

Millenarian Cycles in the Dynamics of the Catholic Church

A Systems Analysis

MARCHETTI-063

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ABSTRACT

In order to apply the quantitative methodology of systems analysis to the Catholic religion, we took the number of saints canonized as a witness to some intensity of faith. Assuming that a religion, seen from a sociological point of view, is a cultural trait, we applied the temporal rules of cultural diffusion to the indicator, the number of saints.

The procedure may seem arbitrary, but the results of the analysis appear very significant. The canonization of saints shows two pulses, highly self-consistent over a thousand years: the first one centered in 340 AD and the second in 1360 AD. Applying the appropriate equation shows that the first pulse started around 500 BC, lending strength to the hypothesis that the Christian doctrine is rooted in the sect of the "Servants of Jahvé." The second one appears to be at its end. We analyze the possibility that science and technology may constitute the third pulse of the Christian *Weltanschauung*, or world view.

Religion assembles and organizes the deepest and stablest set of criteria of choice to interpret the external world and guide personal and social behavior. This *Weltanschauung* is buried deep in the *Es* of a civilization and defines the actuation at incredible levels of detail. The way of wearing a scarf distinguishes at first sight a Christian woman from an Islamic woman. And the difference is not the consequence of the vagaries of evolution. There are precise reasons. As Cardinal König, subtle interpreter of the European East, once said, the great moat between East and West was traced by the Council of Nicea (325 AD). The problem of the consubstantiality between Christ and the Father determined divergent orbits for human aggregations at a continental level, with a consequent hostility and incommunicability at cultural and political levels.

These phenomena have always been of greatest interest to philosophers and historians, and the literature is immense. But as it happens in this kind of study, the objective is a logical-descriptive organization of the facts, without much attention given to the quantities. It is on this last point that we center this analysis. The quantitative tools of systems analysis have revealed unexpected taxonomies in a large number of social and economic phenomena that we have studied to date. The core idea is deceptively simple: man operates individually and collectively on the basis of action paradigms, which are generated at some point in the society and which, if they can overcome the selective

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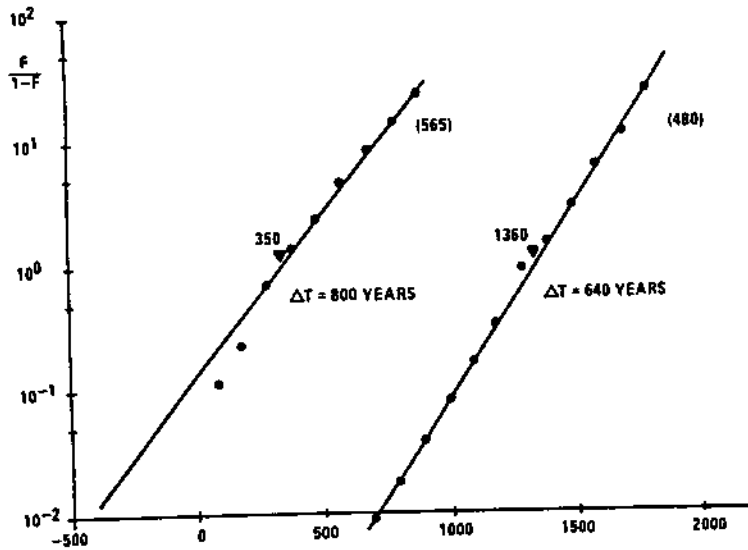


Fig. 1. The basic hypothesis is that religion represents a cultural trait and diffuses, following the paradigm of a cultural diffusion. Saints are taken as a measure for the "temperature" of faith. The canonization of saints (number per 100 years) is an easily measured proxy. To further simplify the procedure, only saints appearing in the Catholic calendar (about 1,000) are considered. The results of the analysis are highly self-consistent and significant. The cumulative number of saints fall into two waves fitted with logistic equations. The first wave is centered at 350 AD (point of maximum canonization of saints). The second wave is centered at 1360 AD. The number of saints appear evenly distributed between the two pulses (565 and 480, respectively).

procedures, diffuse epidemiologically inside it and determine its behavior. The paradigm can be applied to almost everything, from the shape of hats to the subjects that should be studied in the botanic institutes, as the thousands of cases we have studied clearly show.

The analysis is always quantitative and is based on a measure of action, which in the case of scientific research can be reduced to counting publications, just as in a plague epidemic we can count deaths. Such diffusion processes are not instantaneous, but have a temporal dynamic whose taxonomy is usually the subject of our studies. What is needed first is a credible time series measuring some significant parameter of the system under scrutiny.

Epidemic diffusions can be mathematically modeled using logistic equations, independent or interactive, linking our methodology to the Volterra-Lotka equation of the dynamics of ecological systems. Such equations can be fitted on observations covering only a part of the process. This gives us the possibility of forecasting and backcasting, because, as observed in thousands of cases we analyzed, the processes are self-consistent (i.e., they stick to the same equation from beginning to end). External perturbations can produce deviation. But dynamo-static mechanisms will bring the system back into its trajectory.

In the case of the Catholic church the "intensity" of the faith has been measured through the proxy of the number of saints canonized. They are the testimony of the faith. Their number has been counted in blocks of 100 years for the past 2000 years. To simplify the work, instead of digging into the official hagiographies, we chose the saints that are mentioned in the calendar. There are three per day, so the data base is made of about 1000 units. The number is statistically sufficient. There are, however, many possible criticisms. For example, the various periods may not be represented equally, or the tendency to canonize saints may have changed over time. These criticisms are reasonable but very difficult to test. Our strategy was to try. If the results make no sense, one can always try a different data base. However, the results are crisp and make sense. This would be highly improbable if the data base were not representative. Consequently, it is left to the critics to demonstrate their case. The data have been extracted from a Bargellini book on the saints in the calendar [1]. In Fig. 1, the cumulative number of

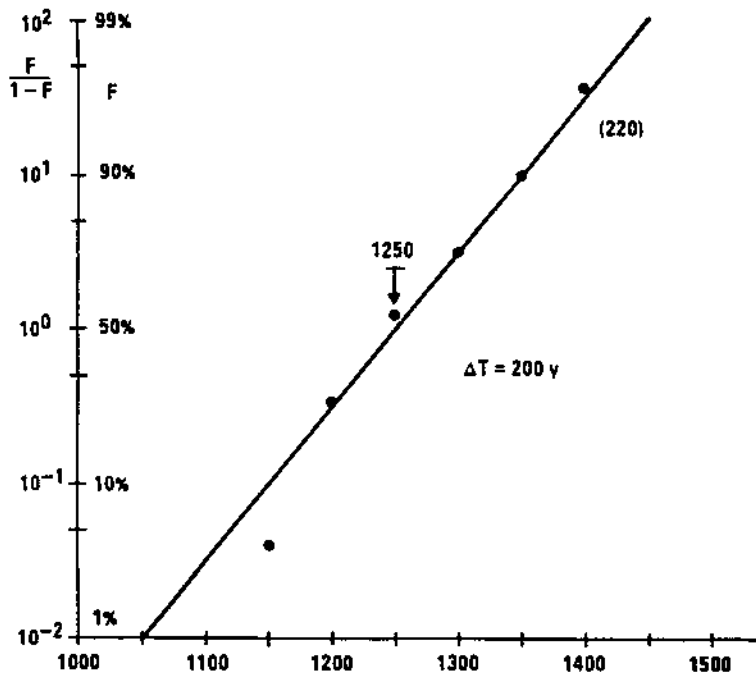


Fig. 2. This example of cultural diffusion refers to the construction of Gothic cathedrals. The chart shows the evolution in time of the cumulative number of construction starts (date of laying the first stone). The solid line represents the fitting equation, a three-parameter logistic. Construction starts were at a maximum around 1250. The whole process spans about 400 years, but 80% of the starts are concentrated in 200 years ($\Delta T = 200$). It is remarkable how such a process remained self-consistent over such a long period of time, with wars, pestilences, and political reorganizations taking place. It seems clear that the mechanisms of the system dominate over historical contingency and Illuministic voluntarism.

The first point is low with respect to the fitting equation, because we did not count some hybrid cathedrals that were part Gothic and part Romanesque.

these saints (in blocks of 100 years, according to their birthdates) is reported in the form of the logistics (Fisher-Pry) transform, resulting in straight lines.

The first unexpected result is that there are two diffusion waves, spaced about 1000 years apart, if we measure their distance in time through their central points (dates of maximum intensity or speed of growth of the cumulative number of saints). The central points are located at 500 AD and 1360 AD. Curiously, the total number of calendar saints (about 1000) splits almost equally between the two waves (565 and 480, respectively). The most striking result, however, is the almost perfect match between the data and the cultural diffusion model represented by the logistic equations. The system is perfectly self-consistent over 1000 years, as if history had not existed around it. Barbarians come and go, kingdoms grow and fade away, along with wars, pestilences, and geographical and technological discoveries: nothing seems to dent the explicit diffusion process. The result is hard to believe because it collides head-on with the current belief in the contingent nature of history. But the case is not isolated. We could present thousands of examples, leading to the same conclusion, but we picked only one, quite in line with the subject: the cultural wave of construction of Gothic cathedrals (Fig. 2). A study of cathedrals has an advantage from a data base point of view: it is difficult to miss one and the dates of the first stone in place, which we use as a parameter, are well documented in most cases. The fitting of the data with the very simple equation of a cultural diffusion is remarkable. Only the first point is a little out of line, but this is because we did not count the first cathedrals which are part Gothic and part Romanesque.

Reassured about the long-term stability of these secular processes, let us return to the study on saints. Just to have a reference name, we called the first impulse Patristic and the second one Tomistic, even if Saint Thomas of Aquinas was an effect more than a cause, having been active near the center of the impulse. An impulse can be described by a single equation that can be fitted using only a slice of the time series of data. In

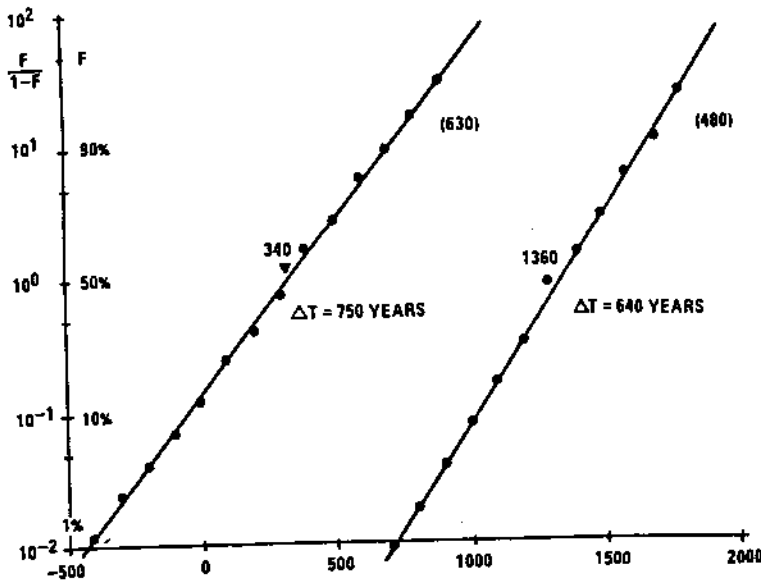


Fig. 3. Because the whole process is so self-consistent, we can fit the logistic equation over part of the data and project it forward and backward. We have done this for the first pulse, which appeared irregular at the beginning (we had to add 65 "virtual saints" that mathematical self-consistency required to be produced in the period preceding the year 0).

Now that self-consistency has been restored, we see that the start of the first pulse of Christianity should be moved to about 500 BC, formally linking the Christian doctrine to that of some Jewish sects, presumably the Servants of Jahvé.

the same sense the parabola describing the whole trajectory of a projectile can be extracted from a segment of it. In other words, we can use the data, for example, between 200 AD and 700 AD to fix the fitting equation and then project it backward. The meaning of this backward projection comes from the fact that these processes of cultural diffusion are self-consistent from the beginning to the end, as stated earlier.

The result of this exercise is given in Fig. 3. It shows that for self-consistency the beginning of the first impulse should be brought back to about 500 BC. The subjacent hypothesis may appear revolutionary, the Christian movement being born 500 years before Christ. But the idea is not foreign to students of the history of religions who have tried to connect Christian Weltanschauung to the Jewish sects of the Essenes or of the Servants of Jahvé. Because the Essenes did not yet exist 500 years before Christ, the analysis brings another argument to the second thesis.

Systems analysis provides a curious way of looking at history, by introducing a design that exauthorizes the contingent with the accidents and the striving will, which are linked to the real driving force of the world according to the Illuministic hypothesis that encompasses the current interpretations. In other words, the mechanisms seem to dominate accidents and free will.

We can now look at the second part of the analysis in Fig. 3 (or Fig. 1) and observe that the second pulse is practically finished, having reached 98% of its saturation value. The equation has been fitted over a period of 1000 years and surges of sanctification, as in recent years, cannot modify it. If we interpret the pulse as mirroring the history of the Catholic church as an institution, then it is at the end. Clearly, with these time scales, 50 years come and go; but, as Nostradamus seems to have said, the list of future popes seems short. We have tried to identify mechanisms for the downfall of an institution that is still very present and triumphant. Although we have not yet investigated it systematically, the scarcity of vocations might be one. The Catholic clergy seems to be one year older every year, and may rapidly evaporate when old age enters the area of high mortality.

One of the curious results of the analysis is the millenaristic character of the two pulses. Not only are the central points, where the intensity of saint canonization is at a maximum, almost exactly 1000 years apart, but the ends of the pulses (99% of the saturation point) are located at 1000 AD and 2000 AD. Perhaps the millenarists have recognized some signals from the real world. As we enter the next millennium, we may ask ourselves

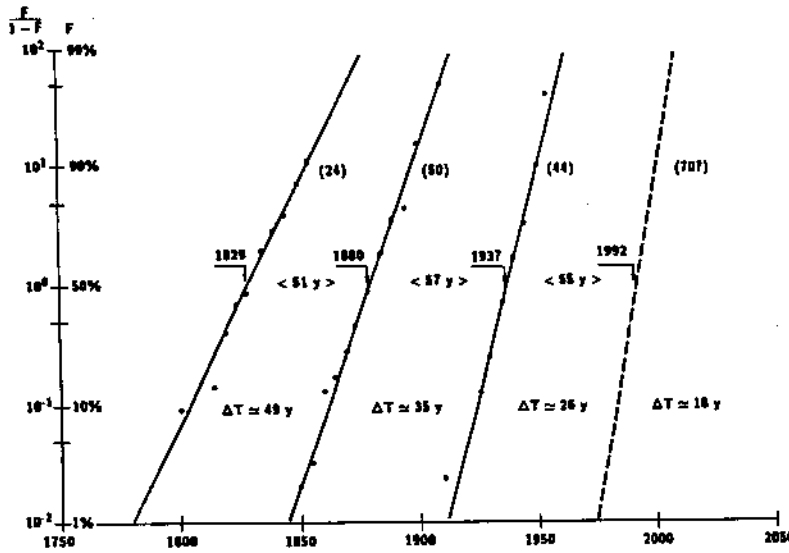


Fig. 4. The fact that the second pulse in Fig. 3 has reached 98% of the saturation level raises the question of whether a Judeo-Christian proxy of the Catholic church will continue in the future. The fact that there are two pulses in time scales of 1000 years each, points to a certain cyclicity of the process; consequently we may try to identify the taxonomy of a third pulse. To provide an example of how these constructions can be made, three historical pulses of basic innovations during the past 200 years are given. The distance between center points and the ratio between successive ΔT tend to stay constant. This is enough to trace the taxonomy of the next wave, centered in 1992, which is now under scrutiny to check the validity of the forecast.

what might happen next. Sequences of pulses are not uncommon. In spite of the concept of open time continuously flowing forward, a magnificent present of Christian theologians to the West, most things move ahead in steps, both short and long. Fig. 4 reports on the case of basic technological innovations as an example. Each line in the figure represents the cumulative number of basic innovation introduced into the world market. The period covers almost two centuries. The center points of the first three pulses, which are analyzed postmortem, have a distance in time of around 55 years (Kondratiev cycle). Their taxonomic regularities permit the construction of a fourth pulse, in which we sit today and which is currently being monitored to verify the forecast (it works!).

Applying the tricks we have learned from other sequences of pulses, we may try to construct a third pulse for the Catholic church. The very simple rules are to keep the distance between the center points constant. The next one, then, would be in $1350 + 1000 = 2350$ AD. The ratio of the time constants ΔT should also be constant. For the first two it is $750:640 = 1.17$. The constant for the third pulse should then be $640:1.17 = 546$, which we round to 550. The pulse so constructed is reported, together with the first two, in Fig. 5.

From these taxonomies, let us attempt some sort of identification of the characteristics of the pulse. Its formal beginning (1% of the final saturation level) is in $2350 - 550 = 1800$ AD. However, at 1% it can already have significant dimensions. The nucleation period, when the basic structures are conceived, will precede that. In the case of the Tomistic pulse, the beginning is located by the historians of religions at the time when Pope Leone I chose Rome as the seat of the papacy. This was in 450 AD, about 250 years before the 1% emersion of the second pulse. If we apply a similar nucleation period to the third pulse, we come to a nucleation period starting some time between 1550 and 1600 AD. This is the period of Leonardo, Galileo, and Newton, when science and technology started liberating themselves from the confines of religion. The medieval historian Lynn White has conducted an in-depth investigation into the religious roots of Western science and technology, with the Franciscan order embracing science and running the

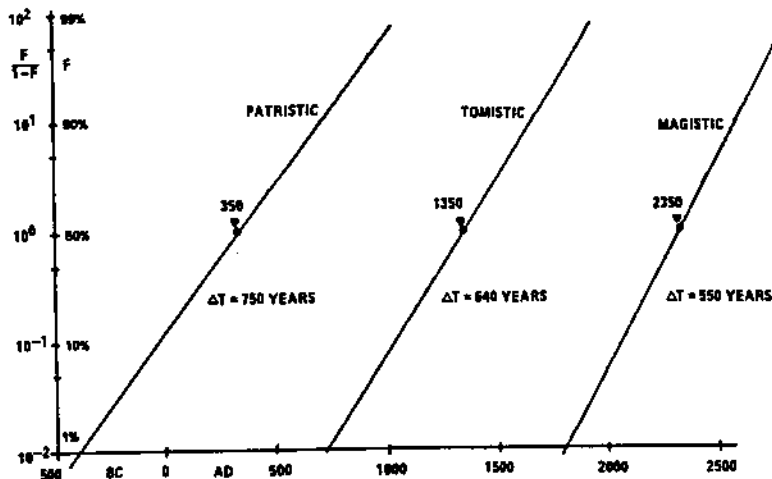


Fig. 5. The two pulses of Fig. 3 are reported and dubbed Patristic and Tomistic, respectively, to identify the dominant Weltanschauung. Following the scheme of Fig. 4 we have constructed the taxonomy of a hypothetical third pulse. This pulse originates in 1800 AD (1% of final value) and will reach maximum speed of growth in 2350 AD. We dubbed it Magistics to adumbrate the art of dominating nature through the knowledge of the laws of nature, without metaphysical intervention. Magistic could identify science and technology as they came from a Christian Catholic matrix at the end of the previous millennium.

universities and the Benedictine order devoted to technology (*Machina ex Deo!*), with documents revealing this bend already in the 8th century.

In the *Utrecht Psalterium*, produced by Benedictine monks around 850 AD, the battle between Good and Evil is represented by two armies, that of the Good led by David. To prepare for battle each party symbolically sharpens a sword. The Bad use the classic whetstone. The Good, instead, use the last cry in the technology of sharpening, first documented in this book: the *grind wheel with a crank* to turn it. Showing this revolutionary technology in the miniature was meant to imply that God gives the machine to the Good in order for them to win. The idea of the machine as an instrument of power had great success in the West for the following millennium.

We would like to give another example with the story of the Benedictine monk named Eilmer, who in the 11th century built a glider and took off from the tower of Malmesbury Abbey; he flew a couple of hundred meters and crashed because, as he acutely observed, he did not have vertical control, having forgotten to build a tail at the rear end (*caudam in posteriore parte*).

The religious role of science was perfectly expressed by Roger Bacon when he said that there are two sources of knowledge of the mind of God, *The Book of Scriptures* and *The Book of Nature*. Each must be searched by the faithful with equal energy. This idea of natural theology was the motivational basis of early science in the modern sense. Every important scientist from about 1250 to about 1650 considered himself also a theologian: Leibniz and Newton are notable examples.

The stress on *The Book of Nature* may have been conceived as a theological weapon to fight the great Cathar heresy, which in the 13th century had expanded on a strip of territory extending from the middle Balkans to the Atlantic over northern Italy and southern France. The Cathar's main doctrine was that the visible universe was the creation of the God of evil. The sanctification of *The Book of Nature* reappropriated the visible universe to the Christian God, the good one all around. Curiously enough, Islam, which was so original and brilliant in science until the 9th and 10th centuries, had deliberately abandoned science in the late 11th century. At that time Christianity picked up the torch and carried it alone.

The laicization of science (and technology), which can be traced back to the Illuministic movement, should not fool anybody. Saint Augustine's *Providence* and the Illuministic

Progress have almost exactly the same descriptors. And in a hundred ways present-day scientists betray cultural traits they took from medieval monachism, including the hostility toward women that is so inbred into the Catholic *Weltanschauung* of the present millennium, and so typical of it. Just as a point of folklore, we can give an example of the American Chemical Society reported by the historian D.F. Noble in his book *A World Without Women: The Clerical Culture of Western Science* [2]. In 1885, which in our time scale is not too long ago, a "misogynist dinner of the American Chemical Society" was organized and concluded with the final recitation of the temptations of St. Antony, where in the spirit of Tertullian a laughing woman with two bright eyes is the "Worst Devil of All." Because so many early practitioners in science belonged to the ascetic Mendicant orders, Western science took root in an exclusively male and celibate homosocial and misogynic culture, centered on the conviction that closeness to God required forsaking the body and living in a world without women. At the end of the 14th century these monkish scientists had developed the substance of the mechanics of motion. Adopting this idea, members of the Royal Society, whether churchmen or not, readily adopted the celibate life. And reading *The Book of Nature* was obviously a search for God. As Newton said after discovering the law of gravitation, this provided mathematical demonstration of God's working in the universe, and, as a sideline, the ultimate weapon in the war against irreligion. This may be interpreted as the quintessence of the scientific revolution. Noble epitomizes the results of his endeavor in the sentence: "However historians might characterize Western science as a secular enterprise, it was always in essence a religious calling, more a continuation than a departure from Christian tradition" [2].

In our opinion, the Illuminist liberation of science and technology from religious constraints finds an analogy in the contrast between father and son, where the son negates the father in order to construct his independent personality. He keeps loving him, however, and inevitably imitates him. That said, if science and technology are so deeply ingrained into the Catholic religion, why not assign them to the next pulse. The datings derived by the taxonomic analysis of the pulse, fit well with the formation period of science, and we do not see any other object acceptable for taking the relay. The hypothesis has various interesting consequences. One is that we are just at the beginning. In 1800 we were at 1% of the development in terms of final saturation levels. Now, 200 years later we are still at a mere 5% level. Multiplying the present stage by a factor of 20, whatever parameter we measure as a proxy, produces an object beyond imagination. But we still have 500 years to bring it to completion.

Who is going to produce all that science? As de Solla Price in his book *Little Science, Big Science* [3] has shown, production of valid results grows as the cubic root of the expenses for research. In other words, producing double costs eight times as much. New nations, where the level of research is still low, may be bargains in terms of specific costs. De Solla Price suggests India or China as an example. But producing scientific innovation is not only a problem of education and funding; it is also a problem of religious *Weltanschauung*. Even cultures that have very efficiently reproduced Western technology (such as Japanese culture) appear very fragile when it comes to creating something fundamentally new. Creation is a daring act against established knowledge and social control, and it requires a support from the deep – that of a religious faith, if embedded in the structures of a culture that is self-declared as a laical one. Will science then remain the "white man's burden"?

If our hypothesis fits the facts, and that is our definition of truth, we are just at the beginning of a great science and technology adventure. We could not resist baptizing it Magistic. After all, the magicians wanted to act on nature using the forces of nature.

Science versus religion and knowledge versus metaphysics appear evolutionary and not contradictory.

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