# Statistical Methods for Studying Mythology: Three Peer Reviewed Papers and a Short History of the Dragon Motif.

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# *Published Articles*

## Statistical Methods for Studying Mythology: Three Peer Reviewed Papers and a Short History of the Dragon Motif

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*The article "Le motif du dragon serait paléolithique, mythologie et archéologie", published in* Préhistoire du Sud-Ouest *21(2), 2013, 195–215.*
*The article "Mythologie et statistique: Reconstructions, évolution et origines paléolithiques du combat contre le dragon", published in* Mythologie Française *256, 2014, pp. 17–23.*
*The article "Une méthode simple pour reconstruire une mythologie préhistorique (à propos de serpents mythiques sahariens)", published in Les Cahiers de l'AARS 17, 2014, pp. 95–104.*

Today we all know stories about dragons, yet for how long have tales about dragons been told? These three peer-reviewed papers suggest a Palaeolithic origin for the figure of the dragon.

In the paper published in 2013, I investigate the possible relationships between different dragons around the world. In this study, I define a dragon as a serpentine animal associated with water. I look at 23 regions around the planet, focusing on 69 plot variables. Then I control each result by using another, smaller database with 9 areas and 26 plots that were used by Robert Blust (2000) to define the dragon. Following these methods, I was in these works the first to apply both mathematical tools belonging to evolutionary biology (Parsimony consensus tree, Bayesian tree parsimony and NeighborNet) and statistics (principal component analysis, principal coordinate and non-metric multidimensional scaling). I also could present trees and tables that show how the motif may have evolved.

I demonstrate the existence of a historical link between multiple representations of the dragon motif, whose evolution follows some of the great migrations that led to the settlement of the planet. So, by comparing similarities between the area variables, I was able to statistically determine that most of the figures of the dragons existing today around the world ultimately came from the same source. According to the trees, the motif first left Africa and reached the Far East, followed by a version brought to Australia, and another was subsequently diffused into the Americas. Soon after this diffusion, the motif was also diffused around the Mediterranean Sea. A final wave of migration was diffused from the Mediterranean area and could be connected to the Indo-European expansion.

As shown in my paper elsewhere in this volume, phylogenetic and statistical methods could also provide powerful tools to classify groups of motifs based on a common ancestor (which remains hypothetical because language does not fossilize), trace their evolutionary past, and identify borrowings and hybridisation across cultural area. In this case, I statistically reconstructed the *Urform*, first during human migration from Africa and then its spread into Paleolithic Europe. The *Urform* was most probably the following:

> *The dragon is a snake with scales, horns and human hair. It is a guardian of springs or other bodies of water and is capable of flight. It appears where sun and rain are closely interspersed. It is opposed to thunder/light or is connected with them. It causes tornados and floods.*

This reconstruction has been put in comparison with the decapitated snakes discovered in the Palaeolithic caves of Montespan and Tuc d'Audouber in the French Pyrenees, near two underground rivers. The Paleolithic rock art at Tuc d'Audoubert strikingly depicts dangerous animals (bison, lions) as wounded or headless. As a result, the serpent may have been considered both dangerous and linked with water at this time. Accordingly, it is also noteworthy that one side of a pierced baton found in Montgaudier Cave in southwestern France features an engraving of two snakes (Vialou 2008: 73) while its other side bears images of at least

two seals and a fish (De Nadaillac 1887: 8). Like the seal, the two snakes may also be linked with saline water and may therefore be representations of mythical beings (as European snakes do not live in saline water). The association between two snakes and many fish is found again on the Magdalenian baton of the Magdalene shelter in southwestern France: on one side, two snakes can be seen, and on the other side, one can see two other snakes, with fish, in a stylized design (Breuil & de Saint-Périer 1927: 150). These two images show a link between snakes and water, a link which corroborates the 2013 reconstruction of the motif. Finally, I try to answer the question of why such a motif could stay popular over the millennia, and I propose a neural mechanism, connected with evolution, able to explain the permanence of the pattern through time.

The second paper corroborates the first. In it, I attempt to perform an analysis of the types of dragons (and not mere geographic area) and new elements. Most of the data comes from Joseph Fontenrose's study *Python: A Study of Delphic Myth and Its Origins* (1959), a study of the dragon motif in antiquity. The analysis uses MrBayes, parsimony trees and Neighbornet to show two main clusters for the motif. The first cluster includes Amerindian, North African, Basque, Hittite and Mesopotamian dragons, which would correspond to the migration from the Far East both to the Americas and to the Mediterranean area. The second includes most of the Indo-European versions and would correspond to a later (probably Indo-European) expansion. The invention of the narrative of the fight against the dragon may go back to the Asian stage of the evolution of the motif and from there spread until Europe and the Americas. Moreover, I reconstruct the *Urform* of this type of tale at many steps of its evolution: proto-myth → European proto-myth → Indo-European proto-myth.

Finally, in the third paper, I perform new calculations involving the 2013 database. Seriation shows the closeness between the migration of the motif into Australia and into the Americas, probably occurring within a short timeframe, and the following evolution of the motif:

Africa → Far-East → → Australia and the Americas
Africa → Far-East → → Eurasia and North Africa

A cluster-analysis with the software Structure yields the following reconstruction:

Africa → Far-East → → Australia and Mesoamerica
Africa → Far-East → → remaining Americas, Mediterranean area, Basque, Greek & Indo-Iranian
Africa → Far-East → → Celtic, Germanic & Slavic area

In addition, I show in this paper that the phylogenetic reconstruction of the proto-form of the dragon presented in the 2013 paper is corroborated by many rock art finds around the world, especially those depicting horned snakes connected with water. In each instance, there are even today similar stories about snakes with a mammalian (and, in most cases, a horned) head, which inhabit permanent waterholes and can often provoke floods. These beings are always connected with rain, storm, thunder and lightning. In all cases they can fly or live in the sky. In most cases, there is an identified connection between the shape of a rainbow and the shape of the snake. The beings can take the form of a human and mainly attack women. They are also associated with crystal. Each of these elements is shared by most cultural areas of the rock art images studied. The number of similar correlated elements for each area is unlikely to establish polygenesis (or convergent evolution) and corroborates our phylogenetic reconstruction.

Included with these three publications are three datasets with three pre-selections of data and terms. A variety of methods were used, all of which yield more or less the same results! Moreover, archaeological data tends to corroborate the results involving mathematical analysis. Therefore, the conclusions seem very robust and ready for further testing.

### *Works Cited*


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# *Essay Collections*

## Fibula, Fabula, Fact – The Viking Age in Finland

Joonas Ahola, Frog, University of Helsinki, and Clive Tolley, University of Turku

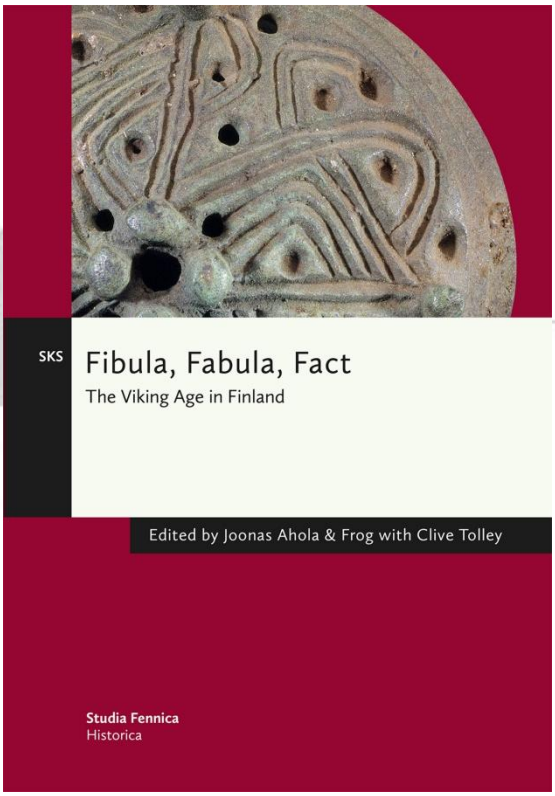
*A collection of scientific articles edited by Joonas Ahola & Frog with Clive Tolley published as volume 18 in the series Studia Fennica Historica by the Finnish Literature Society (SKS) (Helsinki 2014, 516 pages).*

The Viking Age is a term used to refer to a period of history in Northern Europe in the Late Iron Age. This period is often defined as roughly 800–1050 AD and was characterized by the mobility and expansion of Germanic populations from Scandinavia. In spite of the several multidisciplinary volumes that have been produced on the Viking Age in the past few decades, Finland has been left largely outside of these discourses whereas extensive research has been done on the cultural and historical significance of this period for Germanic cultures of Scandinavia and for other cultures to the west.

The chapters of *Fibula, Fabula, Fact – The Viking Age in Finland* are intended to provide essential foundations for approaching the Viking Age in Finland. This means re-evaluating many fundamental concepts and commonplaces that have been connected to the topic. This volume is oriented to provide introductions to the sources, methods and perspectives of diverse disciplines so that these resources and the history of discourse from which they emerge are accessible to specialists from other fields, specialists from outside Finland, and also to non-specialist readers and students.

### *Background*

The chapters of the book are based on the discussions in two multidisciplinary seminars held at the University of Helsinki. These seminars were organized by the project “Viikinkiaika Suomessa – the Viking Age in Finland”. The aim of this project was – and still is – to promote the development of as holistic and multifaceted an image as possible of the circumstances that prevailed in Finland and the adjacent areas during the Viking Age. This is done by bringing the insights of different disciplines into a discourse that enables the recognition of intersections of their research and the development of shared terms and concepts with which to inspect them.




Introducing current perspectives into an extensively multidisciplinary discussion