an earlier chapter on the planning of Cologne Cathedral.

The principal centres named above were presumably the training quarters, while the various local monasteries were directly implicated either in the actual building process or in the production of materials such as bricks, etc.

From southern and central Europe the building clans spread their influence north and west where, for example, in England a strong branch of the organisation was founded, and erected many beautiful edifices.

Simultaneously with this evolution of the monastic building section, there was a second development within several of the other scientific spheres: a gradually increasing number of trainees were breaking away from the influence and hold of the Church in order to practise on their own account. Training was switching from the Church to private institutions, the breakaways spread the word that the Church no longer had a monopoly on the building site.

Maybe the development erupted when a collection of fresh theories and experiences burst upon the individual branches of science. The old, traditional centres of training (churches and monasteries) refused to acknowledge the innovations—because they contradicted tradition.

An atmosphere of tension and strife set in between the established and the radical schools of thought, to be released only when the "new thinkers" broke with convention and began independent work.

In form the development probably began on a modest scale, with only one or two rebels refusing to accept the established training and to conform to traditional rules. But it eventually reached the stage where the State or Society saw fit to take over the new range of schools that arose.

As discussed earlier, a development of

this kind is more likely and easier to effect in a purely philosophic sphere, or with subjects in which the individual is complete within himself, such as medicine.

But if the training is part of a larger picture, in which the individual is a cog in a wheel, the breakaway is more difficult. To obtain sufficient teachers for a school in the latter subject, one person would have to break off simultaneously from each of the many phases of learning.

For this reason the Church's building industry enjoyed a longer lifetime than the other scientific subjects.

But time eventually caught up with the monastic building clans, too, for needs arose in Society which could not be met directly by the Church.

Harbours and ports were required, roads had to be built, more and more houses and homes were needed for ordinary people, and warehouses had to be constructed to store the increasing quantities of merchandise that changed hands and travelled by land and sea.

And the old Church and monastic orders of builders simply could not stand the pace. At some point in time the same happened within the building industry as in other branches of science—more and more initiated brethren broke off from the main tree and set up independent workshops to cater for the new requirements, while the old orders continued to devote themselves to the construction and adornment of church buildings.

Denmark's history provides ample illustration of the press to which the old building guilds were subjected.

The country has of course a large number of old parish churches, dating mostly from the period 1100—1200. Church records show that they were in many cases built by tradesmen who came from the south.

The custom was for a church to be

"ordered" by the local congregation—but 10–12 years might pass before a start was made to the work, so busy were the builders. In the intervening years the locals assembled loads of stones and builders to be used in the building so that the bulk of the material was ready when the master builder and his journeymen arrived to begin work—bringing the completed plans with them from their southern base.

A population can perhaps wait 10–12 years for a church, but if it urgently needs a harbour, a road or a warehouse, it can scarcely wait that length of time, which was why development created—naturally—a number of independent contractors to do these more mundane works. There is not the slightest doubt that these contractors had their original roots within the Church's old building organ.

The builders who broke away from the Church's official order took with them all or part of the experiences, knowledge and training offered by the Church. It was not always the best-trained and most able men who started up on their own. But irrespective what stage they had reached in their training, they were bound by an oath of secrecy which allowed them to use their knowledge themselves, but which forbade them to share structural secrets with uninitiated outsiders.

Another factor which perhaps played a part here was that the traditional knowledge, training and ability may not have suited the requirements of the new building projects, since the latter differed so completely from established church-building projects. New methods had to be introduced.

Dissolution of the Church's building orders presumably occurred gradually—maybe even with the blessing of the old orders of brethren, who at first retained a form of control over their former craftsmen colleagues through the principle of secrecy, etc.

The old building orders may have been forced to acknowledge that they could not possibly honour every practical demand made by Society. They therefore stood aside as many of their members went into the "outside" world to take care of the emerging problems of construction—without anyone fully realising the consequences.

The private contractors became within a relatively short time a vital part of the community. In many ways they became superior to the old organisation, and round about the year 1700 had reached such proportions that they drew all the strength out of the Church's traditional building sects.

So many new ideas and theories regarding construction work came into being that special schools had to be set up to train and practise the new skills—just as outside schools had to be established in the other (once purely the domain of the Church) professions such as medicine, the sciences, etc.

The old methods became out of date in many ways, and it was eventually of no practical significance that one could not teach openly the skills and knowledge of the old organisation. They were not forgotten; they were simply left behind by the new skills.

At this time the old building organisation lived in the shadow of the Church. The once-powerful training centres became depopulated. There were no practical problems to be solved. The formerly vigorous organisation was dying a lingering death.

About this time fresh blood was injected in its veins by the brethren of the Scottish and English orders of Church builders. And that inspiration bore fruit which blossoms even in our time.

The impulse that came from Britain was the start of the Freemasonry fraternity which as an order of ethics now spans the

globe with a myriad of international and national branches.

Historical sources record that speculative Freemasonry began in England in 1717 when a number of nobles and other leading citizens combined to start a "grand lodge" as an ethical branch of a practically operating building lodge. Building lodge was the term used to cover "a building organisation made up of craftsmen from various trades".

But the branch grew so rapidly and strongly that it within a short time became the main trunk of the tree, the purely practical building work taking a back seat.

While the lodge existed as a branch of the operative building organisation, one has a picture of dukes and earls together with other leading citizenry mixing freely with craftsmen directly and indirectly since the latter from apprentice to master were of course lodge members. And if we have recorded the picture correctly, the operative members belonged to the main lodge, while the nobility were merely members of a branch organisation.

There is something here that does not ring true of the scene in Britain in 1717.

Britain at that time was split severely into classes and the difference between the upper and lower classes was so great that no personal contact whatever was possible between them. The only common centre or assembly point shared by the whole community was the Church.

The upper class was the nobility, with all its rights and privileges. Only the higher ranks of churchmen stood on the same level as the nobles.

Under the nobility came the officer class which directly stemmed from the nobles. It cost a considerable sum of money to purchase a commission, and it was generally only sons of the aristocracy who could afford the necessary cash.

The next rung of the ladder was occu-

pied by the gentry and landowners who could not quite claim sufficient blue blood to call themselves nobility. The next group was made up of merchants and traders who had succeeded in assembling fortunes on the strength of their commercial ability. This group included the country's bankers, money-lenders, etc.

The richest of these were accepted—but only just—by the nobility on account of their cash. They were regarded as upstarts who might well take a tumble if the market changed form.

Lesser merchants, and the so-called middle class were a necessary evil to be tolerated and used but not to be encouraged. While purely working class people were allowed to exist—if they could.

Britain was perhaps the most class-conscious society the world has seen (some claim the position has changed little even today) and every class was looked down upon and held down by the one above. Each had its own points of assembly, clubs, houses, areas, etc., and it was simply inconceivable that a person from a lower class should frequent one's own private club or eating house.

With this set-up in mind it is unthinkable that the top buds of society should suddenly plunge down among the masses of the lower class and start a club, society or lodge in connection with something as vulgar as the building industry. It is equally unbelievable that the upper class should without warning begin frequenting the circles of ordinary craftsmen. It would be such a break with tradition as to be doomed from the start to failure.

What is much more likely is that the equals of the nobility, i.e. the Church's leaders, had their entire building organisation lying dormant with few practical projects left to be completed.

Within this organisation, dating from the infinitely distant past, was a ritual which started with the admission of the

apprentice, a ritual which altered in forms as the apprentice progressed upwards through the various degrees and became a master himself.

There were—as in the civil population—extreme differences in “class” between the apprentice and the supreme master, who was frequently the head of the Church. The difference approached that between the ordinary worker and the king. But despite the distance from bottom to top, the spirit within the building organisation was rather more democratic than it was outside.

In spite of the different degrees of importance and training everyone within the organisation, from uppermost leader to the youngest apprentice, worked toward the same end: creation of beautiful buildings. And the holders of the respective degrees taught those of lesser degrees in order to improve their position and status. In theory anyone could achieve the highest degree of learning.

In daily operations holders of the respective degrees had their own meeting premises, so that there would always be a physical difference between the upper and lower degrees. The organisation had probably erected special buildings for the purpose of meeting.

It would be natural for the organisation to have such buildings and to observe a certain amount of ritual for we must not forget their original purpose: to erect churches. When we regard the ornamentation of old church buildings, both from a structural and detail point of view, then we must assume that the masters responsible for the work also knew how to apply their ability and knowledge to ornamentation when it was required as part of their own private rites.

An inspired group of Church leaders, left with the relatively empty shell of the building brotherhood recognised the social need for an organisation which—without

preference to any particular class—could try to wipe out some of Society’s inequalities. At the same time they realised that such an organisation had to include representatives of the ruling classes since without the co-operation of these the plan might collapse.

Thus the entire order of building brethren was reorganised; large sections of the strictly practical side of the traditional ritual were nevertheless retained since the founders were aware that where a thing might once have been of practical significance it could now take on a symbolic and ethical meaning.

The principle of secrecy was directly transferred to the new organisation—which was to become known as Freemasonry—and is still an integral part of the movement today.

Action of this kind on the part of the Church’s top brains could not be ignored, and a large part of the nobility joined in the plan, which gave them an opportunity to lend a strictly anonymous helping hand where required. The organisation gained considerably in size and popularity throughout the length and breadth of Britain.

Outside the island’s shores, presumably with the assistance of religious colleagues abroad, the movement and its principles were acknowledged and introduced in the same manner as in Britain. Within half a century of the foundation of the Grand Lodge in London, Freemasonry had spread not only to the European continent but also to America and Asia. Freemasonry was able to step into the shoes of the established but empty building brotherhood, and thus spread amazingly quickly until 250 years later it forms a network all over the world.

It is difficult to say whether the inspiration that began in Britain was completely spontaneous, or whether it was modelled on or prompted by even older

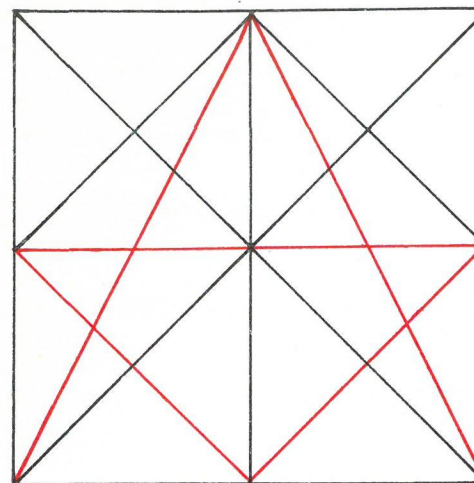


Fig. 380.

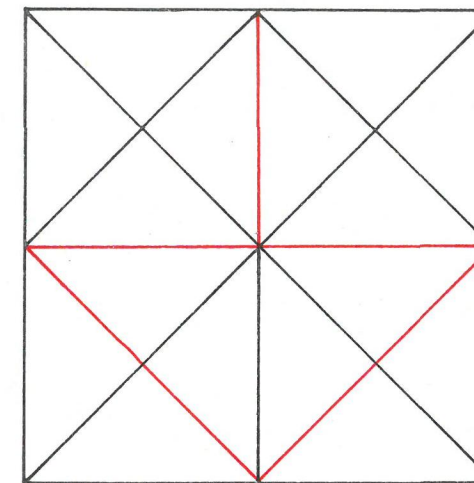


Fig. 381.

orders of knighthood, etc. It was a fact however that the form to which the building brotherhood was converted in Britain suited exactly the period, and is presumably why the new order has developed to a greater degree than other similar, though older, movements.

I think there can be little doubt that the founders of Freemasonry stemmed from within the Church, since they were the only group able to set up such a mixed organisation, cutting successfully through the ties and entanglement of class distinction.

Many things within the Freemasons’ lodge demonstrate that the founders were familiar with the rules of ancient geometry. Of the outer signs of the movement, I can mention the square and compasses. This symbol has been selected from one of the well-known geometric diagrams appearing throughout the past chapters: the square, its half-size version and the acute-angled triangle.

The diagram and symbol are shown in Fig. 380.

Another typical symbol of Freemasonry is the tiny bricklayer’s trowel. It too is taken from the same symbol, but without

use of the acute-angled triangle: Fig. 381.

Thus we see that the outer symbols of Freemasonry fit the same diagrams as we have earlier discovered in many cultural domains throughout these two volumes.

I personally have no doubt that the origin of the movement lay in the roots of the old building fraternity, which can be traced directly back to a period of history and civilisation many thousands of years before our time.

Within the Freemasons’ lodge and its work there are innumerable signs and examples of this link.

But this is not a matter into which I may go very deeply; the oath of secrecy that bound my predecessors applies also to me.

★

This book has followed a development which to our minds stretched over an infinitely long period, and we have examined such widely differing subjects as the pyramids of Gizeh and the beginning of a written language centuries later in Scandinavia.

We have also looked at the attempts of primitive Man to keep a check on the

days of the year, and have seen the impressive art of Greece. Our study has included the shape of vases, the design of temples, and the origin of Freemasonry.

It may surprise the reader that so many spheres can be covered and discussed on the basis of what I have termed ancient geometry, but it is not really surprising when one fully appreciates the connecting thread.

Ancient geometry and its many uses are the keys to very many fields in the research of our past.

When one holds the keys it is not difficult to open the different doors and discover what lies behind, but if one has no key, or if one does not understand how it should be used, the doors remain securely sealed, and the curious are obliged to guess what they possibly screen from sight.

This book is intended only as the introduction to an unlimited field of study, an aspect of our history which we are now able to probe from an entirely new point of view.

