Abstract

A religion affiliation can be considered as a "degree of freedom" of an agent on the human genre network. A brief review is given on the state of the art in data analysis and modelization of religious "questions" in order to suggest and if possible initiate further research, ... after using a "statistical physics filter". We present a discussion of the evolution of 18 so called religions, as measured through their number of adherents between 1900 and 2000. Some emphasis is made on a few cases presenting a minimum or a maximum in the investigated time range, - thereby suggesting a competitive ingredient to be considered, beside the well accepted "at birth" attachment effect. The importance of the "external field" is still stressed through an Avrami late stage crystal growth-like parameter. The observed features and some intuitive interpretations point to opinion based models with vector, rather than scalar, like agents.
I. PREAMBLE

This paper is based on an invited communication at SigmaPhi-2008, held in Kolymbari, GR. It bears upon previously published work (Europhys. Lett., 77 (2007) 38002) and other materials expectedly to be published. In order to maintain originality requirements much has been rewritten though the analyzed data is exactly the same as that used in, i.e. as taken from Barrett et al. publications. New considerations and figures are introduced, some of them being even posterior to the Kolymbari presentation.

II. INTRODUCTION

Wealth, language, age, sex, ... religion can be considered as degrees of freedom of any agent on the human genre network. In fact, religiosity is one of the most important sociological aspects of human populations. Like languages and wealth, religions evolve and adapt to the society developments.

Several questions can be raised, and have been considered from statistical physics points of view, e.g.

- from a “macroscopic” one: How many religions exist at a given time?
- from a “microscopic” one: How many adherents belong to one religion?
- does the number of adherents increase or not?
- is there a universal law, whence any model for this?
- and why ???

Quantitative answers and mathematical laws have been found or guessed about religious population evolution. It has been found that empirical laws can be deduced and related to preferential attachment processes, like on an evolving network. However different algorithmic models reproduce well the data, implying the need for further considerations. A simple growth equation has been shown to be a plausible one for the growing evolution dynamics in a continuous time framework. The case of decaying religions is a little bit more complicated. On one hand, agent based models can be imagined to describe such non-equilibrium processes; on the other hand more formal evolution equations can be proposed.
The Avrami-Kolmogorov differential equation which usually describes solid state transformations, like crystal growth, was used\textsuperscript{2} in order to obtain the preferential attachment parameter introduced previously\textsuperscript{1}. It is not often found close to unity, though often corresponding to a smooth evolution. However large values suggest the occurrence of extreme cases which we conjecture are controlled by so called external fields. A few cases indicate the likeliness of a detachment process. Some cases seem to indicate the lack of reliability of the data. Two difficulties can be pointed out in the analysis\textsuperscript{2}: (i) the original time of apparition of a religion, (ii) the time of its maximum as measured through the number of adepts or adherents. Both informations are necessary for integrating reliably any evolution equation. However due to the human/sociological information so asked, the questions have no and will remain without a precise answer. Moreover the Avrami evolution equation might be surely improved, in particular, and somewhat obviously, for the decaying religion cases. Finally, the importance of a so called “external field influence” modifying a smooth evolution behaviour has been stressed in several cases\textsuperscript{2}.

No need to say that one could consider several papers as pertaining to the stream we emphasize, whence in some sense we are giving here below the state of the art of the subject at the time of writing without asserting that all published results interesting for a statistical physics approach are included.

As usual one could distinguish between algorithmic models from more mechanistic ones. The former ones are at a more complex level than the latter ones, but these have the pertinence of using a few parameters which can be somewhat better controlled.

- Surely the books\textsuperscript{3,4} and paper\textsuperscript{6} appear rather comprehensive in sorting out the various causes in the “adsorption/desorption” process\textsuperscript{7,8}.

In the same spirit let us mention

- dynamic models of religious conformity and conversion by Shy\textsuperscript{9}

- a coevolution model in the book by Dennett\textsuperscript{10}

- and some counterpart on whether religion is due to an evolutionary adaptation by Dow\textsuperscript{11} who observes that most research reports contain agent based simulations considering religiosity as a mental phenomenon but without a biological process in which
the behaviour is carried by genes. However bio-cultural theories do exist\textsuperscript{11,12}, including connections with economic considerations\textsuperscript{13}.

In the analytical class, i.e. with “evolution equations content”, let us point out

- a population growth-death equation has been conjectured to be plausible for the evolution dynamics in a continuous time framework, i.e. along the lines of the Avrami-Kolmogorov late stage growth equation describing solid state formation\textsuperscript{1,2}.

- previously, but not known to the authors\textsuperscript{1}, Hashemi\textsuperscript{14} has proposed a drift-diffusion model to express the time-evolution of density of sect/congregation size

Notice that from a "basic statistical physics point of view" we have discussed two different freely available data sets on many adherents to religions\textsuperscript{1}. It has been found that empirical laws can be deduced for such a number. Two quite different statistical models were proposed, both reproducing well the data, with the same precision, one being a preferential attachment model (leading to a log-normal distribution), another based on a “time of failure” argument (leading to a Weibull distribution function).

In fact, the tail of the partial distribution function (pdf) of the number of religions having a given number of adherents was previously presented\textsuperscript{15}, though hidden in other considerations, unnoticed by many authors\textsuperscript{1}. At this zero order statistical level the pdf evolution of Jeowah witnesses was examined by Picoli and Mendes\textsuperscript{16} who have fitted the pdf with formulae derived in Tsallis non-extensive statistics.

Among others, a paper published in Physica A should also retain some attention where a discussion on inquisition is seen in a self-organization mode\textsuperscript{17}, - though one could debate whether the case is rather not one pertaining the class of “external field” influences.

Leaving aside models of conversion, i.e competition between religions, arising from theological or economic selection, should be reconsidered with attachment and conversion (thus defection) as done in the case of languages. All this in fine indicates that a Hamiltonian or Langevinian description can be of greater interest for the application of statistical physics ideas and techniques to religious population numerical evolutions than is the case for languages.

The remainder of the paper is organized as follows: in Section II the data bank is briefly discussed, - and criticized, though accepted for further research and subsequent analysis.
along the theoretical and methodological tools used here which we adapt to the considered
time series set. In Section III the crystal growth-like model is briefly recalled. The results
are largely presented and discussed in Section IV under the form of Tables and graphs
for various religions, grouping them according to the apparent behaviour and within some
“philosophical class“. Some discussion and a few concluding remarks are found in Section
V and VI, respectively.

III. DATA BANK. THEORETICAL AND METHODOLOGICAL FRAMEWORK

Let us quote Iannaccone18: Religious data are, on the one hand, limited and unreli-
able. Governments collect few religious statistics and sponsor little religious research; most
religious organizations keep sloppy financial records and overly inclusive membership lists;
and many aspects of religion are inherently difficult to observe. Yet religious data are more
abundant than most academics realize and far more extensive than those pertaining to many
other nonmarket activities and institutions, such as clubs, friendships, recreational activities,
self-help groups, and most social movements.

She also mentions that Institutional records complement self-reported survey data. Nearly
all denominations track their membership, contributions, expenditures, number of congrega-
tions, and number of clergy, and many also keep records on baptisms, conversions, ordina-
tions, missionary activity, and attendance; e.g., see Picoli and Mendes16.

Beginning in 1972, NORCOs General Social Surveys provide (nearly) annual responses
to many more religious ”questions“.

Whence data banks indeed exist. However to remain coherent in our own work, the data so
below analyzed here was taken from the World Christian Trends (WCT) book3. It is fair
to say that this is a remarkable compilation work. The tables give information on the
number of adherents of the world’s main religions and their main denominations: 55 specific
(”large”) religious groups + atheists + nonreligious, plus a set called other religionists made
of 3000 religions so that we have examined 53+2= 55 (truly recognized) religions2. From this
data set one has also information on changes during one century of the number of adherents
of each religion from 1900 till 2000 (information in the data set are given for the following
years 1900, 1970, 1990, 1995 and 2000) - with a forecast for 2025 and 2050.

A critical view of this data has to follow: we have already noticed a break at 107
adherents, in the pdf, indicating in our view an overestimation of adepts/adherents in the most prominent religions, or a lack of distinctions between denominations, for these, - as can be easily understood either in terms of propaganda or politics, or because of the difficulty of surveying such cases precisely. Yet one paradoxical surprise stems in the apparent precision of the data. E.g., in several cases, the data \(^3\) seems to be precise up to the last digit i.e., in mid-2000, there are 1057328093 and 38977 roman catholics and mandeans respectively. In strong contrast there are 7000000 and 1650000 wahhabites and black muslims respectively, numbers which are quite well rounded. Thus a mere reading of the numbers warns about the difficulty of fully trusting the data. Nevertheless the analysis is pursued bearing this \textit{caveat} here below. In the following 18 religion evolutions, as listed in Table I and II will be compared.

IV. RECALL AVRAMI GROWTH MODEL

We can nevertheless recall that history is full of examples of individuals or entire groups of people changing their religion, - for various reasons: following the ”leader”, or ”external pressure”, in face of the martyrdom choice, or ”internal (social or economic) pressure” or so called adaptation under proselytism action. ”Competition” through interactions or under ”external field conditions” exist in many cases. In this way, the number of adherents can evolve drastically due to such various conditions\(^17\). External field conditions are rather more drastic and frequent in the religious domain than in e.g. language history.

We recognize that the definition of a religion\(^20\) or an adherent (or adept) might not be accepted univocally. One might distinguish between adepts and adherents, as well as debate on the ”intensity” of the adhesion or measure the ”importance” of a religion thorough other indicators\(^21\). This ”intensity” of a sociological attitude is a well known problem in sociological studies. It cannot be avoided. However our primary goal is not discuss data acquisition on religious adherence. We will take for granted WCT published data, recognizing that we have as much as other authors, including the data surveyors, some doubt about the exactness and validity of the data.

Nevertheless one can expect to more precisely certify the religious adherence of an agent than e.g. the linguistic one. Indeed one can hardly be multi-religious but one can be a polyglot. Whence the fundamentally relevant variable is taken here below as the number of

6
adherents of a "religion", under "usually accepted" denominations.

Of course one can also switch more easily, i.e. through "conversion" from one religious denomination to another than in language cases. Thus the observation time of a religious state needs very careful attention in surveys. In the same framework, the time axis, it is hard to know precisely when a religion was born. The origin is usually quite conventional. The time life, or aging, of a religion can be studied through the number of adherents, surely for modern times, but with some uncertainty on the initial conditions, here the initial time.

The population growth-death equation conjectured in \(^1\) is a first approximation plausible modeling of the evolution dynamics in a continuous time framework, i.e. the time evolution of several "main" religions, from a microscopic interpretation point of view looks like the growth Avrami-Kolmogorov equation, describing solid state formation in a continuous time framework. The solution of which is usually written as

\[
f(t) = 1 - \exp[-Kt^n]
\]

where \(f(t)\) is the volume fraction being transformed from one phase to another; \(K\) and \(n\) are adjustable parameters (Fig. 1); this Avrami equation is of interest for so called late stage growth, i.e.

\[
\dot{f}(t) = \frac{1}{1 + \exp[-Kt]}
\]

A priori in analogy with crystal growth studies\(^22,23\), we have considered that a microscopic-like, continuous time differential equation can be written for the evolution of the number of adherents, in terms of the percentage with respect to the world population, of the world main religions, as for competing phase entities in Avrami sense

\[
\frac{d}{dt}g(t) = \gamma t^{-h_A}[1 - g(t)].
\]

It can be solved easily giving the evolution equation for the fraction \(g(t)\) of religion adherents

\[
g(t) = 1 - \eta \exp\left[\frac{-\gamma}{1 - h_A}t^{1-h_A}\right]
\]

where, adapting to our case this Eq. (4), \(\eta\) is related to the initial condition, \(\gamma\) is a (positive for growth process) rate (or scaling) parameter to be determined, and \(h_A\) is a parameter to be deduced in each case, measuring the attachment-growth (or death) process in this continuous time approximation.
For further consideration, let us explicitly write the "very (infinitely) slow" growth case $h_A=1$, i.e.,

$$\frac{d}{dt}g(t) = \gamma t^{-1}[1 - g(t)],$$

whence

$$g(t) = 1 - \beta t^{-\gamma},$$

where $\beta$, being positive (negative) for a growth (decay) case, is set by initial conditions; for $h_A = 1$, there is no "relaxation time", but a scaling time $\tau_1 = \beta^{1/\gamma}$, or $\beta = \tau_1^{-\gamma}$.

The $h_A$-cases which can be illustrated through an Avrami equation are shown in arbitrary time units in Fig.1 for various $h_A$ values, for $\eta = 1$ and $\gamma = 1 - h_A$. They are compared to the (generalized, i.e. $n \neq 1$) logistic map (Fig.2).

What should be emphasized is the fact that religions have appeared at some time $t_0$ which is somewhat unknown, or to say the least, loosely defined, due to a lack of historical facts but also due to the inherent process of the creation of a religion. Yet this initial time is a parameter much more important than in crystal growth, but less well defined. Therefore we rewrite the Avrami equation as

$$g(t) = 1 - \exp \left[- \left(\frac{t - t_0}{t_1}\right)^{1-h_A}\right],$$

thereby allowing also for a time scaling through $t_1$ related to some growth (or death) rate process. Notice or so that the maximum in such theoretical laws occurs at zero or +/-infinity, - a time information on which there is not much data in the case of religions.

When the number of adherents presents a maximum or a minimum which can be recognized to occur during the present or a recent century we will use a second order polynomial like $y = A + Bt + Ct^2$ for the fit.

If $(t - t_0)/t_1$ is much smaller than 1, Eq. (7) can be expanded in Taylor series, taking only the first order, and gives

$$g(t) = \alpha + \left(\frac{t}{t_1}\right)^{1-h_A}$$

where we have mapped the time axis onto an $x$ axis starting from 0 (instead of 1900, being this completely arbitrary and purely conventional) and $\alpha$ representing the initial condition, i.e. the value of the number of adherents for $t = 0$. This is obviously the most simple non linear expression, i.e. 3 unavoidable parameters, which can be used.
\begin{align*}
    y &= 1 - e^{x - h_A} \\
\end{align*}
\[ y = \left(1 + e^{h_V x}\right)^{-1} \]
Sometimes it is readily observed from the WCT tables that there are either "presently growing" or "presently decaying" religions, for which a minimum or after some recent maximum is observed during the 20-th century. For such "religions" the number of adherents can be in a first approximation fitted with a second order polynomial \( y = A + Bx + Cx^2 \) for which the parameters are given in Table II, without presently having a modelization of such a behaviour.

V. RESULTS

The number of adherents has been transformed as relative proportion, thus in per cent (pc) of the supposed world population during the surveying year(s). We recognize the lack of precision of such a value. In all cases the least-square best fit has been made over 5 points, represented by dark symbols in the figures. The WCT forecasts are indicated by an open but corresponding symbol with a cross inside. The fits are usually rather good, but we emphasize that the extrapolation either often overshoots or sometimes underestimates the WCT forecast for 2025 and thereafter, except for cases cases for which \( 0 \geq h \geq -1 \). This disagreement is partially due to the lack of saturation implied by the Avrami model.

Results of the \( h_A \)-fit to Avrami equation of the WCT surveys\(^3\) are summarized in Tables II and III. The parameter \( h_A \) value and meaning deserve some short explanation and discussion. According to the standard growth (Avrami) process \( h_A \) should be positive and less than 1, since \( n \equiv 1 - h_A \); if it is greater than 1, this is indicating the possibility for detachment. We consider that if \( |h_A| \) is outside the \((0, 1)\) interval, we have to imagine that the nucleation growth process is heterogeneous and/or conjecture that it is due to external field influences. Moreover notice that when \( h_A \) is greater than 1, the Avrami equation solution decays, ... from a maximum at the time \( t_0 \). However it is hardly difficult to know when a religion has attained its maximum number of adherents. Thus the time scale or the initial appearance time of a religion are questionable points.

In the main denominations were "loosely grouped". To be more specific: Christians in\(^4\) were the results of grouping together 12 denominations; similarly for Muslims we grouped 15 denominations. A somewhat more detailed analysis on 58 "time series" can be found in\(^2\), as taken from the World Christian Encyclopedia (WCE) and World Christian Trends (WCT) reference books.\(^2,3,4\) Let us examine several cases according to their loosely defined
TABLE I: Values of the parameters $h_A$ and $t_1$, used for fitting the data of ”increasing religions” with a power law formula; see Eq. (8); religions are hereby ranked based on the size of the attachment parameter $h_A$ which can be negative or positive but $\leq 1$, and on ”decreasing religions” with Eq. (7); $h_A$ is in this case $\geq 1$

| Religion                      | $h_A$ | $t_1$ |
|-------------------------------|-------|-------|
| Zoroastrians                  | -3.64 | 530   |
| Afro-Caribbean religionists   | -2.75 | 1800  |
| Black Muslims                 | -2.36 | 1110  |
| Pentecostals/Charismatics     | -2.19 | 208   |
| Independents                  | -1.61 | 288   |
| Afro-American spiritists       | -1.32 | 4990  |
| Afro-Brazilian cultists       | -1.21 | 2610  |
| Baha’is                       | -0.368| 1.38e+004|
| Marginal Christians           | -0.206| 1e+004 |
| crypto-Christians             | 0.230 | 1.8e+004|
| Orthodox                      | 1.14  | 1.06e-008 |

"connections" in a philosophical sense and present comparative results for various groups, starting from the less populated ones, approximately at most 0.001 to the biggest ones, 0.20 at most.

In Fig. 3, a set of black christian and islam based related religions is shown. Their growth is pretty obvious. The geographical localization of such groups is rather limited, and the socio-economic level of the adherents usually not the highest one. The $h_A$ parameter is near -2, and the scaling time around 2000. We may here recall the ”high” growth also seen$^2$ for Hanfites, Shafiites and Malikites which are all Sunnis.

This should be compared or contrasted to the cases of Fig.4 for Bahais and Zoroastrians. Both are ”not politically” nor ”religiously” approved by the main rival religions or the political regime(s). The former has a steady growth. the latter is a very old religion, officially replaced by more modern ones, like Christianism or Islam, with adepts mainly based in Iran, but who are not supposed to be ”recognized”. One may debate on the data
TABLE II: Values of the parameter used for fitting data on 4 "decreasing" and 3 "increasing"
religions with the polynomial equation $Cx^2 + Bx + A$

| Religion                  | $C$           | $B$    | $A$  |
|---------------------------|---------------|--------|------|
| Nonreligious              | -2.61e-005    | 0.103  | -102 |
| Atheists                  | -1.31e-005    | 0.0514 | -50.3|
| unaffiliated Christians   | -4.38e-006    | 0.017  | -16.5|
| Roman Catholics           | -4.2e-006     | 0.0165 | -16  |
| Protestants               | 7.66e-007     | -0.00306 | 3.11 |
| Anglicans                 | 9.75e-007     | -0.00386 | 3.83 |
| Evangelicals              | 5.95e-006     | -0.0233 | 22.8 |

value, i.e. the case of Zoroastrians (in Fig. 4) indicates an anomalous point corresponding
to 1975. One might recall a similar religious attitude masking a political one, in Poland
during the communist time. Religion being a mask for an identification to a political (in
both cases somewhat illegal) opinion. Maybe we should not need to add a comment based
on "political considerations" here, but we may consider that the meaning of $h_A$ makes sense
again.

The case of a few christian based "small" denominations, but more widely spread than
in Fig.3, is illustrated in Fig.5. Two are rather steadily growing, but anglicans have been
decaying during the last century and are now re-growing, while unaffiliated christians are
quickly disappearing after a maximum in the 1940-1950 range. Although one is a growing
and the other a decaying denomination, within a similar philosophical origin, one should
not immediately conclude that there is a transfer from one to the other. Yet this different
behaviour points to the interest of measuring the religious transfers, if any, as in language
studies.

Though small in membership, such an ensemble of "sects" and "cults" are prominently
featured in media stories, public debates, and legal disputes about the place of religion in
society. One encounters repeated claims that participation in such groups should not be
viewed as the exercise of religious freedom but rather as enslavement to organizations bent
on "brainwashing" and exploitation. Thus it seems natural to expect some high "volatility"
in the number of adherents, and the number of religious denominations as well.

With respect to the cases presented in Figs. 4-5, one should observe the fast growth of independents and charismatics in Fig. 6 which have $h_A$ close to -2, but $t_1$ quite small ($\simeq 250$). Further research on the christian varieties and adherence volatility, beside transfer intra and inter christian denominations, seems of interest.

Although they are not truly religious denominations, atheists and religionists are part of the ”religious world” also. It might at first appear surprising that these two groups reach a maximum in the 1950’s and are now much decaying (Fig.7). One fundamental question related to the above comment is : where are they going ? ... ! Some simulation based on ”ageing” might be derived mutatis muntandis in adapting Shya$^{24}$ simulation with explanation on changes in the proportion of secular and religious people.

Finally, the main christian based denominations are examined in Fig. 8. As in Fig. 5 for smaller denominations, growth after a minimum (evangelicals) and decay after a maximum (roman catholics) can be observed, with two (protestants and orthodoxes) decaying denominations. The similitudes and contrasts between the two figures are amazing. Can we suppose that indeed a simple model of transfers will be workable and reproduce such features?

VI. DISCUSSION

We consider that the religious practice is more likely more diverse than WCE and WCT surveys indicate. We indicate that with an Avrami late stage crystal growth-like equation equation the fits to the relative adherence evolution can be quite often good, in particular for the growing cases. Physically speaking that gives some support to the conjecture of religions growing like crystals$^{25}$. However we cannot expect that the Avrami equation holds true for ever; the system should saturate at some point, except if only a few religions are excessively predominating, and not ”allowing” the probability of existence (in a thermodynamic sense) of others. Indeed most of the fits seem often to indicate an exponential behavior. This is clearly wrong on the long term. Whence it would be of interest to develop an alternative set of fits and considerations through the logistic map approach, recalled in the introduction (Fig.2). In this way the growth of the population due to the inherently limited resources would be more realistically taken into account. However this introduces an extra social
parameter, hard to measure or conceive.

The same is true for the parabolic fits, which either indicate a quite quickly forthcoming disappearance of a religion or allows for infinite growth. We recognize that these are approximations. Of course one could remap the parabolae into the exponential expansions, allowing for error bars in the identification of coefficients, but this has not been done yet.

Last but not least, it might considered that the growth in many cases only reflect the population growth in several countries. It is true that it would be interesting to recount the number of adepts, and their rate of adherence, per religion and per country, and to correlate the evolution to the birth rate in the examined country with the religion(s) growth rate, and in particular the attachment parameter value. The latter might not be a constant as assumed here above.

Finally, it could be of interest to obtain and analyze data taking into account the emergence of denominations, rather than their long time behaviour. Let us point to a dramatic case in Japan after World War II, when the abolition of state Shinto and advent of religious freedom led to a five-year period known as The Rush-Hour of the Gods during which some 2,000 new sects and cults were formed. See also Upal26 on the emergence of new religious movements. Should not this be an interesting system with quite a different time scale, with heterogeneous or not fluctuations, thus of interest in statistical physics?

VII. CONCLUSION

In conclusion, here above we have shown that we can attempt to make a statistical physics like analysis of the number of adherents in religions, going beyond our first paper1 on the subject. However the data seem sometimes barely reliable. Nevertheless one can, expecting better surveys, at a more limited scale, suggest further lines of research.

Rates of growth and decay are surely not the only characteristics that vary across denominations18 nor should they only be taken without other measurements and out of context. The time dependence of the number of adherents can be considered to be a very restrictive way to ”measure” the evolution of a religion. One could also ”weight” the level of adherence to a religion. For example, one could try as for languages to define a religion through its quantity of practitioners, rituals, .... Many other indicators are possible27. One can measure diverse quantities related to the religious effect. Yet we observe some general
features. More modelization and simulation are still in order beside those already published\textsuperscript{6}. We suggest to let religious adherence to be a degree of freedom of a population, and take it through statistical physics considerations for our enlightenment. Models of opinion formation are obviously in order. One could suggest agent based models like for languages, including the role of external fields. Sex, age, memory, location, environment considerations, are to be taken into account, whence heterogeneous agents with vector-like properties. Correlations to other socio-economic features will allow a more interesting qualification of models.

One could try to have a Langevin equation connexion to Avrami equation; of course we need to define a hamiltonian $H$ and a current: that implies interactions thus competitions between entities; what we do not see here yet. However the hamiltonian can be obtained following standard ideas, like turning over the pdf into its log and defining some temperature. Religions seem to be an interesting field of study for statistical mechanics!

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19 Data Source Information: The sources used in the WCT database were so numerous and diverse that we only mention here few of them, for a more exhaustive discussion the readers are referred to the WCE. The major physical collections of data built up may be summarized here:
around 5000 statistical questionnaires returned by churches and national collaborators over the period 1982-2006; field surveys and interviews on the spot in over 200 countries conducted by the authors, who over the years 1965-2006 visited virtually every country in the world; the collection of 600 directories of denominations, Christian councils, confessions and topics; a collection of 4500 printed contemporary descriptions of the churches, describing denominations, movements, countries and confessions; officially-published reports of 500 government-organized national censuses of population each including the question on religion, in over 120 countries, covering most decades over the period 1900-2005; bibliographical listings from searches (including computerized enquiries on key-words) in a number of major libraries including those of the British Library (London), Library of Congress (Washington), Propaganda (Rome), Missionary Research Library (New York), and a score of universities.

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27 It is indeed clear that a religious adherent instead of being an analog of an up or down spin, is rather a vector for which each element can be a quantity measuring some value like one of those considered in sociology, i.e. a ”quality”. The adept attaining an extreme value of one or several vector components. Next we may imagine Potts vector or ferroelectric type (Hamiltonian) models for describing an ensemble of religious agent state or evolution.