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## Modern religion as vestigial structure: an evolutionary account of secularisation

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### ABSTRACT

This article offers a new solution to a theoretical problem facing scholars attempting to interpret religion and secularisation in light of biological evolution. Some scholars argue that the diversity of religious beliefs and rituals in contemporary societies is compatible with secularisation or even facilitates it by weakening the plausibility structures of any one religion. Other scholars argue that religious diversity is not evidence of a decrease in interest in religion but rather shows the ingenuity of religious entrepreneurs. Here we extend the former school of thought by outlining a theory of the vestigialisation of religion. We describe three key characteristics of vestigial structures (increasing variability, decreasing costliness and the appearance of novel functions) and identify shifts in these characteristics in some religious traits. We argue that this supports the idea that religious diversity is a predictable effect of secularisation.

### KEYWORDS

Religion; secularisation; diversity; vestigialisation

## Introduction

Is an increase in religious diversity evidence that a population is undergoing secularisation? This question is at the centre of one of the most contentious and long-standing debates among social scientists and historians who study these issues. By ‘religious diversity’ we mean the diversity of available religious beliefs and rituals engaging putative supernatural forces. By ‘secularisation’ we mean the decrease in such beliefs and rituals. Broadly speaking, there have been three schools of thought in this debate. The first is grounded in classical secularisation theory and argues that religious diversity is compatible with secularisation. Indeed, it may be that religious diversity weakens the plausibility structures required for accepting any one religion because of the cognitive dissonance that emerges when confronted by the implausible claims of many religions, thereby promoting secularisation (Berger 1967; Bruce 2011; Stolz 2020). In this approach, religious diversity may be taken as evidence that secularisation is occurring or will soon occur.

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The other two schools of thought take the contrary position, arguing that a growing diversity of religious beliefs and behaviours is evidence that a population is not undergoing a process of secularisation. This ‘supply side’ school argues that religious diversity indicates a growing number of options, not a decrease in demand. So, the emergence of new religious movements, for example, is interpreted as illustrating the ingenuity of religious entrepreneurs rather than secularisation (Stark and Iannaccone 1994). Similarly, the ‘individualisation’ school interprets the increase in various incarnations of New Age spirituality as evidence that religion is not decaying in a population but only being expressed in new, less institutionalised forms (Woodhead and Heelas 2005). These latter two schools take diversity as a sign that although (or because) its characteristics are changing, religion remains robust.

In this article, we offer a cognitive evolutionary account of secularisation, grounded in insights from biological theory, which argues that religious diversity is an expected effect of secularisation – along with religious expression becoming less costly and religious traditions coming to take on new functions. This account is compatible with classical secularisation theory and may be considered to be a development of it. We argue that the ways in which religious beliefs and behaviours have changed in contemporary societies indicate that they have become (or are becoming) vestigial structures. It is important to emphasise that this evolutionary argument makes a different and stronger claim against the ‘supply side’ and ‘individualisation’ schools than previous sociological arguments. Proponents of secularisation theory have pointed out that the increased diversity and individualisation of religion is not in fact making up for the decrease in traditional institutionalised religion (Bruce 2011) and that such patterns of ‘fuzzy fidelity’ are wholly compatible with a general shift towards secularisation (Voas 2009). We agree that the empirical evidence from sociology supports the correlations identified by the first school of thought, but our goal here is to offer a complementary argument grounded in theories of causation from evolutionary biology, one showing that secularisation should be seen as naturally involving the growth of diversity, as well as a decrease in the cost of involvement in religion and the recruitment of religion to serve new ends: the reason being that secularisation is an example of vestigilisation, which inevitably involves those traits. The bulk of the article demonstrates ways in which religious characteristics in pluralistic environments show such traits of vestigiality and discuss this pattern’s relevance to the claim that religions played a prosocial function in traditional societies. The first step, however, is to clarify the structures we have in mind.

### The characteristics of vestigial structures

Within evolutionary biology, the existence of vestigial structures is a consequence of the possibility that structures which have an adaptive function might lose that function for some reason. A number of examples of such structures have been discussed. Perhaps the best-known example in humans is the appendix, which has for a long time been thought to be the remnant of an organ that became non-functional in human ancestors and subsequently has become reduced in size, leaving only a small sac at the end of the colon. Another example of a supposedly vestigial structure in humans is that of goosebumps, which raise the tiny hairs on our bodies when humans are cold or scared. While goosebumps apparently serve no function in humans – who have only short,

thin hair over most of their bodies – they helped our hirsute ancestors to stay warm or appear larger when threatened. As is well-known, however, it can sometimes be difficult to identify the biological function of a trait. It is likewise not easy to ascertain that a particular trait or structure lacks any function. This makes identifying vestigial traits doubly difficult, as they are traits that once possessed a function they have now lost. Moreover, it is not always clear whether we are dealing with some other product of evolution such as an exaptation or by-product. Thankfully, the task is made easier by the fact that the process of vestigialisation leads to several characteristic changes – an aspect of vestigialisation that will play a crucial role in this paper.

We focus here on three kinds of changes that are generally accepted among evolutionary biologists as characteristic of the process of becoming vestigial: (1) greater variation in the variants due to genetic drift, (2) lower average cost of the variants due to their cost not being off-set by their functionality, and (3) the appearance of new functions as variants are exapted. To anticipate our argument below, in the case of religion, these changes can involve: (1) an increase in the variety of individual and group beliefs and practices, (2) a tendency for those beliefs and practices to take on forms that are less socially impracticable, and (3) a growth in approaches to religion that focus on immediate individual benefits.

First, *variation* in structures that are functional tends to be limited and cluster fairly closely around the optimal version of the structure in question. Variants of the structure that differ significantly from the optimum are selected against. However, in the case of structures that lack function, genetic drift will lead over time to a greater variety of forms. For example, the variability in eye colour among humans indicates that none of the different colours provides a significant enough advantage for the alternatives to have been eliminated. In the case of vestigial structures, there should exist a variety of alternative forms, with that variety growing over time.

Second, while functional structures can often be very costly to construct and maintain (e.g., the human brain), their cost is off-set by their functionality. The same is not the case with traits that lack function. In the case of non-functional traits, so long as their production and maintenance involve a significant cost, there will be a strong selective pressure towards variants that are *less costly*. Over time, these become remnants of formerly adaptive traits with high functionality. This means that over time vestigial structures will evolve towards variants that are smaller, simpler and less likely to interfere with the overall functioning of the organism – as is the case with the remnant rear limbs of whales, which no longer protrude from their abdomens.

Third, it is common in evolutionary history for structures to be recruited to serve novel functions, i.e., to become *exaptations*. The forelimbs of humans are a prime example, seeing as how they now primarily serve to manipulate tools whereas in our ancestors they were used to run on and, prior to that, to swim with. While it is possible for a structure to serve an additional function even while it already serves another, different variants of the structure are likely to be better at performing the different functions, leading to a competition that may result in a compromise that is far from satisfactory. This is not an issue in the case of vestigial structures. Since they no longer serve a function (or are no longer central to the functioning of the organism), the most advantageous variants of the structure are free to be further modified to the new function, and the variety of forms that genetic drift provides makes that even easier. In fact, two of the examples provided above – the human appendix and the remnant bones in whales – are

examples of structures that are now thought to have been exapted to serve a function and, therefore, are no longer considered to be vestigial structures. Thus, in the case of the whales, the bones appear to play a role in copulation.

The examples we have used so far are clearly examples of biological evolutionary processes. However, basic evolutionary theory can be expressed in terms that abstract away from what it is that is evolving. Famously, all that is required is a population that exhibits variation, selection and retention. This flexibility has allowed a wealth of often competing theories as to how cultural phenomena like religions can be involved with evolutionary processes. A complete account of modern religion as a vestigial structure would need to be spelled out in terms of one or more of these theories – clearly stating what it is that is evolving and what mechanisms are involved. In effect, something like a full account of religion as an evolved phenomenon. However, this is not our aim here. The aim is much more modest. We wish to provide a *prima facie* plausible case that the ubiquity of the common characteristics of vestigial structures among religions in secularising societies is best explained by concluding that in these societies religion has lost its function. To use an analogy, if there is smoke, heat and light, one does not have to have identified the source of the conflagration to know that there is a fire. We turn, therefore, to looking at how religions in secularising societies differ from those in more traditional societies and how this is indicative of the evolutionary change we are proposing. In doing so we will consider some ways in which religions in secularising societies might be vestigial.

### The *variability* of religious traits

Given the focus on various aspects of novel variability as indicative of the robustness of religion, it is that category which is the most important to consider from an evolutionary perspective. Both the supply-side view and the individualisation view have argued against the secularisation thesis by claiming that the changes that have been witnessed in Europe and the United States during the twentieth century are indicative of increased *variation* in religious practices and beliefs rather than of a move *away* from religion. In the case of the supply-side view, which is largely US-based, variability here primarily means the number of different religious traditions that may coexist in a single society. The US is typically presented as the paradigmatic case of a society where religion has remained strong, thanks to a variety of religious ‘products’ on offer. This position has been somewhat deflated by the recent strong growth in the number of people in the US identifying with no religious grouping (Voas and Chaves 2016).

Our main point here, however, is that the large number of different denominations that now exist in the US should not be interpreted as a sign of the relative health of religion in the US since such variation is most plausibly indicative of vestigialisation. This interpretation is only strengthened by observations of the fall in the relative number of religious individuals in the US, already noted above. The point applies, however, to any case where new religious movements have appeared in societies that appear to be undergoing secularisation. Those newly emergent arrivals are not evidence against the secularisation thesis but, in fact, provide evidence in support of it. The appearance of new religious movements is indicative of the old religious traditions being in crisis. That ever more new religious movements keep on appearing indicates that they are not providing a solution and it is religion in general that is in crisis.

The individualism interpretation of variability fares no better. The key claim of individualist approaches to religion is that, rather than undergoing secularisation, religion in the western world is becoming individualised – a matter of individual preferences and beliefs rather than of institutional traditions and dogma. However, once we come to consider secularisation as the result of vestigialisation and therefore necessarily involving an increase in the variability of religious traits, we no longer need to think of this situation in those terms. Growth in highly individualised religious beliefs and practices is one of the ways in which the variability resulting from loss of the prosociality function of religion can show itself. What is more, it is vital to note that the growth in individualised religion is not robust enough to make up for the losses in institutionalised religion (Voas and Bruce 2007). In effect, the resulting picture is exactly the kind of pattern of change that one would expect to accompany secularisation once variability is understood to be a product of vestigialisation. It would be the lack of individualisation that would be hard to explain for a secularisation theorist.

An important consideration that perhaps complicates the picture in this context is the topic of spirituality. What spirituality might be is probably an even more contentious question than that of how to define religion. It is clear enough that what is intended is some notion of beliefs, practices, and experiences that are in an important way similar to religious beliefs, practices and experiences but that are to be considered independently of institutionalised religion. So, something like individualised religion. The difficulty comes with characterising the bounds of spirituality. Overly broad definitions of spirituality can forestall claims of secularisation only at the cost of triviality. Furthermore, spirituality may well be best understood in terms of religions coming to serve new functions, i.e., being exapted, as per the third characteristic of vestigial structures to which we will return below.

Of course, while vestigialisation leads to increased variability it is by no means the only set of conditions in which you can get increasing variability – so the presence of increased variability isn't necessarily a sign of vestigialisation. So it is necessary to consider the other alternatives but to also take into account the degree to which this trait of vestigialisation is coextant with a decrease in costliness of religious traditions and their recruitment to serve new functions. Such a confluence would be hard to explain by any means other than the vestigiality hypothesis.

Let's take an example from the cluster of traits referred to as anthropomorphic promiscuity (Shults 2018), i.e., cognitive tendencies which lead individuals to infer that some natural phenomena (especially ambiguous or anxiety-inducing phenomena) are caused by human-like supernatural forces (or 'gods' in the general sense, whether animal spirits and ancestor ghosts, or deities like Xiuhtecuhli, Yahweh, or Zeus). It is commonly argued in the cognitive and evolutionary sciences of religion that the psychological mechanisms of error management, especially the tendency to attribute causality to imagined supernatural agents under anxious and ambiguous conditions, were naturally selected in early ancestral environments because false positives would have been more conducive to survival than false negatives. In traditional, small-scale societies the supernatural agents that are imagined due to these mechanisms tend to be rather set, although of course there is some variation. In other words, pretty much everyone believes in the same animal spirits or ancestor ghosts (although the details that go beyond practical considerations of how to maintain the right relationship with such spirits are at best

nebulous). In larger traditional societies with ‘big gods’, the majority will tend to believe in the high god(s) and there will be some variation when it comes to other spirits (e.g., angels, jinn, boddhisatvas). However, as the functions of anthropomorphically promiscuous errors related to gods begin to wane in a population, this variation is free to roam widely. This indicates that vestigialisation may be occurring. And this is exactly what we see in the religious diversity and diverse forms of spirituality in secularising societies.

The objection could be raised that there is a disanalogy between the biological and the cultural cases we are looking at. In the case of biological vestigial traits, the growth in variability is primarily due to rare variations, already present in the population, becoming more common. In the case of cultural variation, much of the variability may be due to altogether novel religious denominations or due to ones that are exported from elsewhere. However, this difference in whether the source of diversity is exogenous or not is of secondary significance. What is important is that the pressure which previously eliminated it has been removed – external or novel religious denominations always existed but were rarely successful in spreading in premodern societies. In both cases, we have a situation where selection had previously worked to eliminate all but a few of the possible alternatives in a particular population. The source of the variation that is seen once that selective pressure is removed is not directly relevant to the fundamental distinction that we are considering – it is the loss of function that removes the selection pressure previously eliminating variability in the structure, thereby allowing various mechanisms to generate novel variety.

A further objection is that the lack of variability in religious beliefs and practices has historically been due to the socially enforced opprobrium towards heretical beliefs and practices rather than due to their lower functionality. There are several problems with this objection, however. The most basic is that there are many biological examples where functionality of a trait is dependent upon its frequency or even where the environment is altered in order to create a niche in which a trait is functional. Furthermore, this raises the question of why it is that the mechanisms to reduce variability have ceased to be effective – a plausible ultimate explanation being precisely because the variants no longer differ in terms of their functionality. More generally, the question has to be considered to what degree the appearance of novel religious traditions has been connected with the failure of existing ones to maintain functionality. At least *prima facie*, it seems that this is very much the case, leading to the conclusion that the perceived success of efforts made by existing religious institutions to maintain stability has ultimately little to do with the institutional efforts themselves and much more with broader underlying conditions.

### **The costliness of religious traits**

It has long been a rhetorical device to call religion in modern societies a remnant. This is not the purpose here, of course. Rather, it is to consider to what degree the religious variants which persist in western societies are relatively low-cost, as compared to religious structures within more traditional societies. A highly illustrative example of what is meant can be provided by consideration of the relative cost of religious versus secular architecture. In traditional societies within Europe and in other parts of the world it would have been quite normal for the religious buildings to have dominated the

landscape of any community, with usually only the castle or the manor of the local landowner potentially competing in terms of size and cost. That is rarely the case now where modern-day churches, even when impressive in scale, tend to be dwarfed by stadiums, universities, shopping centres, museums and a forest of high-rise office blocks. Modern societies invest a relatively small percentage of available resources in the construction and upkeep of religious architecture. Moreover, it is not at all uncommon to find many an old building once designated as a place of worship, now turned into luxury apartments. Nor is it rare to see religious groups making do with spaces once designated for industrial use, due to the limited resources available to those groups.

At the individual level too, belonging to a religion can involve any of a number of different costs. The costs may be material, such as in the case of ritual sacrifices or tithing. They may involve spending time participating in various activities related to being a member of the religion. They may be in terms of forgoing opportunities such as those resulting from regulations against particular activities including against education or consumption of certain foods, or resulting from requirements to wear clothing or symbols that identify one as a member of the religion and thereby potentially limit one's interactions with outsiders. Finally, the costs might be even more fundamental, as is the case with participation in rituals that are potentially life-threatening. All of these costs provide us with an opportunity to see whether religious participation has been growing less costly, as the hypothesis that religion is a vestigial structure in western societies would suggest. If we consider common examples from secularising societies, it does appear to be the case that the costs of religious adherence borne by individuals have been falling – with some significant exceptions. Tithing is primarily an informal and rare activity. Individual involvement in religious activities that take up significant time is low and falling. Forgoing opportunities such as education on a religious basis sounds bizarre to most people in modern societies. If people do wear symbols of their religion, they tend to be unobtrusive, mostly worn on special occasions and certainly do not serve to limit interactions with nonbelievers. And rituals that involve physical danger are more likely to attract social opprobrium and prosecution than attendance.

One could think of a specific example of the way in which the Catholic Church has changed in respect to the demands it places upon individuals. In many societies, all individuals were expected to make regular contributions to the Church, with many of the more well-off making the large-scale grants that made possible the creation of rich monasteries and grand cathedrals. Religiously motivated fasting was a routine experience for every member of the faith – either in being adhered to or being a significant fact about someone that they did not adhere to it. Contacts with Jews or Protestants were often controlled, discouraged and limited. None of these costs are a realistic element in the lives of modern Catholics living in developed countries today. Even in a relatively traditional Catholic country such as Poland, personal contributions to the Church are limited to the small sums put on the collection plate on the rare occasion that Mass is attended. Fasting, limited to Easter and Christmas, is very much optional and more traditional than religious. And the religious affiliations of other people are usually not even known in most everyday contexts.

These examples are related to the cluster of traits referred to as sociographic prudery (Shults 2018), i.e., an aggregate of biases that lead individuals to prefer the supernaturally authorised norms of the religious coalition with which they primarily



identify. Let's take another example to make it more concrete. As noted above, vestigialisation is indicated when variants of the structure become less costly. Scholars in the cognitive and evolutionary sciences of religion have argued that the psychological mechanisms of risk management, especially the tendency to affiliate with individuals who are biological or ideological kin, were naturally selected in early ancestral environments. One way in which this is hypothesised to work is that when the members of a group all ritually engage with the same imagined supernatural agents, especially when the latter are potentially punitive or redemptive, then those members are less likely to try and break the group norms. For example, they are less likely to cheat or steal even if no humans are around because they believe punitive but invisible spirits may be watching.

However, if different individuals in a population believe in quite different supernatural agents or believe less in any particular punitive spirit, and have multiple options for affiliation, then it will be easier to defect from any one religious group or even to freeload off religious groups without paying the high cost of associating with them. This can be seen, for example, in the way non-religious Norwegians utilise the feel-good services of the Lutheran church (for weddings, e.g.) without bothering to attend other services or provide extra financial support to the church. The point here is that this lessening of the costliness of affiliating with a religious coalition (and the extent to which one can get away with such fuzzy affiliation) is an indication of vestigialisation, which supports rather than contradicts the secularisation thesis. In this way, it is simply the other side of the argument that traditional religion must be functional because it is so costly.

A considerable objection to this line of argumentation has been put forward by Iannaccone (1998). He has observed that it is strict churches that are strong – it is the religious denominations that place a number of costs upon their members that have typically fared better than their more liberal competitors. The explanation for this phenomenon is also evolutionary. The higher costs of participation help to avoid the free rider problem that all groups have to deal with in one way or another. Groups that do not require members to make any sacrifices are open to being destabilised by intruders who take advantage of the benefits of being a member without helping to maintain the group. One case where this phenomenon has been studied in detail is that of Israeli kibbutzim, where Sosis and Bressler have found that it is the religious kibbutzim that place the greatest entry requirements upon their members that have managed to maintain cohesion for much longer than those that lacked such requirements (Sosis and Bressler 2003). The difficulty is what conclusion to draw from this.

There is extensive evidence that the function of 'religion' is to maintain prosocial behaviour and Iannaccone's insight fits into this line of reasoning – high costs of membership ensure freeriding is not an attractive option. However, to understand the relevance of Iannaccone's observation for the vestigialisation view, it is important to notice several other details of the situation. Importantly, the religious groups that have taken the 'strict' route in western societies tend to be small and to hold themselves separate or even against society in general. Furthermore, despite the apparent relative strength of the 'strict' religions, the religions that have been dominant in western societies have been particularly lenient if one compares them not just to those strict religions but to religions around the world and throughout history. Finally, the western societies

Iannaccone considers have managed to maintain cohesion and promote prosocial behaviour at levels not normally found among much more religious societies.

What can we conclude from this? It seems that our vestigialisation of religion approach to understanding secularisation flows naturally from the joint claims that high cost (strict) religions have a prosocial function and that contemporary secularising societies are socially successful. The strict and strong churches highlighted by Iannaccone are in a certain sense exceptions that prove the rule. To put it another way, the existence of strict, strong, and small religions is made possible by secularisation. On the one hand, they are an example of increased variability. On the other, and this explains how it is that they can maintain costly behaviours, they are an example of exaptation – rather than promoting prosocial behaviours aimed at maintaining society they now promote such behaviours aimed at maintaining a much smaller, exclusive group in tension with society. Having said this, it should be stressed that the evidence for our claim that religion is becoming vestigial in modern societies does not depend upon the claim that traditional religion had a prosocial function, just the claim that it was functional.

### **The exaptation of religious traits**

Determining whether religious traits in secularising societies are taking on new functions is perhaps the most difficult of the three categories of vestigialisation to have a clear view on. The most fundamental issue is that the relevant concept of function is much more strict than that which is usually used in the humanities or even the social sciences. It is not enough that religions be used to achieve some goal. That goal must have an effect in terms of the relative success of genetic variants or their cultural analogues. Thus, the often considered ‘function’ of making people feel more at ease, cannot be biologically considered a function unless it is shown that that feeling of ease plays a positive role in what matters in evolutionary terms. On the other hand, it makes no difference to evolutionary considerations of functionality whether an effect is intended or even known. This means that common sense discussions of what religions are for, typically offer relatively little insight into the issue. It also means that points raised in relation to this characteristic can only be broadly indicative until they are backed by extensive and diverse evidence.

Let’s illustrate this process of exaptation with an example related to the reciprocal relation of anthropomorphic promiscuity and sociographic prudery. Research in the cognitive and evolutionary sciences of religion has provided evidence that psychological mechanisms (upheld by biological structures) from each of these clusters of traits can be mutually intensifying. So, the tendency to erroneously guess that a punitive supernatural agent is the cause of something (e.g., a disease, or famine) will support the tendency to avoid the risk of affiliating with individuals who are not committed to ritually engaging and appeasing said supernatural agent. And vice versa. Repeated participation in synchronic, emotionally arousing, rituals that reinforce the norms of the in-group will make it easier for an individual to buy into the existence and power of said supernatural agent. It can be argued that this reciprocal reinforcement between error and risk management has been (or is being) exapted in new secularising contexts (Shults 2018). This mutual intensification has a different function, namely, strengthening naturalism and

secularism. In other words, the tendency to manage errors through scientific analyses of naturalistic causes promotes the tendency to support secular modes of affiliation that promote such scientific openness and pragmatic solutions to societal challenges. The tendency to commit to a way of life governed by secular institutions that one takes to be trustworthy (enough) and provide welfare and existential security promotes the tendency to be open to more naturalistic explanations of the world rather than relying on supernatural authorities to stock one's ontological inventory. Here the point is that the reciprocity functions of religiously salient error and risk management strategies can be exapted in naturalistic and secularistic contexts because (or as) these functions lose their connection to religion.

The tendency that seems evident in secularising societies is for religions to increasingly focus on their utility – where this word is intended more broadly than ‘function’ – to individuals. New religious movements often play up their role in helping people achieve personal, worldly aims. This contrasts with the more traditional explicitly stated aims of fostering community and achieving personal aims that are otherworldly, such as getting into heaven or achieving liberation from rebirth. Even if we take the stated aims with a grain of salt given what has been said above, we can see an important difference. The community-focussed aims that concern changes in the visible world fit with the conception of religions as serving to maintain social cohesion that Iannaccone works with. The traditional personal aims are such that their fulfilment could not be determined, making success in their achievement inconsequential in social terms, and leaving only their effect upon individual behaviour as having any significance. This is in contrast with the personal aims of novel religions, whose effectiveness in achieving peace of mind, subjective feeling of enlightenment, or personal wealth is much more open for evaluation and therefore a potential factor that may determine the success of such religions. As a result of this, the effectiveness of explicitly stated individual aims that are worldly in this sense may determine the success of religions, thereby coming to be a function in the evolutionary sense. Otherworldly individual aims did not have this possibility, leaving only the community-focussed aims as potentially functional. Of course, as already stated, this leaves the possibility that the evolutionary functions of religions might not have any explicit analogues.

The vestigialisation scenario that the above-outlined changes in the explicit utility of religions appear to fit with most easily is one where traditional religions had the function of maintaining social cohesion, lost it, and are now in various ways coming to serve individual needs. Whether those needs translate in some way into the success of genetic or cultural variants is of course very much open for discussion. Furthermore, by contrasting individual needs with maintaining social cohesion we do not wish to take a stance regarding the group-level selection debate – we assume that maintaining social cohesion is at least in many cases advantageous for individuals. Finally, the case of strict religions to which Iannaccone drew attention provides an example of an exapted function: here religion plays a role in maintaining the cohesion of small counter-social groups set in the broader context of pluralistic, secularising societies.

### **Operationalising, testing and mechanisms**

The argument that has been put forward for the most part tries to eschew coming down on any particular side of the various discussions regarding evolutionary interpretations of

religion, such as whether religion should be understood as being functional on the individual or the (cultural or biological) group level. This has in part been a very conscious decision – religions in secularising societies exhibit the tell-tale signs of vestigiality and tying ourselves to a particular theoretical approach would have needlessly constrained the relevance of that observation. None-the-less, it would be false to claim that the idea that religion is becoming vestigial in modern societies is theoretically neutral. Most obviously because the claim is that religions had a function in premodern societies but have lost it. The point can be appreciated if we consider various hypotheses regarding the causes of secularisation.

Among the causes that have been recently discussed are four that will be considered here: education, freedom, pluralism and existential security. Initially, it might seem that there is little to differentiate between them in terms of how they relate to the vestigiality hypothesis. However, it is the existential security hypothesis that fits best with the idea that religion is undergoing vestigialisation. This is because if religions had a prosocial function in premodern societies, they would have served to ensure social cohesion and thereby maintained a relatively high level of cooperation and in effect a way to support existential security. This mechanism would have been counter-weighted by the resulting security leading over the long term to lower anxiety levels and, in effect, lower religiosity. The two mechanisms could have maintained a prosocial equilibrium where religiosity stayed high enough to help ensure an acceptable level of existential security (Talmont-Kaminski, 2014). However, in modern societies, secular institutions have ensured historically unprecedented levels of existential security, in effect taking over religion's prosocial function. On this view, it would be difficult to claim that historical religions have had the analogous effect on education, freedom or pluralism that would be necessary to make the idea of premodern equilibrium states plausible in those cases. That would require claiming that religions in premodern societies had the function of maintaining education, freedom or pluralism. This does not mean that changes in the level of education, freedom and pluralism have not played some role in secularisation, of course. But it does mean that treating the vestigialisation hypothesis as plausible provides an additional reason for treating the existential security theory seriously.

The relative theoretical neutrality of the basic vestigialisation hypothesis can be seen as a boon, also. It is possible to operationalise the three traits of vestigiality in a variety of ways. For example, as has already been seen for costliness, it is possible to compare the actual costs (financial, social or other) borne by individuals or the costs that religious groups or even whole religious traditions require. Sosis's classic studies of kibbutzim provide one example of a potential methodology to use. A similar approach can be taken to operationalising diversity. Exaptation is perhaps the most difficult aspect to operationalise but the observation that modern religions are more focussed upon direct, verifiable personal ends provides a way to at least attempt this. If the vestigialisation hypothesis is correct then it should be the case that the three aspects co-occur reliably. Examining data that takes into account different ways of operationalising these aspects will in effect fulfil two complementary goals. On the one hand, it will help to provide empirical evidence for the vestigiality hypothesis. On the other hand, it will help to direct attention to where and in what ways religion (or, rather, the complex and interacting sets of psychological and cultural mechanisms that hide under that *nom de guerre*) is becoming vestigial.

Of course, what is described here is not a single study but a multipronged research project that would require data gathered from across a variety of societies and religious traditions in order to provide the kind of insight that could be hoped for. And even then the methodology could be open to claims of spurious connections. To avoid that possibility as well as to more fully explore the mechanisms and conditions that would explain the observed vestigialisation it would be well to use the data to build agent-based models which would embody and thereby test the kinds of concrete theoretical claims that we have avoided here.

## Conclusion

As noted above, researchers have often claimed that the evolutionary function of religion is to maintain group cohesion and promote prosocial behaviour. However, the extent to which the success of modern societies, whose cohesion is maintained without much call for religion, implies the vestigiality of religion in those societies has not been rigorously discussed or adequately theorised. We have argued that shifts in the variability, costliness, and exaptation of religious traits imply that secularisation should be understood in terms of religion losing its function in many modern, secularising societies; with prosociality being a plausible candidate for the function that had been lost. This undercuts the criticism made by supply-side theorists and supporters of the individualisation hypothesis – growing diversity in religious movements and individual religious or spiritual practices does not present a challenge for secularity theorists. Instead, such growth in diversity (as well as lower costliness and the appearance of new functions) is an unavoidable element of secularisation, if the latter is to be understood in terms of religion having lost its function and becoming vestigial. While *prima facie* plausible, the claim that secularisation is invariably accompanied by those three characteristics of vestigiality needs to be explored empirically. Doing so will provide important evidence for understanding religion in the modern world, as well as potentially help to understand in what terms religions can be thought of as being the products of evolutionary processes.

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