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O. Tekebaev, K. Choroev



DYNASTY
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VOLUME I • Genesis

**The Birth of the Eurasian
Nomadic Civilization**

**Kuban Choroiev
Omurbek Tekebaev
Dynasty. Metal. Horse. Volume
I. Genesis. The Birth of the
Eurasian Nomadic Civilization**

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Аннотация

For over two thousand years the Eurasian steppe sustained a civilization without cities or bureaucracy — built on dynasty, alliance, marriage and exchange. Volume I: Genesis traces its birth, from the chariot-builders of Sintashta to the first time a written civilization records its name. Weaving palaeogenetics, archaeology, epigraphy and myth, it introduces the DAEX model and reads the steppe as one of the engines of Eurasian history.

Содержание

List of Abbreviations	8
Acknowledgements	10
Preface	12
One Ancestor, Two Lineages — and the Birth of a Nomadic Civilization	12
I. The Deep Past	14
II. Two Lineages, Two Landscapes	16
III. Encounter and Synthesis	17
IV. Space as a Factor	18
V. The Birth of the System	19
VI. Entry into Written History	20
VII. A New Perspective	21
VIII. What This Book Is About	22
Postscript: On Method	23
Introduction	25
The Problem	26
What the Existing Schools Left Unexplained	29
The Russian School:	31
The Central Hypothesis	32
The DAEX Model	34
Steppe Dynamics as a Complex System	35
The Steppe Institutional Continuum	37
Sources	39

Methodological Limits	40
The Structure of Volume I	41
Chapter 1 — Operational Definitions: Dynasty, Convergence, a Living Model	44
1.1 Dynasty: Not a Throne but a Mechanism	46
1.2 The Principle of Convergence	48
1.3 The DAEX Model: Four Indicators	50
1.4 The Supercomplex Chieftdom	54
1.5 The Kyrgyz Sanjyra:	56
1.6 Sintashta: An Early Crystallization	62
1.7 Limits of Applicability and the Heuristic Character of the DAEX Model	65
1.8 What Remains to Be Tested	68
Conclusions	70
Chapter 2 — Sintashta:	72
2.1 The Country of Towns:	74
2.2 Where the Hierarchy Appears: Burial Practice	78
2.3 The First Pillar: The Horse	80
2.4 The Second Pillar: Metal	83
2.5 The Genetic Picture: Alliance from the First Day	84
2.6 The Third Pillar: Inherited Power and the Eight Roads out of Sintashta	87
2.7 Why Here, and Why So Fast	90
2.8 The Andronovo Fan: The Empirical Skeleton	92

of the First Process	
2.9 Summary	94
Conclusions	96
Appendix to Chapter 2	98
Конец ознакомительного фрагмента.	108

Dynasty. Metal. Horse.

Volume I. Genesis

The Birth of the Eurasian Nomadic Civilization

Omurbek Tekebaev
Kuban Choroiev

*To the memory of the teachers and predecessors who
opened the steppe to us as an object of historical reason.*

*'The steppe does not divide — the steppe connects.
Whoever holds access to the passes and pastures gains
the key advantage in continental communication.'*
— *From the legacy of Eurasian archaeology*

*'...the nameless confederation was for the first time
entering documented history, taking on a configuration;
in the final chapter it received a name — Juanhan.'*
— *Conclusion of Volume I*

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List of Abbreviations

Theoretical concepts

Abbreviation	Expansion
DAEX	Dynasty · Alliance · Exogamy · Exchange — the four-component institutional configuration of the steppe system.
DSKC	Deer Stone–Khirgisuur Complex — a single ceremonial-funerary system, ~1200–700 BCE, from the Mongolian Altai to Eastern Kazakhstan.
IAMC	Inner Asian Mountain Corridor — the mountain-steppe corridor of Inner Asia (the concept of M. D. Frachetti).
BMAC	Bactria–Margiana Archaeological Complex — the Oxus civilization; 2300–1700 BCE.

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Sources

Abbreviation	Expansion
MTZZ	<i>Mu Tianzi Zhuan</i> ('The Life of Mu, Son of Heaven') — a Chinese text of the Western Zhou era, discovered in 279 CE in a tomb at Jixian (Henan province). It contains the first written mention of Juanhan.
Shiji	The <i>Records of the Grand Historian</i> of Sima Qian (c. 145 – c. 86 BCE). Chapter 110 ('Xiongnu liezhuan') contains the first traditionally recognized mention of Gekun.
Hanshu	The <i>History of Han</i> of Ban Gu (32–92 CE). Contains a mention of Jiankun.

Chronological abbreviations

Abbreviation	Expansion
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BCE	Before Common Era.
CE	Common Era.
calBCE	Calibrated BCE — calibrated radiocarbon dates.
ybp	Years before present (1950 as year zero).
TMRCAs	Time to Most Recent Common Ancestor.

Palaeogenetic databases

Abbreviation	Expansion
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FTDNA Discover	FTDNA Discover Haplotree — the public phylogenetic Y-DNA tree (discover.familytreedna.com/y-dna). The primary source for the verification of Y-subclades and TMRCAs estimates.
AADR	Allen Ancient DNA Resource v52.2 / 2.07.40 (Reich Lab, Harvard Medical School). A database of ~15,000 ancient genomes. An independent parallel source for the verification of Y-subclades (the Y_Haplotree_Public field).
ENA	European Nucleotide Archive.

Key Y-DNA subclades (canonical TMRCAs, FTDNA Discover)

Node	TMRCAs	Significance in Volume I
R-Z93	~2650 BCE	Basal for the whole eastern-steppe R1a-Z branch
R-Z94	~2550 BCE	Daughter node of Z93
R-Z2124	~2500 BCE	Daughter node of Z94
R-Z2125	~2400 BCE	Daughter node of Z2124
R-S23592	~2200 BCE	The Orak-Ulus crystallization (Chapter 3)
R-FGC56408	~2150 BCE	The key dispersal node; parent of the Sagsai sibling subclades
R-YP1456	~2100 BCE	Sibling subclade of FGC56408 (sample I7033 at Sagsai, Chapter 5)

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The conceptual architecture of the volume rests on a critical dialogue with the theoretical works of M. D. Frachetti (the concept of non-uniform complexity and of choke points), B. K. Hanks (the concept of non-state complexity), N. N. Kradin (the theory of nomadic empires), C. I. Beckwith (the central role of Central Asia), N. Di Cosmo (the Zhou — steppe relationship) and A.M. Khazanov (the classic analysis of nomadic societies).

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O. Ch. Tekebaev, K. A. Choroev Bishkek — Berlin, May 2026

Preface

One Ancestor, Two Lineages — and the Birth of a Nomadic Civilization

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On a high plateau in the spurs of the Mongolian Altai, where the wind off the glaciers meets the steppe, there stands a stone. It is some three thousand years old. At its top, a solar disc; below, deer drawn out in flight, their antlers turning into the branches of a world-tree; at the base, a belt with a dagger, a bow and the paired hooks of a charioteer.

There are hundreds of such stones, from southern Siberia to Transbaikalia, from Tuva to Semirechye, from the Altai to the Mongolian plateau. They were raised by people who spoke different languages, followed different burial rites and belonged to different genetic lineages. And yet they recognized one another by these stones. They belonged to one world.

This book is about how that world came into being — and about why it cannot be understood if the story begins where it is usually begun: with the Scythians, the kurgans, the classical chronicles. By the time classical authors first wrote down the word ‘Scythians’, this world had already existed for more than

fifteen hundred years.

I. The Deep Past

The history of humankind is most often told as a succession of states, wars and empires; less often as a history of languages and cultures; and almost never as a history of the deep demographic lineages that diverge across space and time, only to meet again tens of millennia later and become the precondition for new forms of society.

Some thirty-five to forty thousand years ago, in the space of Central Asia and southern Siberia, the Y-chromosomal macro-lineage P-M45 takes shape. About thirty to thirty-three thousand years ago two of its great daughter branches diverge within it — R and Q. This was not merely a genetic event: it was a fork in historical trajectories. The bearers of lineage R would in time become one of the key components of the Indo-European world; the bearers of lineage Q would settle, among other places, the New World; and their later reunion in inner Eurasia would become the demographic precondition for a new form of society — nomadic civilization. The oldest known bearer of lineage R is the Mal'ta boy near Lake Baikal, who lived some twenty-four thousand years ago; his genome already combines western and eastern components, forming that Ancient North Eurasian core which would play so great a role in the continent's later history.

But deep genetic antiquity is only the backdrop of this book,

not its plot. Genes here are not an explanation of civilization. They are merely the routes by which people came into the space of a future synthesis; what they built there is explained not by the origin of lineages but by the institutions they created.

II. Two Lineages, Two Landscapes

The fate of a historical lineage is determined not only by origin but by the landscape in which it gains stability.

Lineage R, having taken hold in the steppes and forest-steppes of Eurasia, divided early into R1a and R1b. The R1b branch moved predominantly west, sharing in the formation of the populations of Western Europe. R1a met a more complex fate: one part spread into Eastern Europe, Iran and India, becoming a component of the Indo-Iranian world, while another — the bearers of the eastern branch R1a-Z93 — moved east, into southern Siberia, the Altai and the Sayan. Thus within a single macro-lineage two civilizational vectors arose: in the west and south, the Indo-European world; in the east, the preconditions of a different, autonomous system.

But the picture would be incomplete without the second lineage. Some bearers of Q remained in the Sayan-Altai region, adapting to the mountain-taiga and steppe landscape; others went far to the north-east and, by way of Beringia, reached America, where their descendants became part of the complex societies of the pre-Columbian age. Two lineages that had diverged tens of millennia earlier followed two different historical trajectories — only to meet again millennia later.

III. Encounter and Synthesis

The place of this encounter is the Minusinsk Basin. Here the bearers of the eastern branch R1a-Z93 — linked to the Sintashta — Andronovo circle of the Bronze Age, with its developed metallurgy, chariot technology and military organization — meet the autochthonous population, the descendants of the Okunev world, in which lineages of Q played a significant role.

And a rare historical phenomenon occurs. Not displacement. Not simple assimilation. But synthesis. Recent archaeogenetics records the coexistence of different Y-chromosomal lineages in the same cemeteries, mixed maternal lines, stable exogamy and the prolonged reproduction of an allied structure. This is no longer chance contact — it is the formation of a new institutional model, which we designate DAEX.

DAEX: Dynasty · Alliance · Exogamy · Exchange.

Here a supra-clan system begins to take shape, one able to reproduce itself across vast spaces without cities, bureaucracy or written archives. It must be stressed at once: what is born here is not a ‘new people’ but a new institution. The meeting of lineages is only a demographic precondition; the civilization itself is a configuration of institutions, not a combination of haplogroups.

IV. Space as a Factor

This process unfolds in a particular space: the Sayan — the Altai — the Tian Shan. This is not a border. It is a zone of integration.

European historiography long regarded the steppe as a periphery — an empty space between the ‘real’ centres of history. But Eurasia is built otherwise. The steppe does not divide; it connects. Several great centres of sedentary civilization — the Mediterranean, the Near East, India, China — are joined here by an unbroken belt of steppe and mountain pasture more than eight thousand kilometres long. This is not the margin of the continent but its connective belt.

It is here that the Infrastructure of Speed arises: whoever controls the passes, the pastures and the routes of vertical transhumance gains the advantage in continental communication. A distinctive mobile economy takes shape, based on the seasonal movement of herds between winter valleys and summer highlands — and such an economy demands not only mobility but planning: the coordination of routes, the distribution of resources, the reconciliation of group interests, stable rules of alliance and exchange. Thus a new type of elite arises — one whose power rests not on the control of a city but on the management of space.

V. The Birth of the System

The archaeological expression of this system is the complex of deer stones and khirgisuurs — in international nomenclature, the DSKC. Deer stones sharing a single symbolic language, ritual enclosures, horse sacrifices and a standardized iconography of the elite spread across thousands of kilometres. This is no longer a local culture — it is a macro-system: people of different tribes and lineages begin to recognize one another through a single ritual and symbolic code, and an infrastructure for the reproduction of the steppe elite comes into being.

From this core the model begins to diverge: west, into the Scytho-Saka world; east, into Mongolia and Transbaikalia; south, into the Tian Shan and Xinjiang. In this perspective the Pontic Scythians prove to be not the beginning of steppe civilization but one of its later projections — a reflection of a more ancient eastern world.

VI. Entry into Written History

For most of its early history this world exists without writing. It is visible in archaeology, in burial complexes, in symbolism, in routes, in mobile elites, in archaeogenetic links — but it remains nameless for the written memory of humankind.

This is why the tenth century BCE matters so much. It is then that the steppe world first comes to be reflected in the written tradition of China. In the narrative of the *Mu Tianzi Zhuan* — a complex, many-layered, partly mythologized text about the expedition of King Mu of Zhou — there appears, for the first time, a description of a distant north-western space, of contacts with steppe societies, of the exchange of gifts and of political relations between the Zhou world and the northern steppe. The text would later be reworked and set down anew, but the memory of the northern world is preserved within it.

And if Yu Taishan's hypothesis, linking the name Juanhan with the later forms Gekun and Jiankun, has a historical basis, then before us is one of the earliest written reflections of a world later associated with the ancient Kyrgyz. The present volume does not pass this hypothesis off as a demonstrated fact: it poses it as a research horizon and tests it, step by step, in Chapter 7.

VII. A New Perspective

In this light nomadic civilization appears not as a secondary or ‘parasitic’ form dependent on its sedentary neighbours, but as an autonomous historical system — with its own logic, its own institutional structure, its mechanisms of reproduction, its infrastructure of mobility and its own ideology of space. It was not a periphery of world history. It was one of the great continental systems of Eurasia — a system that endured for millennia, from the Late Bronze Age to the Turkic khaganates and the Mongol empires.

VIII. What This Book Is About

The central question of this work is not only who descended from whom. It is how, in the depths of Eurasia, there arose a system able to shape the dynamics of the continent for millennia.

The present volume is devoted to the moment of that system's birth — from Sintashta to Juanhan; from the first chariot elites to the first written reflection of the steppe world. It is a book about dynasty and metal, about the horse and space, about alliance and exchange, about memory and mobility — about the birth of one of the greatest civilizational systems of Eurasia. Volume I is complete as a self-contained book; the later fortunes of the matrix — its unfolding through the Scythian world, the Xiongnu empire and the Turkic khaganates — are taken up in the subsequent volumes of the trilogy.

Postscript: On Method

The book's approach rests on the principle of convergence: the coincidence of independent lines of evidence — genetics, archaeology, linguistics, climatic history and written sources. No single line is sufficient on its own; preference goes to the interpretation that better explains all the data at once. The detailed operational account of the method is given in Chapter 1.

Three obligatory caveats follow, without which the book's argument may be misread.

First. The use of Y-chromosomal markers here is operational in character and does not imply that worldview models are biologically determined. The markers R-Z93, Q-M120 and others are used as indicators of demographic flows, not as 'codes of culture'.

Second. Ethnographic parallels — with the Kyrgyz *sanjyra*, with the Altai transhumance cycle, with Khakas clan reckoning — function as structural resonators, comparative models of a pastoral logic, and not as proof of the biological continuity of an ethnos across millennia.

Third. Between the Sintashta of the twenty-first century BCE and present-day ethnography lie not centuries of continuity but millennia mediated by migrations, language shifts, political collapses and population restructurings. We trace the continuity of an institutional matrix — DAEX itself — and not of an

ethnos.

This frame holds the book back from two equally dangerous extremes — romantic primordialism and radical scepticism. It does not reduce steppe history to the categories of the state; it grants the steppe its own logic and its own institutions, which worked without a state.

If the reader comes to see in the Altai, the Sayan, the Yenisei and the Tian Shan not a margin but one of the most ancient nodes of world history — then the purpose of this work has been achieved.

The Authors Bishkek — Berlin, 2026

Introduction

Picture a belt of land eight thousand kilometres long.

It runs from the Danube to Manchuria, from Hungary to the Pacific — eight thousand kilometres of steppe, mountain and pasture binding the Mediterranean to China and the Near East to Siberia. For most of the twentieth century this belt was treated as intermediate space: a transit corridor across which waves of ‘barbarians’ periodically rolled, disturbing the repose of the great civilizations. Yet that view leaves one fact unexplained. Across these eight thousand kilometres, over several millennia, structurally similar polities arose again and again — from the steppe confederations of the Bronze Age to the medieval khaganates. What secured this reproducibility?

This book — the first part of a trilogy — addresses the moment at which that institutional form was born, in the era spanning the twenty-first to the tenth century BCE. Archaeogenetic evidence, available only in the past decade, allows steppe Eurasia to be seen differently: not as a periphery, but as one of the principal regions in which alternative forms of social and political complexity took shape. Our concern is with the moment of emergence — the time when its original institutional framework was assembled.

The Problem

The twentieth century viewed steppe Eurasia through a single optic. Steppe societies were interpreted chiefly as migratory pressures bearing upon the agrarian states of the continent (McNeill 1963; Lattimore 1940). ‘Civilization’ was associated above all with the markers of sedentary life — writing, urban infrastructure, monumental architecture, bureaucracy — and nomadic societies, lacking most of these markers, were consigned to the margins.

But Eurasia is built differently from any other continent. The steppe is not a periphery; it is a ligature. Eurasia joins several independent centres of sedentary civilization — the Mediterranean, the Near East, South Asia and East Asia — through an unbroken band of steppe and mountain pasture more than eight thousand kilometres long. This is a unique continental configuration. Steppe zones exist on other continents too — the Great Plains of North America, the South American pampa, the African savannahs — yet none produced anything comparable to the polities of the Eurasian steppe, from the Scythian confederations to the empire of Chinggis Khan. A steppe environment creates the preconditions for mobility, but it does not determine institutional integration. To explain the latter one needs a wider context: the very structure of the Eurasian landmass, in which the steppe served as the connective tissue

between sedentary civilizations.

Yet this wider context lies not only in the extent of the steppe belt as a connecting band. For millennia the space of the Sayan, the Altai, Mongolia and the Tian Shan remained a zone of contact between distinct human flows, economic regimes and cultural worlds. The exceptional position of this region was already noticed in the nineteenth century, when, in the idiom of the day, it was described as a 'frontier' between the Indo-European and East Asian worlds. But where the science of that era saw a line of racial division, the present evidence shows something else — not a boundary between 'races', but a zone of high demographic, technological and institutional turbulence.

Like an atmospheric front, where colliding air masses generate cyclones and new weather regimes, the mountain-steppe belt of Central Eurasia became a space of prolonged interaction between different systems. Here the metallurgical and chariot traditions of the steppe Bronze Age met autochthonous mountain-taiga communities, dissimilar models of mobility, and divergent forms of social organization and exchange. New and durable orders tend, historically, to arise precisely in such contact zones — not within a homogeneous milieu, but at the intersection of flows: demographic, technological, economic, ecological and cultural.

Seen in this light, the Sayan-Altai node appears not as a civilizational backwater but as one of the great generators of historical synthesis in inner Eurasia. It was here that the

environment gradually took shape in which a new institutional model of mobile society could emerge — one able to integrate heterogeneous groups without a single sedentary centre, without urban bureaucracy, and without rigid territorial borders. The earlier schools, to which we now turn, each saw separate facets of this process; to bring them together required both new data and a different analytical language.

What the Existing Schools Left Unexplained

Over the past four decades several approaches to steppe power have taken shape. Each has illuminated an important facet; none has offered a complete mechanism for long-term reproduction.

Thomas Barfield (1989) described steppe empires as ‘shadow’ formations arising in response to the consolidation of sedentary states. This accounts well for the synchrony of the rise of the Xiongnu and the Han, or of the Türks and the Tang; it does not account for the eastern Scythian horizon, which existed before any unified Chinese state. David Sneath (2007) treated steppe societies as aristocratic networks without centralized bureaucracy — capturing the networked character of power (our Alliance component) but not the persistence of a patrilineal core across millennia. Nicola Di Cosmo (2002) emphasized military leadership and the distribution of spoils, explaining the military mechanism of consolidation but not how a confederation survives the death of a charismatic leader. Christopher Beckwith (2009), through the concept of the *comitatus* — the retinue core — illuminated the opening phase of a steppe empire, but not its long-term reproduction. Michael Frachetti (2008; 2012), with his account of ‘non-uniform institutional complexity’ generated by networked interaction in mountain-steppe corridors, supplied the ecological frame but not the internal institutional mechanisms

of durability.

Each theory describes a single aspect: Barfield, dependence on external resources; Sneath, network structure; Di Cosmo, the military mechanism; Beckwith, the retinue principle; Frachetti, the ecological frame. But steppe power endured for more than a thousand years, and no one of these accounts, taken alone, is sufficient to explain reproduction across that depth of time.

The Russian School: A Question without an Instrument

The Russian school of nomadology made decisive contributions to the understanding of steppe societies. N. N. Kradin (1992; 2007; 2020) showed that nomadic empires constitute supercomplex chiefdoms with a stable, reproducible structure. A.M. Khazanov (1994) analysed the dependence of nomads upon sedentary societies. S. G. Klyashtorny, G. E. Markov, V. V. Trepavlov and T. D. Skrynnikova developed key aspects of the political anthropology of the steppe and of the handling of written sources.

One question, however, remained open: do genetic lineages outlive the turnover of political formations? Before the advent of archaeogenetics there was no instrument with which to answer it. Today there is.

The Central Hypothesis

This book examines the mountain-steppe continuum of Central Eurasia — the spatial arc running from the Altai and the Sayan through Mongolia and Dzungaria to Zhetysu, the Tian Shan and the Pamir — through the lens of long-term institutional continuity.



Figure 1. The mountain-steppe continuum and the Inner Asian Mountain Corridor (IAMC · Frachetti): the geographic frame of Central Eurasia, twenty-first to tenth centuries BCE.

The working hypothesis may be stated thus: within the mountain-steppe continuum of Central Eurasia a stable institutional configuration of mobile power was reproduced; durable patrilineal lines of elite succession can be traced within it as one diagnostic indicator — not as its cause, and not as its ethnic content.

The hypothesis is tested against archaeogenetics, archaeology, historical sources, toponymy and the oral epic tradition. The palaeogenetic evidence indicates that, from the Bronze Age to the Early Iron Age, a stable patrilineal line can be traced through the mountain-steppe belt, marking the elite of successive archaeological cultures; alongside it run parallel patrilineal lines of autochthonous origin, integrated into a shared institutional framework. The matrix itself took shape in the course of the Orak-Ulus Synthesis — the meeting of the Sintashta R-lineage with the Okunev multi-lineage confederation on the Yenisei in the seventeenth century BCE (Chapter 3). Its later historical fortunes belong to the subsequent volumes of the trilogy.

The DAEX Model

To describe the mechanisms by which steppe political systems reproduced themselves, we propose the DAEX model; its detailed operationalization is given in Chapter 1. In brief, DAEX names four components of reproduction. Dynasty (D): the reproduction of elite patrilineal lines — the intergenerational transmission of leadership. Alliance (A): confederative unions that integrate heterogeneous groups. Exogamy (E): exogamous marital strategies, yielding high diversity of maternal lines alongside stability of the paternal ones. Exchange (X): institutions for the redistribution of status and resources. Each component is operationalized through concrete indicators (Chapter 1). DAEX is a heuristic instrument, not a final explanation: it helps to show how steppe power actually worked, without claiming to exhaust its complexity.

Alongside DAEX we employ the notion of a tripartite resource base — three linked components of material superiority: the patrilineal dynasty as the institution that reproduces power; mass cavalry and the Infrastructure of Speed as the means of projecting it; and control of the metallurgical macro-system as its economic foundation. If the tripartite formula answers the question of what the steppe elite commanded, DAEX describes how it organized those resources into a durable system.

Steppe Dynamics as a Complex System

Complex systems do not arise by design. They arise at the intersection of conditions: when several factors coincide in time and space, stable yet dynamic forms of organization appear. Steppe Eurasia is precisely such a case.

The notion of a complex system has long been at work in the natural sciences — in physics, for structures born of the interaction of many elements, such as climatic processes and non-linear dynamic media; in biology, for ecosystems and the mechanisms of living self-organization; in hydrodynamics, for atmospheric and oceanic cycles. In all these cases the system is not created by a single controlling centre: it emerges at the intersection of several stable factors and sustains itself. Its distinguishing properties are the capacity to self-organize, to reproduce stable structures, to adapt to its environment and — having broken apart — to re-emerge in a different configuration.

The historical dynamics of steppe Eurasia display exactly this logic. The steppe polities were not a single continuous state: empires vanished, confederations collapsed, languages, elites and self-designations changed. Yet the model of mobile integration was reproduced again and again — in the later volumes of the series we shall see Scythian unions give way to the Xiongnu, the Xiongnu to the Türks, the Türks to the Mongols, while the institutional matrix beneath these successions

persists. This allows nomadic civilization to be regarded not as a sum of migrations but as a pulsing continental system, in which particular states disappear while the mechanism that generates them is retained.

Three factors underlie steppe integration. *Environment* — the continent's unique geography: several centres of sedentary civilization joined by an unbroken steppe belt of mobility. *Institutions* — the confederative forms of power described by the DAEX model. *Energy* — the technological configuration of the steppe world: horse (mobility) plus metal (military force) plus dynasty (the reproduction of elites). When the three coincide, supra-regional political systems form, capable of rapid expansion. When external conditions or internal parameters change, such systems may disintegrate, transform or pass into another state — but the mechanisms of their formation, as a rule, do not vanish entirely. They may be reproduced anew wherever similar conditions arise.

In this perspective the historical dynamics of the Eurasian steppe belt take on a different aspect. They are not a series of disconnected episodes of 'barbarian invasion', but the pulsing dynamics of a continental system in which particular states disappear while the institutional matrix is preserved. This formula is tested against the empirical material in Chapters 2 — 7; its fuller articulation — the model of the Pulsing Core — belongs to the subsequent volumes of the trilogy.

The Steppe Institutional Continuum

This brings us to the central concept of the study. The Steppe Institutional Continuum is the ensemble of reproducible institutions of mobile power: patrilineal dynastic lines, allied confederations, exogamous marital strategies and exchange networks. Across diverse historical epochs these institutions enabled the societies of the Eurasian steppe to form similar types of supra-regional political system. The concept of a continuum stresses not the continuity of particular polities — which arose and dissolved — but the durability of the institutional matrix that made it possible to create them anew.

In this perspective the history of the Eurasian steppe is not a series of disconnected episodes. It is a prolonged process of reproduction of a distinctive institutional matrix of mobile societies, formed within the mountain-steppe continuum of Central Eurasia. Institutional continuity, in this sense, requires not one condition but three at once: the persistence of a patrilineal stem marking the elite in the palaeogenomic samples of successive archaeological cultures; the continuity of an ecological niche — the Inner Asian Mountain Corridor (IAMC; Frachetti) that sustains the economic cycle; and a working mechanism for the transmission of institutional memory — genealogical traditions, epic and rite. The varied trajectories along which these conditions were maintained or broken in

different regions of the Eurasian steppe form a separate theme of the later volumes.

Sources

The study draws on six types of source: palaeogenetic data (Y-chromosomal and autosomal); archaeological assemblages; historical sources in Chinese and Old Turkic; toponymic data; palaeoproteomic data; and the oral epic tradition, above all the Manas epic. Its theoretical foundation is the concept of non-uniform complexity (Hanks & Linduff 2009; Frachetti 2012), whose key idea is that different aspects of social organization may develop asynchronously. The absence of writing is not evidence of ‘primitiveness’; it indicates a different configuration of complexity, one in which mobility and oral tradition perform the functions of coordination.

Methodological Limits

Any analytical model must know its own boundaries.

Genetic data do not, in themselves, prove political continuity. The use of Y-chromosomal markers here is operational in character and does not imply that worldview models are biologically determined; Y-DNA lineages are treated solely as indicators of patrilineal continuity and demographic structure, and they acquire historical meaning only in combination with archaeological context, written sources and ethnographic parallels.

Archaeological cultures are not equated with ethnic communities: a culture is an analytical construct of the researcher, not the self-description of an ancient society. The DAEX model, the Pulsing Core and the Steppe Institutional Continuum are heuristic instruments, not final explanations. Ethnographic descriptions record the traditional practices of nomadic societies; the authors neither evaluate them normatively nor treat them as proof of biological continuity.

The interpretation offered here does not claim to give a final account of the full complexity of the historical processes of steppe Eurasia. Its purpose is to set a new analytical frame for discussion and to stimulate further interdisciplinary research.

The Structure of Volume I

Volume I — the first book of the trilogy *Dynasty · Metal · Horse* — is devoted to the formation of the institutional matrix of steppe civilization. It is conceived and completed as a self-contained intellectual work: the reader should close it with a sense of completeness, not of fragmentation. The later fortunes of the matrix thus formed are the material of the subsequent volumes — Volume II, *Integration*: the Scythian macro-system and the first Eurasian integration; and Volume III, *Imperium*: the imperial phase of steppe civilization — the florescence and transformation of the steppe empires across Eurasia.

Seven chapters, one hypothesis, six tests.

Chapter 1 sets out the operational definitions. What is a dynasty in a society without a state? What does the ‘principle of convergence’ mean? Why is the Kyrgyz *sanjyra* a palimpsest rather than proof of continuity?

Chapter 2 — Sintashta: how a model of power was kindled and scattered. At Kamennyy Ambar 5 the three pillars — Horse, Metal, Dynasty — crystallize early, within an already multi-lineage milieu.

Chapter 3 — the Orak-Ulus Synthesis: the meeting of two worlds. In the Minusinsk Basin of the seventeenth century BCE — the biological anchor of the whole trajectory of Volume I — the Okunev multi-lineage confederation receives the Sintashta

R-lineage as one of the many components of an already existing system.

Chapter 4 — Ideology: the birth of a calendar, a cult and a formula of power. The ideological package is the fourth dimension of the model. Without it, the DAEX matrix remains social mechanics; with it, it becomes a reproducible institutional system.

Chapter 5 — Spatial expansion: the birth of the Unnamed macro-system. The Sagsai horizon of the fourteenth to ninth centuries BCE in the Mongolian Altai; the translocal infrastructure of the deer-stone — khirgisuur complex (DSKC) as a ritual frame; documented horse mobility of up to eight hundred kilometres.

Chapter 6 — the Peng polity: how steppe power operated without armies or borders. A frontier mechanism for translating the institutional model into the sedentary world — steppe rite in burials where there are no steppe genes.

Chapter 7 — Written attestation: entry onto the historical stage. The tenth century BCE. For the first time a steppe macro-confederation receives a name in a written source — a Chinese narrative of the expedition of King Mu of Zhou.

The Conclusion synthesizes the argument of Volume I — the moment of the system's birth and its first written attestation — and states what is directly demonstrated, what is reconstructed, and what remains hypothesis. Volume I also includes the Appendices to Chapters 2—7 (palaeogenetic datasets and the

Western Zhou epigraphic dossier), the Bibliography and the List of Abbreviations.

The question tested across all seven chapters is not who inhabited the steppe in different epochs. It is how power was reproduced under conditions of high mobility and in the absence of stable state structures. The answer begins with the theoretical frame of Chapter 1 — and then with a single town in the southern Urals that lasted only eighty years, yet changed the course of steppe history.

Chapter 1 — Operational Definitions: Dynasty, Convergence, a Living Model

'Kinship-based systems of authority provided a durable framework through which leadership and political influence could be transmitted across generations.'

— M. D. Frachetti, *Differentiated Landscapes and Non-Uniform Complexity*, 2009: 25

In 2019 the journal *Science* published a table: more than five hundred ancient genomes, hundreds of rows, dozens of columns. An exemplary product of large-scale palaeogenetics — and almost no one noticed that a seven-century-long story lay hidden inside it.

One and the same patrilineal line — one — surfaces in three cemeteries separated by a thousand kilometres of terrain and six hundred years of time: in Central Kazakhstan at the start of the second millennium BCE, on the Yenisei in the age of the Orak-Ulus Synthesis, and in the Mongolian Altai at the close of the second millennium (see the Appendix to Chapter 2). Between the extreme points lie changes of landscape, of culture and of epoch. And running across all of it, an unbroken chain of male heirs.

And at the very heart of this chain, at Orak-Ulus, a second

observation, stranger still: three different male macro-lineages lie in one cemetery, buried with equal honours.

What is this — a family? A tribe? An alliance? Or an institution for which we do not yet have a familiar name?

This chapter answers the question. It does not describe the past; it sharpens the tools with which we shall work on concrete material in Chapters 2—7. Three tasks are accomplished here: to introduce an operational concept of ‘dynasty’ applicable to societies without a state; to formulate the principle of convergence as a method of testing; and to show how Kyrgyz ethnography functions in our study not as proof but as a comparative model.

1.1 Dynasty: Not a Throne but a Mechanism

The word ‘dynasty’ drags palaces, crowns and royal succession in its wake. We use it otherwise — without a palace, without a bureaucracy, without a throne.

In our terminology a *dynasty* is a reproducible system of inherited leadership in non-state societies. Four features distinguish it from an ordinary lineage structure:

1. Status and power are transmitted along patrilineal lines.
2. Succession is fixed ritually and materially — elite burials, standardized grave goods, horse sacrifices.
3. The integration of heterogeneous groups is secured through exogamy and confederative ties.
4. Power is sanctified by an ancestor cult and by a bond with sacred landscapes.

This is an analytical category, not a metaphor. Steppe societies worked out a concrete, empirically traceable mechanism for the transmission of power across generations — one that can be described, tested and contested should the data come to contradict it. It is this mechanism, and not a general discourse about ‘nomadic chieftains’, that concerns us from Chapter 2 onward.

And here a caveat that will accompany us throughout the volume. Y-chromosomal lines function as an *indicator* of a

dynasty but are not equivalent to it. Power on the steppe was often collective, and the dominance of a single male line in elite burials may have a purely social explanation — adoption into a lineage, consolidation around a charismatic founder, a founder effect in a small population. Genetics alone is insufficient for an inference of dynasty. Convergence is required.

1.2 The Principle of Convergence

No single type of evidence proves the existence of a dynasty on its own.

Genetics does not prove it: a recurring line may be chance. Archaeology does not prove it: a standardized rite may reflect a cultural style rather than an institution of power. Epic does not prove it: genealogical formulae may turn out to be a late literary construction. Nor do written sources: a foreign chronicler may err, or may describe another society in his own categories.

But if all four lines point in the same direction within a single archaeological context, that is no longer coincidence.

The principle of convergence. One hypothesis + four independent strands of evidence: archaeology · palaeogenetics · epigraphy · ethnography.

When these lines converge, the alternative explanations for each taken separately grow weaker. In the philosophy of science this is called multiple-line consistency — and it is, as a rule, the most that can be achieved in work on the deep past. It is not a formal Popperian refutation of null hypotheses; we do something more modest — we show that the body of evidence is consistent with the model better than with the known alternatives.

The principle works in the opposite direction too. If a line recurs across three cemeteries but the rite differs in each, the sources are silent, and the epic carries only general mythological

motifs, then what we have is not a dynasty but simply an isolated patrilineal succession without institutional correlates. Convergence filters out such cases. It is a filter that forbids strong conclusions from a single line of evidence.

What this means. Each separate clue — a kurgan, a genetic line, a line of chronicle, an epic motif — admits a dozen readings. It becomes a signal only when four clues point to a single spot.

1.3 The DAEX Model: Four Indicators

Announced in the Introduction as a general concept, the DAEX model requires operationalization — the translation of each of its four components (Dynasty, Alliance, Exogamy, Exchange) into a concrete empirical signature that can be sought in the material.

A methodological boundary, at once. What follows is not a set of formal thresholds for statistical falsification, but working operational criteria: guides that help to recognize, in fragmentary data, configurations consistent with the model, and to mark where the data contradict it. A full statistical verification of DAEX would require a separate population-genetic study — with its own sampling design, null distributions, and modelling of drift, bottlenecks and selection biases. That task lies beyond the present volume.

The four indicators of DAEX. **D** — the recurrence of a limited set of Y-lines in elite burials across several generations. **A** — the coexistence of several Y-haplogroups of equal status in the elite cemeteries of a single culture. **E** — high diversity of maternal DNA alongside stability of the paternal lines. **X** — the standardization of prestige artefacts across large territories; isotopic traces of long-distance movement.

The DAEX Model

four independent indicators and their alternative explanations · the principle of convergence (§1.3)



Figure 2. The DAEX model: four indicators and their alternative explanations. The principle of convergence (§1.3).

Dynasty looks for the same limited set of Y-lines in the elite burials of connected contexts across generations. We have already seen it: the patrilineal trunk through three Bronze Age cemeteries, traceable over some seven centuries (Chapter 3). But the same pattern is also compatible with a founder effect, with sampling bias, and with consolidation around a charismatic leader in the absence of a formal dynasty. The indicator works only with a sufficient sample, reliable stratification in time, and a comparable context.

Alliance looks for bearers of different Y-haplogroups in

a single elite cemetery of one culture — with comparable constructions, grave goods and ritual, that is, of equal status. We shall find it both at Sintashta's Kamennyi Ambar (Chapter 2) and at Orak-Ulus (Chapter 3). The alternatives: non-contemporaneous use of one site, ritual proximity without political integration, background population structure in place of an institutional alliance. The indicator demands demonstrated contemporaneity and an assessment of status comparability, not the mere fact of proximity.

Exogamy looks for high diversity of mitochondrial DNA alongside stability of the Y-lines in the same contexts — a pattern we shall meet in the Sintashta — Okunev zone among the R-, Q- and N-lines (Chapters 2—3). But the same picture may be mere patrilocality without a formal rule, a demographic fluctuation in the female lines, or multiple sources of wives outside any institutional structure. The indicator requires comparable mtDNA and Y samples from shared contexts and a comparison with the regional background.

Exchange looks for the standardization of prestige forms across large territories, imports in elite burials, and isotopic traces of long-distance movement. The alternatives: military seizure rather than exchange, the concentration of craft in a single centre, ritual diffusion, elite imitation of foreign styles. The indicator requires a context that distinguishes exchange from plunder, and a chronology that excludes imitation.

The strength lies not in any single indicator but in their

coincidence. When, within one context — one culture, one phase, one zone — the recurrence of patriline, the equal-status coexistence of haplogroups, maternal heterogeneity alongside paternal stability, and long-distance exchange are observed at once, the alternative explanations for each signal weaken in the light of the rest. Strong convergence within a single context lends the model conditional support in that case; convergence repeated across several independent contexts gradually builds its weight — but never to the level of formal proof.

To forestall misunderstanding, let us mark out the four boundaries of the frame. DAEX makes no claim to universality: Sneath's headless societies and Frachetti's non-uniform networks may prove more economical for other contexts — it is one analytical lens, not the single correct one. DAEX makes no claim to finality: the model remains a heuristic, open to revision. DAEX makes no claim to mono-causality: founder effects, drift and selection biases are real, and are taken into account at each application. And DAEX has ecological limits: the model is to be expected in mountain-steppe mobile-pastoral environments with a specific profile of demographic pressures — beyond them its predictive power falls sharply. Within those limits it remains a methodologically disciplined operational heuristic — that which can be done at all with evidence of the deep past of steppe Eurasia.

1.4 The Supercomplex Chieftdom and the Micro-Mechanisms

DAEX does not arise in a vacuum. Over half a century the Russian school of steppe studies — Kradin, Khazanov, Markov, Klyashtorny, Kychanov, Trepavlov, Skrynnikova — accumulated the key observations. The most important belongs to Kradin: steppe polities occupy an intermediate position between chieftdom and state. They possess a multi-tiered hierarchy and mobilize thousands of warriors — yet they create no permanent bureaucratic apparatus. Kradin named this form the *supercomplex chieftdom*, and it remains the most parsimonious description of the steppe political form.

Bound up with it is a thesis central to our work.

The socio-political organization of nomadic empires ‘changed little in its essentials from Xiongnu times’ — from the Xiongnu through the Xianbei, the Türks and the Uyghurs to the Mongols, one and the same institutional matrix was reproduced. — N. N. Kradin, 2020 [*trans. ours*]

This thesis of the structural recurrence of the matrix the present work takes as its point of departure — and tests against palaeogenetic material. With one essential caveat: the object of study is not ‘continuity’ in any essentialist sense, but the reproduction of a *type of configuration* under stable ecological

and demographic pressures (see §1.5).

Here too runs the line between Kradin and DAEX. Kradin described the macro-structure — what is visible from outside: scale, hierarchy, mobilization. DAEX uncovers the micro-mechanics of its everyday reproduction: Dynasty explains how an elite survives the turnover of generations; Alliance, how a confederation holds together without bureaucracy; Exogamy, how new groups are drawn in; Exchange, how resources are distributed. Kradin answered the question of *what* is reproduced. We propose an answer to the question of *how* — and palaeogenetics for the first time allows this internal mechanics to be tested against the material of millennia. Khazanov's observation (1994) of the dependence of nomads upon sedentary societies DAEX does not reject but supplements: internal institutional mechanisms held steppe polities together even when contact with the sedentary world fell to a minimum.

1.5 The Kyrgyz Sanjyra: Palimpsest and Comparative Model

Methodological frame of this section. The Kyrgyz ethnographic material functions here as a comparative analytical model, supplying a vocabulary for interpreting the fragmentary data of the Bronze and Early Iron Ages. It is not proof of three thousand years of biological or ethnic continuity. The epistemic position of Volume I: the sanjyra is a palimpsest — a multi-layered, historically reworked institution, not a *fossilised survival*; resemblance is not inheritance but the structural resonance of reproducible functional responses.

If the hypothesis of a Steppe Institutional Continuum is correct, its traces should appear not only in kurgans and genomes but in living traditions. The Kyrgyz genealogical tradition — the *sanjyra* — is the first candidate for the role: its documented depth is impressive, and its living practice makes it a convenient object. But before entrusting it with any analytical function at all, one must say honestly what it can and cannot do.

The sanjyra in its present form is not an original structure that has come down untouched through millennia, but a historically reworked institution. Its present configuration is shaped by at least six layers, which accumulate like a palimpsest (oldest at the base):

1. Turkic (early medieval) — *ata, ene, aga, ini*; the Orkhon formulae.
2. Islamic (from the tenth — eleventh centuries) — *nasab, silsila*, the sharia norms of inheritance.
3. Chinggisid (from the thirteenth century) — a model of dynastic legitimation.
4. Imperial Russian (nineteenth century) — administrative stabilization through the ‘Steppe Statute’.
5. Soviet (twentieth century) — ethnographic fixation in the categories of clan and tribe.
6. Post-Soviet (after 1991) — a national-identitarian reconstruction.

The Turkic layer is discernible in the Orkhon inscriptions honouring Kül Tegin and Bilge Qaghan, with their developed patrilineal legitimation; the Islamic layer brought Arabic — Persian conventions of genealogy and the technique of chains of transmitters; the Chinggisid layer, a model of legitimation through descent (the Kyrgyz did not advance it through their dominant line, but structurally it shaped the whole zone); the imperial Russian layer fixed the clan-tribal division within the legal field of the ‘Steppe Statute’ of 1822; Soviet ethnography at once recorded and stabilized the *sanjyra* — what we now call by that name is in large part its product; and the post-Soviet revival already rests on those Soviet records. Between the *sanjyra* of the ethnographer of the 2020s and the Bronze Age steppe there lie, then, three thousand years of historical work — migrations,

language shifts, political collapses, population restructurings. Any statement of the form ‘this institution worked for three thousand years’ is empirically incorrect. What is documented is not the preservation of a form but the maintenance of a certain *type* of institutional functionality.

And it is in this — comparative — capacity that the Kyrgyz material retains its value. It shows how a complex genealogical-political system can work in a mountain-steppe environment without a sedentary bureaucracy, and it displays a distinct structural resonance with the four components of DAEX. The resonance is not abstract: Kyrgyz kinship terminology gives each component a concrete institutional body. The patrilineal vertical (Dynasty) is held by categories such as *ata-jurt*, the ‘father’s homeland’, the clan as primary identity. Alliance is inscribed in a person’s threefold clan membership — the father’s clan, the clan of the mother’s brother (*taga-jurt*), the clan of affines (*kayyn-jurt*) — in which the mother’s brother holds a special, ritually protected position. Exogamy is upheld by the prohibition of intra-clan marriage to the seventh generation and by the institution of *kuda* — the relationship between clans created through marriage, which turns an individual union into a structural inter-clan compact (direct parallels: Mongol *khuda*, Kazakh *quda*). Exchange is encoded in the kinship categories themselves: *jeen*, the sister’s son, physically embodies the outcome of a past inter-clan marriage. To these four the Kyrgyz system adds a fifth dimension — fictive kinship (*ökül-*

ata, the sponsor-father), formalizing alliances between unrelated clans, with parallels in Mongol *anda* and Turkic *atalyk*.

Three caveats matter. First, we treat these categories *functionally* — by what they do, what obligations they generate — and not etymologically. Second, the Kyrgyz case is not unique: structurally parallel categories are attested among the Mongols, Buryats, Tuvans, Kazakhs and Tibetans; the choice of Kyrgyz material is dictated by the completeness of its documentation, not by any exceptionality. Third, the patrilineal focus of the *sanjyra* is an analytical property of the source, not the whole of social reality: alliances and exogamous strategies were often organized precisely by women as intermediaries, and their invisibility in formal genealogy is an artefact of the source, not of the society.

Why the resonance is possible at all is a question not of ‘mysterious continuity’ but of ecology. Seasonal vertical mobility requires the synchronization of the movements of several groups across a shared territory, and without a bureaucracy this can be coordinated only through personal and genealogical networks. A low-bureaucracy environment without capitals or written law throws legitimacy back onto oral genealogy. Military and climatic threats — the *jut* (catastrophic winter die-offs), raids, border conflicts — exceed the strength of a single lineage and constantly push toward multi-tribal alliances. And in medium-density pastoral populations the biological necessity of avoiding inbreeding coincides with the political necessity of alliances,

making marriage at once a genetic and a political instrument. The combination of these pressures makes a certain configuration of institutions — patrilineal genealogies with confederative superstructures, exogamous rules, obligations of exchange — functionally probable and durable for as long as the ecological niche persists. When the niche disappears — sedentarization, the destruction of the pastoral system, imperial infrastructure, urbanization — the configuration breaks down or is transformed. Resemblance, then, is not inheritance but a structural pattern that any mobile-pastoral population in a similar niche tends to reproduce.

The same holds for the epic. The *Manas*, as recent scholarship shows (Reichl 2000; Prior 2013; van der Heide 2008), is not a static corpus but a living tradition regenerated in each generation (the canonical recensions of Sagymbai Orozbekov and Sayakbai Karalaev passed through Soviet philological and national-epic processing). Genealogical legitimation, inter-clan integration and obligations of exchange can be read in it — but as a structural resonance that any rich epic from a comparable environment can provide, not as the codification of a matrix three thousand years old.

Finally, the genetics of living bearers. The concentration of certain subclades in the Kyrgyz sample of the *Kirgiz DNA Project* (FTDNA Discover) is real, but this is a volunteer consumer-testing database with self-selected participants: any concentrations within it carry selection bias and are not

statistically representative. Such data generate hypotheses for future randomized studies — but they do not confirm continuity. The corresponding observations on particular descendant subclades belong to the subsequent volumes, where they are treated with the proper discipline.

What this means. The sanjyra is not evidence of three thousand years of continuity but a comparative model: an example of how a complex genealogical-political system can work in a mountain-steppe environment. The resemblance of ancient and modern institutions is not inheritance but the reproduction of functional responses to stable ecological pressures. When the environment changes, the institution disappears with it.

1.6 Sintashta: An Early Crystallization

Around 2100—1800 BCE, in the southern Trans-Urals, dozens of fortified settlements with a single circular plan arise within an area of less than two hundred square kilometres. This is Sintashta — not the ‘homeland’ of steppe civilization but one of the earliest contexts in which the three elements of the system’s energetic base — horse, metal and patrilineal dynastic succession — are first attested in a stable combination. An early analytical site, not a final confirmation; the detailed treatment is in Chapter 2.

Sintashta is one of the most debated phenomena of the Eurasian Bronze Age: it is read as an early chiefdom with proto-urban infrastructure (Anthony 2007; 2009), as a fortified response to climatic deterioration (Hanks et al. 2007; Hanks & Linduff 2009), and, more cautiously, as a set of specialized craft-and-burial centres (Epimakhov 2023). These readings need not exclude one another; for our purposes it is enough to register the structural features consistent with DAEX and their chronological priority.

Horse here means specifically chariot power, not mass cavalry — and the caveat is fundamental to the whole chronology of the volume. The military use of the horse through the chariot is only the first stage; mounted warfare will come at the close of the second millennium, the mass cavalry army in the first

millennium BCE. The spread of the domestic lineage DOM2, on the latest evidence dating to about 2200 BCE on the Lower Volga (Librado et al. 2021; 2024), makes Sintashta rather an *integration node* — a place where the DOM2 phenotype met the chariot complex and the metallurgical infrastructure. *Metal* is represented by a specialized production far exceeding household craft and embedded in the Circumpontic-steppe metallurgical province (Chernykh); the quantitative parameters of the workshops are given in the Appendix to Chapter 2. *Dynasty* shows through in the elite cemetery of Kamennyy Ambar 5, where the dominance of the Y-line R1a-Z93 is combined with a high diversity of maternal DNA — the first case in which all four DAEX indicators converge in a single context (the full sample, with coverage thresholds, in the same Appendix).

But Sintashta is not a mono-lineage society. Kamennyy Ambar 5 shows the coexistence of several paternal lines (R1a, R1b and Q), and this matters more than it seems: the Alliance component is observable already in the earliest attestable phase of the system. The confederative configuration is not a later invention but a structural feature of the Sintashta horizon itself. Hence the frame for Chapter 3, where the Sintashta R-Z93 fan will meet, in the Minusinsk Basin, an autochthonous Okunev population already complex and multi-lineage. The working hypothesis we shall test: Okunev society was already an established confederative system, and the Sintashta R-line

entered it as one of many components. Should this reconstruction withstand testing, it will strengthen the principal methodological conclusion: the DAEX configuration is not an 'invention' of Sintashta but a structural pattern recurring in the mountain-steppe environment as a functional response to stable ecological pressures.

1.7 Limits of Applicability and the Heuristic Character of the DAEX Model

The DAEX model (Dynasty — Alliance — Exogamy — Exchange) proposed in this study is not regarded by the authors as a universal law of historical development or as an exhaustive explanation of all forms of social and political organization in Eurasia. The model is heuristic in character and is intended above all for the analysis of societies in which the following features are stably present:

- a high mobility of elites;
- a significant role for inter-lineage and inter-dynastic alliances;
- exogamous mechanisms of integration;
- the functioning of extended exchange networks;
- a limited role for stable urban and bureaucratic infrastructure.

Within this study DAEX is understood not as an exclusive property of steppe societies but as a particular configuration of integrative mechanisms in which networked forms of connectivity play a system-forming role.

Individual elements of the model — dynastic succession, allied relations, marital strategies and exchange — are also found in the sedentary and semi-sedentary states of Eurasia, including Turkic, Islamic and mixed imperial systems. In such

societies, however, these elements usually coexist with other, dominant mechanisms of spatial and political integration — bureaucratic administration, urban centres, a fiscal system, written governance, a territorially fixed apparatus of power.

In early and classical steppe societies the situation was otherwise. Under conditions of low population density, high mobility and vast distances, it was precisely dynastic ties, allied networks, marital exogamy and exchange that performed not an auxiliary but a largely structure-forming function. In this sense the DAEX model describes above all a type of prevailing integrative logic, rather than a unique set of exclusively steppe institutions.

The authors also proceed from the principle that the presence of archaeogenetic continuity does not in itself prove the existence of political institutions, statehood or cultural identity. Genetic data are considered solely in combination with archaeological, spatial, cultural and textual sources. Archaeogenetics can point to the durability of demographic and elite lines, but the interpretation of their political and institutional significance always remains probabilistic and requires interdisciplinary verification.

It should be borne in mind that individual phenomena interpreted within the DAEX framework may also admit alternative explanations bound up with ecological conditions, military necessity, technological change, local cultural traditions or the particularities of specific historical situations. The model

therefore makes no claim to a final explanation of all the processes of steppe history.

Of particular interest for further research are those societies and periods in which the DAEX components are partially expressed, transformed or absent altogether. Such cases matter not as exceptions refuting the model but as a necessary condition for testing its boundaries and analytical applicability.

DAEX is thus proposed not as a finished, dogmatic construction but as a working interdisciplinary model for the comparative analysis of the mechanisms of mobile integration in steppe and steppe-related Eurasian systems.

1.8 What Remains to Be Tested

The theoretical apparatus is ready. The DAEX model is operationalized through concrete indicators; the principle of convergence sets the method of testing; the Kyrgyz tradition shows how such institutions work in living practice; the idea of a Steppe Institutional Continuum sets the scale. The key question remains: can the stable mechanisms of the reproduction of elite power be *empirically* attested in the non-state societies of steppe Eurasia?

The chapters that follow test this hypothesis six times in succession, each on its own material. Chapter 2 will show how the Sintashta ‘social reactor’ crystallized the three pillars in a multi-lineage milieu. Chapter 3 — how, in the Minusinsk Basin, this framework met the Okunev confederation and gave rise to a proto-Scythian community with the synchronous diversification of R1a and Q. Chapter 4 reconstructs the ideological synthesis — the fourth dimension, without which DAEX remains social mechanics and with which it becomes a reproducible institutional system. Chapter 5 will trace the spatial expansion of the model beyond Minusinsk — into the Altai, Tuva and Western Mongolia — and its materialization in the complex of deer stones and khirgisuurs. Chapter 6 will reveal the mechanism by which the model was translated into the sedentary world on the northern frontier of Zhou — steppe rite where there are no steppe genes.

And Chapter 7 will fix the moment when the confederation first receives a name in written history.

Six successive tests of one hypothesis. The instruments are ready — it is time to use them. We begin at the fortified walls of Arkaim and Sintashta, the place where horse, metal and inherited power first converge in a single archaeological configuration. That place lasted only eighty years — but what was created within its walls would prove a functional matrix to which steppe polities would return for centuries.

Conclusions

1. The dynasty is defined operationally — as a reproducible system of inherited leadership with four features: the patrilineal transmission of status, the ritual-material fixing of succession, exogamous integration, and sacral legitimation.

2. The principle of convergence is the principal method of verification: an inference of dynasty arises only when independent lines of evidence coincide (archaeology + palaeogenetics + written sources + ethnography).

3. Each DAEX component is operationalized through a working indicator — with explicit alternative explanations and limits. This is an operational heuristic, not a formal procedure of refutation; full statistical verification is a task for a separate study.

4. DAEX uncovers the micro-mechanics of the supercomplex chiefdom (Kradin 1992; 2007; 2020): the macro-structure is what is seen from outside; DAEX is what works within.

5. The Kyrgyz sanjyra is a palimpsest of six historical layers and a comparative model. Its structural resonance with DAEX is explained by the ecological pressures of the mountain-steppe environment, not by ‘mysterious continuity’; the material does not prove continuity, but it supplies an analytical vocabulary for reading fragmentary data.

6. Sintashta is an early context for the crystallization of the

three pillars in an already multi-lineage milieu (R1a + R1b + Q). The confederative configuration is a structural feature of the horizon itself, not a later invention.

7. A ring composition with Chapter 7. The operationalization of DAEX developed here closes in the volume's finale, where the model receives its first written-attested test. Volume I is built as an ascent from a theoretical model (Chapter 1), through its archaeological correlates (Chapters 2—5) and the frontier mechanisms of translation (Chapter 6), to the first documentary attestation (Chapter 7).

Chapter 2 — Sintashta: How a Model of Power Flared and Scattered

'The Sintashta phenomenon demonstrates an early form of complex elite organization in which control over mobility, metal, and the mechanisms of inherited status played a key role.'

— *B. Hanks & K. M. Linduff, Social Complexity in Prehistoric Eurasia, 2009: 29*

Around 2100 BCE, in the interfluvium of the Ural and the Tobol, on a narrow strip of the southern Urals steppe, something without direct analogue occurred. Within an area of less than two hundred square kilometres there arose dozens of fortified settlements with an identical plan: ring walls, radial building, an empty central square — as if someone had drawn a diagram of the cosmos upon the steppe. Nearby, elite kurgans with chariots and mass horse sacrifices; a little apart, metallurgical workshops smelting ore from nine different sources.

And the strangest detail: all of it lasted no more than eighty years — three generations — and was abandoned. But in those three generations a configuration took shape here that went east at once and unfolded fanwise as far as Xinjiang. This chapter is about how that became possible — and about the eight parallel

dynastic lines that left this place, each with its own fate over the millennia to come.

Before entering the material, a brief caveat on method. Ancient DNA speaks directly only of a few things: the population a person came from, the male and maternal line to which they belonged, whether they were closely related to a neighbour in the grave, whether populations mixed and in what proportion. Institutions, chains of command, treaties and rituals it does not show — these are reconstructed at the junction of genetics, archaeological context and comparative analysis. So when we say that ‘Sintashta crystallized three pillars of power in a multi-lineage milieu’, this is not an inference from a single table but the convergence of several lines: the diversity of male lines in one cemetery, architectural standardization, the concentration of chariots in elite kurgans, and the chronological compression of the whole phenomenon. The phrase ‘is consistent with the hypothesis’ is here not a stylistic figure but the boundary between fact and reconstruction. And one thing more: aDNA samples are always incomplete — a whole millennium is read from a few hundred bones (exact sample sizes in the Appendix to Chapter 2).

2.1 The Country of Towns: An Architecture of Power without a State

The Sintashta culture occupied a narrow strip in the upper reaches of the Ural and the Tobol — a small region where three things happened to coincide: pastures, outcrops of copper ore, and a crossroads of steppe corridors. Archaeologists have counted here more than two dozen fortified settlements, gathered in the literature under the name ‘Country of Towns’: Arkaim, Sintashta, Kamennyi Ambar, Ustye, Alandskoye. Their plan is strikingly uniform — a circle, oval or rectangle, one or two ring walls with a ditch, radially arranged dwelling-sectors, and an empty square at the centre. The settlements are small, of a few hundred people.

The 'Land of Towns': the Sintashta Culture

the Southern Trans-Urals · XXI-XVIII c. BCE

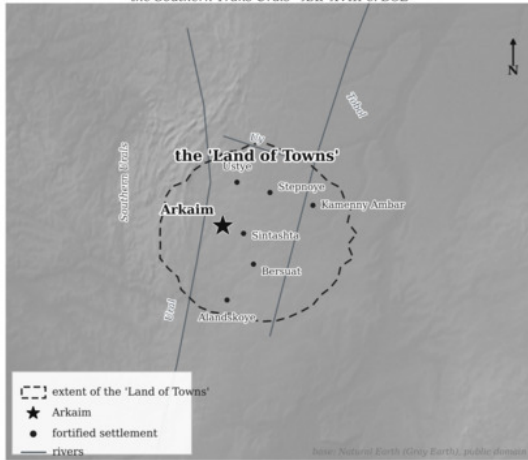


Figure 3. The 'Land of Towns': sites of the Sintashta culture in the Southern Trans-Urals, twenty-first to eighteenth centuries BCE (§2.1).

Best excavated of all is Arkaim: two concentric rings of dwellings divided by a radial street, rammed-earth walls several metres thick, a ditch. And a characteristic detail — a metallurgical furnace is built into each dwelling. Metallurgy here is no royal monopoly and no centralized craft, but a distributed practice: the technology of turning ore into metal is available to every household. This is the picture of a society in which technical knowledge is widely diffused, but its application in the prestige register — weapons, ornaments, ritual objects — is held

in the hands of an elite.

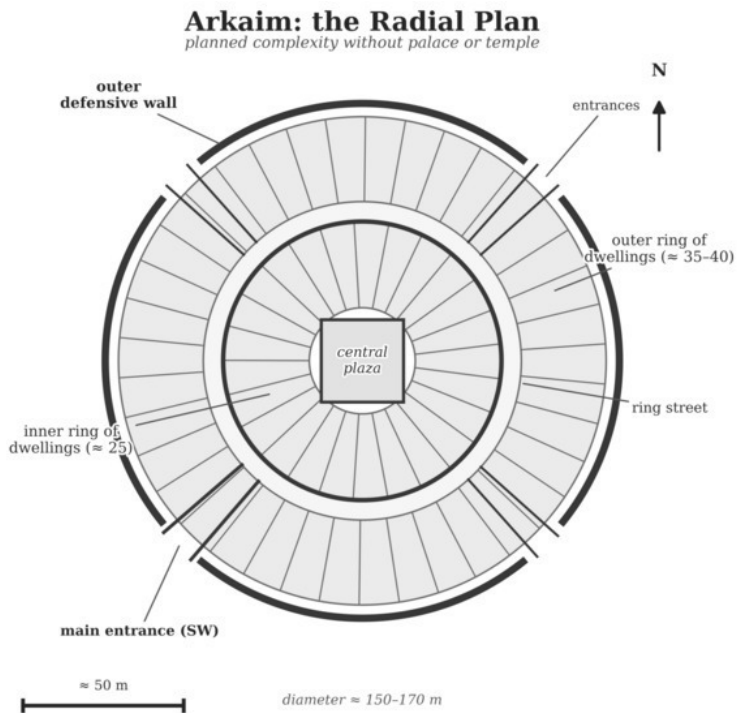


Figure 4. Arkaim: the radial plan — planned complexity without palace or temple (§2.1).

The ‘Country of Towns’ is not a country of towns in the usual sense. No palaces, no temples, no writing, no bureaucracy; the dwellings are of one type, and no sharp property hierarchy is

visible within a settlement. But the scale of the fortifications speaks of a capacity to mobilize large collective labour, the single plan of a common architectural and cosmological canon, and the burial asymmetry of a clear hierarchy of status. Archaeologists call such a form a *complex chiefdom*: the status of the elite is read not in separate palaces but in a monopoly over ritual, in the mobilization of labour for monumental construction, and in grave goods that mark out a special path into the other world.

And, finally, this. Radiocarbon dates show that the active phase of the fortified settlements lasted no more than eighty years. Not a gradual evolution but a flare — a rapid phase transition, followed by dispersal. (These eighty years are the active phase; in the broader window of 2100—1700 BCE the horizon also takes in post-functional burials of the same circle — for the extended range see the Appendix to Chapter 2.)

2.2 Where the Hierarchy Appears: Burial Practice

Where within the settlements hierarchy is barely visible, burial practice paints a quite different picture. Elite kurgans differ sharply from ordinary graves on every parameter — size, construction, grave goods, ritual complexity. The richest include timber-framed chambers, bronze weapons, mass horse sacrifices — up to eight horses in a single burial — the imprints of spoked wheels, and sets of bits, with ornaments of gold and silver.

The principal source of palaeogenetic data is the cemetery of Kamennyi Ambar 5. And it is precisely this that makes the Sintashta picture unexpected. Beneath a single mound, and sometimes in a single grave, lie people from different male lineages — representatives of different genetic clusters in a shared sacred space. Close relatives among the buried are on the whole few, but within individual kurgans stable family cells are recorded: the most telling is three full brothers in one kurgan, sharing a common male and a common maternal line (see the Appendix to Chapter 2).

This is a double principle of cemetery organization. On the large, political scale different male lines are buried together — as participants in a single alliance. On the small, familial scale lineage cells are preserved within the common structure. Before us is a direct archaeological reflection of a *multi-lineage alliance*:

of many parallel male lineages held within a single polity not by blood kinship but by common ritual and social institutions.

2.3 The First Pillar: The Horse

Sintashta is known above all as the point of birth of the war chariot. The light two-wheeled spoked vehicle, three times lighter than wagons with solid disc wheels and able to manoeuvre at speed, with bronze bits and bone cheekpieces, is the oldest known — though the question of priority remains open. The chariot complex occurs exclusively in elite contexts: it is not transport for all but a marker of status, of military function and of sacral competence. Mass horse sacrifices in the same kurgans add a ritual dimension — the horse becomes a mediator between the world of the living and the world of the dead.

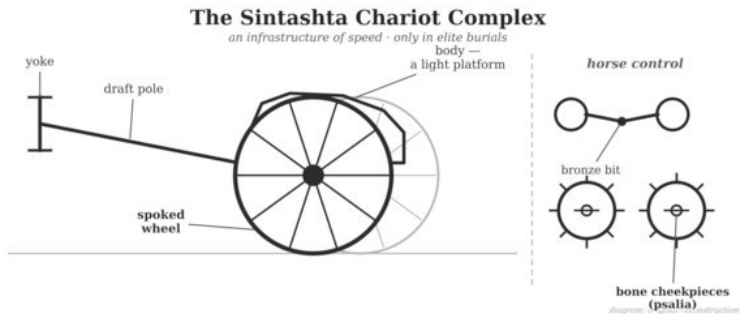


Figure 5. The Sintashta chariot complex: an infrastructure of speed — light spoked wheels, bronze bit and bone cheekpieces (psalia) — attested only in elite burials (§2.2).

In recent years the palaeogenetics of the horse has become one of the liveliest subjects of debate on the Bronze Age. L. Orlando's team (Librado et al. 2021; 2024) proposed a chronology in which 'effective domestication' — the appearance of the DOM2 clade — falls about 2200—2100 BCE, synchronous with the Sintashta chariot. This position was contested by the review of D. Anthony, M. Trautmann and F. Heyd (Anthony, Trautmann & Heyd 2026, *Science Advances* eady7336): domestication, on their argument, was a protracted and regionally variable process, beginning as early as the fifth — fourth millennia BCE, with several parallel clades and the systematic use of the horse already in the Yamnaya horizon (c. 3200—2600 BCE), long before Sintashta.

In this picture Sintashta is not the 'cradle of horse culture' but an *integration node*: a place where the DOM2 phenotype met the chariot complex and the metallurgical infrastructure. The debate over the precise chronology of each stage continues; for our chapter the structural fact suffices.

In the Sintashta horizon three components — horse, metal and inherited power — converge for the first time into a single configuration, one not found in the preceding horizons.

And one further distinction, fundamental to the whole chronology of the volume: 'horse' at Sintashta means chariot power, not mass cavalry. Mounted warfare will come only at the close of the second millennium, the cavalry army in the

first millennium BCE. But even in its chariot form, control over the selection, breeding and training of horses meant differential access to speed — and speed on the steppe is a resource of a special kind: it sets military force, the range of communication, the capacity to coordinate space. Whoever controls the horse controls the steppe.

2.4 The Second Pillar: Metal

Sintashta metallurgy is not a local craft but an element of the infrastructure of power. At Ustye alone the finds of metal production run into the thousands — slag, ore, crucibles, tuyères, ingots — beside furnaces of the most varied construction and copper from nine sources scattered over hundreds of kilometres (precise parameters in the Appendix to Chapter 2). This alone implies stable exchange networks drawing raw material from different districts of the southern Urals, and perhaps Kazakhstan; control over these networks may have been one of the key resources of elite power.

The standardization of weapons — socketed axes, daggers and spearheads of stable types — betrays a professional tradition with a firm canon, working in three principal alloys: pure copper, arsenical bronze and the rarer tin bronze. This tradition was not isolated: as Hanks (2010) stresses, Sintashta metallurgy is embedded in the Circumpontic-steppe metallurgical province (after Chernykh). And the casting moulds, crucibles and slag in the elite burials themselves point to a sacralization of knowledge: power over the transformation of ore into weaponry and prestige combined technology, ritual and military function at once. The smith at Sintashta is no craftsman. He is almost a priest.

2.5 The Genetic Picture: Alliance from the First Day

When the first detailed Sintashta palaeogenomes appeared in the second half of the 2010s, the picture proved the direct opposite of the earlier model of a ‘homogeneous R1a society’.

If you imagine Sintashta as one great family with common ancestors — abandon the thought. In the Kamennyi Ambar sample some fifteen male lines stand side by side, falling into three large groups. The majority of the men carry the Fatyanovo heritage of R1a, with several parallel branches already within it. A minority carry the relict Yamnaya line R1b — and in three different clans with three different fates: one a widely distributed Yamnaya marker; the second a Samara — Volga clan that vanishes from the palaeogenomic record for good; the third a rarest line that will surface only some two thousand years later, in a single Türkic warrior of the central steppe. And, finally, two men carry the Okunev Q — the line of the autochthonous population of southern Siberia. Three groups, different trajectories — and all of them lie in the same kurgans, as one elite community (exact proportions in the Appendix to Chapter 2).

The first discovery was hidden in the dates. The central male line of Sintashta, R-Z93, proved to be *older than Sintashta itself*: the same line was already present in the Corded Ware cultures

and in the Fatyanovo culture of the Upper Volga five to eight centuries earlier — the earliest reliably dated bearer lived near Yaroslavl around 2700 BCE. The Sintashta elite did not engender the R-Z93 line; it inherited it from the preceding East European horizon.

What this means. Sintashta did not create ‘special genes’. It inherited a ready-made line — and by the time the culture crystallized, that line had already diverged into eight parallel branches, each facing its own millennial fate. To this fan we return in §2.6.

The second discovery came from the east. The Okunev Q at Kamennyi Ambar consists of male lines of a population whose homeland, the Minusinsk Basin, lies two thousand kilometres away. And they are already here — and an identical Okunev subclade is attested in Khakassia two to five centuries before Sintashta, which makes the hypothesis of early contact strong. But the movement was one-directional: among dozens of maternal determinations there is not a single classic Okunev marker. Only the men came. This is the first, protocol form of that dual R+Q configuration which, half a millennium later, will unfold in the Orak-Ulus Synthesis (Chapter 3) and will go on working as the structural partner of the R-line in all the volume’s subsequent horizons.

And the third. If the male lines are gathered into a few large families, the maternal lines are the complete opposite: almost exclusively western Eurasian, but scattered across the

most varied haplogroups, with origins from the Balkans to the Baltic. One signature is especially eloquent — the line U2e1h, carried by several Sintashta women, attested earlier in the Balkans and Central Europe by a century or a century and a half. Women bearing this line came from the west, probably from the Fatyanovo — Abashevo milieu; and after Sintashta the same U2e1h travels on — into the Andronovo horizon, to the early Scythians of Swat, to the Sarmatians of Uyk. This is a *matrimonial relay*: western wives marry the sons of the Sintashta elite, their daughters marry the next wave of chiefs, and so on from generation to generation.

Behind this picture stands a familiar logic. ‘A narrow set of male lines alongside a broad spectrum of maternal ones’ is the classic signature of a patrilocal-exogamous society, in which the men remain in the lineage and inherit status while the women come from different populations along allied networks. Sintashta works in exactly this way — and works literally: the proportion of ‘foreign’, western Siberian autosomal admixture among the buried is appreciable, and people from biologically different populations lie beneath one mound, sometimes in one grave. Biologically, different populations. Socially, one elite group.

2.6 The Third Pillar: Inherited Power and the Eight Roads out of Sintashta

Now the most remarkable thing. By the time the culture crystallized, the central line R-Z93 had already branched into eight parallel branches, and each was to become the root of a separate phylogenetic trajectory for the historical horizons to come.

An important caveat at once: these are *phylogenetic labels*, not *historical attributions*. The conventional label of a branch does not mean the presence at Kamennyi Ambar of ‘proto-bearers’ of any later ethnic group — it means only that a subclade which centuries later will become diagnostically linked to particular descendant horizons is already differentiated in the Sintashta cemeteries. The people of Sintashta did not, and could not, know where their descendants would be carried thirty generations on. But genetics has preserved it.

The framework of the fan rests on the convergence of two kinds of data: palaeogenomic samples record eight terminal subclades descending from R-Z93 in the Sintashta cemeteries, while an independent Big-Y phylogenetic survey (FTDNA Discover) documents the full descendant structure of R-Z93. Some branches are confirmed directly, the rest reconstructed from a combined base — the archaeogenetics of descendant samples, the geography of present-day Y-projects, the historical-

archaeological context. The full phylogenetic passport of all eight branches, with basal nodes and canonical dates, is set out in the Appendix to Chapter 2; here what matters is not the nomenclature but its meaning.

And the meaning is twofold. First, for our volume the central of the branches is the one running through the node *R-S23592* (around 2200 BCE), the principal Central Eurasian node, which two centuries later will become the core of the Orak-Ulus Synthesis. Below it lies the node *R-YP1456*, splitting off around 2100 BCE — that is, *exactly in the heyday of Sintashta*; it is this line that will become the trunk of Volume I. (Its palaeogenomic appearance at Orak-Ulus around 1700 BCE, which we shall meet in Chapter 3, lags the node's calculated age by some four centuries — a normal interval between the rise of a subclade and its archaeological attestation.) Parallel to the eight R-branches runs a ninth axis — the Okunev Q, represented at Kamennyyi Ambar by two men: the proto-form, already familiar to us, of the dual R+Q configuration.

Second — and this is the main point for the model as a whole — the fan is not 'invented' later. It is already built into the Sintashta horizon: by the time the culture crystallized the root line is branched, the dispersal programmed in advance. This is the fundamental property of the Alliance component — multi-lineality from the first day, not a later superstructure.

The three pillars — horse, metal, dynasty — form here the technical and social infrastructure of power. Their ideological

articulation — the synthesis of Steppe Verticality and Local Horizontality — we reconstruct in Chapter 4; their first mature synthesis with an autochthonous society, in Chapter 3. For now the moment of crystallization itself stands recorded.

2.7 Why Here, and Why So Fast

Complex non-state societies of the Bronze Age arose not only in the southern Urals — there was the Scandinavian Bronze Age, there was Mycenaean Greece, there was Shang China, with comparable levels of military organization and craft specialization. The Sintashta configuration differed in one thing: it joined control over mobility (the horse), over resources (metal), and over the reproduction of the elite (inherited power within a multi-lineage structure) into a single system able to work on the steppe — without cities, writing or bureaucracy.

Why the southern Urals? Because three conditions coincided there at once: pastures, accessible outcrops of copper ore, and a crossroads of steppe corridors. It was this resource node that allowed the three pillars to grow at the same time — stockbreeding gave the base for horse-rearing, ore for metallurgy, the crossroads position for exchange networks and marital ties.

And why so fast? Eighty years for a whole culture is not evolution but a *phase transition*: in the terms of complex systems, the moment when the coincidence of environment, structure of interaction and energetic base gives birth to a qualitatively new configuration within a few generations. When the conditions changed — the exhaustion of ores, demographic pressure, an external threat — the configuration did not disappear. It was

transmitted east through the broad Andronovo horizon. And it scattered fanwise.

2.8 The Andronovo Fan: The Empirical Skeleton of the First Process

After the close of the Sintashta phase proper, around 1800 BCE, the macro-branches of the R-Z93 fan dispersed across an enormous range. This post-Sintashta horizon is documented by a palaeogenomic corpus of several dozen samples from some fifteen sites across Central, Eastern and Western Kazakhstan, Zhetysu, the Upper Irtysh and the Minusinsk Basin (the full corpus in the Appendix to Chapter 2). This is the empirical skeleton of the first process — the fanwise dispersal — and if its stops are set out in a line, a road to the east can be read.

At *Maitan and Ak-Mustafa* (Central Kazakhstan, the start of the second millennium) the line R-S23592 first shows through — the very one that two centuries later will become the core of Orak-Ulus. At *Ak-Togay* (Eastern Kazakhstan) it is already represented by two synchronous male burials. At *Koken-3* on the Upper Irtysh it reaches its greatest density in the corpus — three bearers of R-S23592 in one multi-lineage cemetery, beside other R-lines and a parallel Q. The *Zevakino cemetery* in Eastern Kazakhstan reproduces the very principle of the multi-lineage alliance — a late analogue of Kamennyi Ambar, repeated in another region five to seven centuries on. And *Ust-Bir IV* (around 1607 BCE) closes the eastern arc of the fan already in the Minusinsk Basin, throwing a biological bridge to the material

of Chapter 3.

Structurally the whole horizon says one thing: several parallel subclades diversify at the same time within a single geographical arc — Central Kazakhstan → Zhetysu → Upper Irtysh → Minusinsk.

The Alliance model is not invented later. It is inherited and reproduced at every node of the fan.

2.9 Summary

Sintashta matters twice over.

First, it crystallized the three pillars of power — horse, metal, dynasty — in an already multi-lineage milieu: some fifteen male lines in one cemetery, three large groups with different historical trajectories, a western Eurasian maternal pool. The model of the multi-lineage alliance is not invented later — it is inherited and institutionalized here.

Second, from it the fanwise dispersal began: eight parallel branches of R-Z93, differentiated already at the moment of crystallization, scatter across the post-Sintashta horizon, attested at some fifteen sites from Central Kazakhstan to Minusinsk, and each begins its own trajectory.

The configuration of horse, metal and inherited power proved a functional matrix to which steppe formations would return for centuries. And each time it met a new autochthonous society, one of the branches gave a local synthesis — inheriting the common matrix but rewritten for local conditions. The first and key such synthesis is the Orak-Ulus.

The fan has scattered. One of its branches — the one that will become the central trunk of this volume — moved east through the Kazakh steppes toward the Yenisei. There, in the mountain-enclosed Minusinsk Basin, a society awaited it that was itself a multi-component union, with a millennium's

experience of mutual integration. The Andronovans brought the horse, metal and the model of inherited power. The Okunev brought a millennium's experience of exogamy and multi-lineage coexistence. What was born of their meeting is the subject of Chapter 3.

Conclusions

1. Sintashta (2100—1800 BCE) is one of the earliest nodes of the institutionalization of power in steppe Eurasia. The brevity of the active phase (about eighty years, three generations) points to crystallization — a phase transition at the coincidence of environment, structure and resources.

2. Kamennyi Ambar 5 is a multi-lineage alliance from the first day. Some fifteen male lines in three large groups (R1a in the majority, R1b in three clans with different fates, Okunev Q in two bearers). The Alliance component works from the very beginning; it is not formed later.

3. The central line R-Z93 is five to eight centuries older than Sintashta — inherited from the Corded Ware and Fatyanovo horizons of Eastern Europe. Sintashta did not engender it, but institutionalized it and at the same time spread it into eight parallel branches.

4. The three pillars converge into a single system: the horse (the DOM2 phenotype, synchronous with the horizon, in the role of an integration node rather than a ‘cradle’), metal (a specialized production embedded in the Circumpontic province), and dynasty (a narrow set of male lines alongside a broad western Eurasian maternal pool).

5. A fan of eight branches. By the moment of crystallization R-Z93 is already branched; the line central to the volume

runs through the node R-S23592 (~2200) to the node R-YP1456 (~2100), whose splitting-off coincides with the heyday of Sintashta. The full passport of the branches and the canonical dates are in the Appendix to Chapter 2.

6. The post-Sintashta fan is documented by a palaeogenomic corpus across some fifteen sites from Central Kazakhstan to Minusinsk; the Zevakino cemetery is a late institutional analogue of Kamennyi Ambar.

7. DAEX at Sintashta is in embryonic form. The bond of the three pillars is the first archaeologically documented manifestation of the structure that the full DAEX model (Chapter 1) unfolds into four components.

8. The link with Chapter 3. The fan has scattered; one of the branches went east to the Yenisei — into the Minusinsk Basin, to the point of the Orak-Ulus Synthesis.

9. Epistemic status. The thesis that ‘Sintashta crystallized a multi-lineage alliance and launched the great fan’ is a strongly supported hypothesis: the palaeogenomic corpus records the facts (the diversity of Kamennyi Ambar, the post-Sintashta dispersal of daughter lines, the Fatyanovo pre-existence of R-Z93), while the institutional interpretation remains a step of reconstruction, open to refinement as the samples expand.

Appendix to Chapter 2

Sintashta: Origin · Archaeogenetics · The Eight Macro-branches of R-Z93

The Sintashta phenomenon is not the invasion of a ready-made people, but the crystallization of a new social form out of the interaction of steppe and forest-steppe populations.

— *after Hanks & Linduff, Monuments, Mobility and Mining (2009)*

Purpose of the Appendix

This appendix contains the palaeogenetic corpus for the source node R-Z93 — the root biological point of the whole mainline of Volume I. The eight macro-branches of R-Z93, diverging from the Sintashta horizon around 2100 BCE, form a phylogenetic fan whose central branch (R-Z93 → R-Z2125 → R-S23592 → R-FGC56408 → R-YP1456) is traced in Chapter 3 (the Orak-Ulus Synthesis, sample I3391), Chapter 5 (the Sagsai horizon: I7033, I6363, ULI001) and Chapter 7 (the written fixation of the polity-name in the geography of Sagsai — the name is revealed there). The present appendix records the initial point of this biological axis. All the data have been verified through two independent primary sources: the public FTDNA Discover Haplotree and the aggregated aDNA database 2.07.40. The appendix remains within the horizon of Volume I; the later historical associations of individual branches are the material of

the subsequent volumes of the series.

Three methodological safeguards run throughout the appendix.

(1) *Anti-ethnicization*. The figurative branch-names used in Chapter 2 ('Indo-Aryan', 'Bashkir', 'Árpád' and others) are navigational labels of the later historical traditions associated with the corresponding subclades, not assertions of ethnic continuity. A Y-subclade is not equal to an ethnos, a language or a culture; the R-Z93 macro-branch does not 'carry' ethnicity.

(2) *Anti-biologization*. The use of Y-chromosomal markers here is operational in character and does not imply that worldview models are biologically determined. The subclade designations distinguish demographic flows by their historical-geographical origin, nothing more.

(3) *Anti-temporal-compression*. The tracing of a branch across millennia does not mean the continuity of a people. Between the Sintashta horizon and any later tradition lie millennia with migrations, language shifts, political collapses and population restructurings.

A Brief Glossary of Key Terms

Term	Brief explanation
aDNA	Ancient DNA — DNA extracted from skeletal remains; the quality of preservation depends on climate, soil and the age of the sample.
Y-chromosome	Transmitted only from father to son; used to trace male lines back thousands of generations.
mtDNA	Mitochondrial DNA; transmitted only from mother to child; traces maternal lines.

Term	Brief explanation
Subclade	A branch of the Y-chromosomal phylogenetic tree (e.g. R-Z93); new subclades form as mutations accumulate — roughly one per 150 years.
SNP	Single-Nucleotide Polymorphism — a point mutation in the DNA; a diagnostic marker of belonging to a subclade.
TMRCA	Time to Most Recent Common Ancestor by the Y-chromosome; the margin of error is usually $\pm 10\text{--}15\%$.
Haplogroup	A large branch of the Y- or mtDNA tree, characteristic of a particular region or population (R1a — steppe; Q — East Asian / Siberian; N — Siberian).
Macro-branch	In the terminology of the monograph, one of the eight large descending lines of R-Z93 (I–VIII), each of which, over one or two millennia, becomes the root of a separate historical tradition.
IAMC	Inner Asian Mountain Corridor (Frachetti 2008, 2012) — the mountain-steppe corridor of Inner Asia, linking the Greater Altai with the Tian Shan through Minusinsk, Dzungaria and Zhetysu.
MLBA	Middle–Late Bronze Age horizon; in steppe Eurasia, roughly 1900–1200 BCE.
ybp / BCE	ybp — years before present (from 1950); BCE — Before Common Era.
FTDNA Discover Haplotree	The public Y-DNA tree of FamilyTreeDNA with SNP-nodes and TMRCA estimates; the primary source for the verification of subclades.

Bridge Keys: What Is Mentioned in the Chapter and Where to Find It in the Appendix

In Chapter 2 you met	Look in the appendix
‘The central R-Z93 line is older than Sintashta by 500–800 years’	Block 1 · the control table + ancestral samples (I0432, NAU001)
‘14 male Y-subclades in a single necropolis’	Block 2 · Table 2.3 (32 samples from Kamenny Ambar 5)
‘Family E: a trio of brothers’	Block 5 · family clusters (I1056 · I1057 · I1058)
‘The Okunev Q-line at Sintashta’	Block 2 · the Q-lines (I1007 Q-M346) + Block 5 · the Q-M346 node
In Chapter 2 you met	Look in the appendix
‘Eight branches of R-Z93’	Block 4 · Table 2.5 (macro-branches I–VIII)
‘40 aDNA samples of the post-Sintashta fan’	Block 3 · Table 2.4 (the MLBA fan across 14 sites)

The Chapter 2 Passport

Parameter	Content
Thesis of the chapter	Sintashta society is a synthesis: a paternal R1a-Z93 from the Fatyanovo milieu; a maternal substrate from the Late Yamnaya, Fatyanovo and local pre-steppe milieu; at the root level the differentiation of eight R-Z93 macro-branches is recorded; the Q-line is a western offshoot of the Okunev stem.
Root nodes	R-M417 → R-PF6162 → R-Z93 → R-Z94 → R-Z2124 → R-Z2125 → {R-Z2123, R-S23592}
Chrono-geographical window	The Volga–Oka forest-steppe + the Southern Urals + the Middle Volga · 2900–1700 BCE (the main corpus) + the post-Sintashta MLBA fan · Central / Eastern / Western Kazakhstan + Zhetysu + the Upper Irtysh + Minusinsk · 2134–572 BCE.
Sample	83 men: 32 from Sintashta (Kamenny Ambar 5, Bulanovo, Stepnoe) + 8 ancestral (7 Fatyanovo + I0432 Poltavka-outlier) + 43 of the post-Sintashta MLBA fan (14 sites, including the Koken R+Q link) + DA17, a Saka echo.
Sources	Mathieson 2015; Saag 2021; Allentoft 2015; Narasimhan 2019; Gill 2025; Damgaard 2018; aDNA 2.07.40; FTDNA Discover Haplotree.

BLOCK 1 · ANCESTRAL LINES AND THE CONTROL COMPARISON OF R-Z93

The control comparison records that the R-Z93-descending subclades are absent in the Yamnaya and Central European Corded Ware samples, appear in the Poltavka (a single outlier), and crystallize in the Fatyanovo culture — 500—800 years before Sintashta. This localizes the biological root of the

mainline in the forest-steppe Fatyanovo milieu, not in the steppe proper.

Table 2.1 · Control Comparison by Culture

Culture	Period (BCE)	Men with Y	R-Z93-desc.	% Z93-desc.
Yamnaya	3300–2500	22	0	0.0 %
Corded Ware (C. Europe)	2900–2350	46	0	0.0 %
Poltavka	2800–2200	9	1	11.1 %
Fatyanovo	2900–2300	17	8	47.1 %
Sintashta	2100–1700	32	20	62.5 %

Table 2.2 · Ancestral Samples (Fatyanovo + the Poltavka Outlier)

№	ID ·	Site	Date (BCE)	Y-line	Context	Source
1	I0432 · Sok/Samara		2925– 2491	R-Z2124	Poltavka_outlier — an early penetration of Fatyanovo populations into the steppe, 500–600 years before Sintashta	Mathieson 2015
2	NAU001 · Naumovskoe		2836– 2573	R-Z93	The oldest R-Z93; Fatyanovo culture	Saag 2021
3–8	HAN002, NIK008, HAN004, HAL001, NAU002, BOL003		2859– 2342	R-Z93	The Fatyanovo series (Khanevo, Nikultsino, Khaldeevo, Naumovskoe, Bolshnevo)	Saag 2021

Of the 46 Y-determined samples of the Corded Ware culture in the aDNA 2.07.40 database, not one carries R-Z93-descending subclades; in the Yamnaya (n = 22) — likewise zero. The earliest R-Z93 is NAU001 (Fatyanovo, 2836—2573 BCE). The earliest R-Z2124 is I0432 (the Poltavka outlier, 2925—2491 BCE), autosomally distinct from the typical Poltavka individuals. This is an observed configuration localizing the root of the mainline in the Fatyanovo forest-steppe milieu; it does not assert a direct demographic continuity ‘Fatyanovo → Sintashta → later traditions’.

BLOCK 2 · THE SINTASHTA NECROPOLIS: 32 SAMPLES BY Y-BRANCH

Kamenny Ambar 5 yielded 30 of the 32 male aDNA determinations of the Sintashta sample. The samples are grouped by Y-branch: the Z2123 branch, the Z2124 branch, basal Z93/Z94, basal R1a, relict R1b and Okunev Q. 20 of the 32 men (62.5 %) carry R-Z93-descending subclades.

Table 2.3 · The Sintashta Samples by Branch

Branch	Samples (Kamenny Ambar 5 unless noted)	Y-subclade	n
Z2123	I1027, I0987, I1053, I1054, I1064 (Y874); I1019, I1057, I1058, I1056 (Z2123); I1055 (FT287785)	R-Y874 / R-Z2123	10
Z2124	RISE386 (Bulanovo), RISE392 (Stepnoe), I0984, I1065, I1008, I1084, I1018 (Z2124); I1011 (Z2125)	R-Z2124 / R-Z2125	8
Z93/Z94 basal	I1082 (Z94), I0989 (Z93)	R-Z93 / R-Z94	2
R1a basal	I0986, I1086, I1010, I1012 (PF6162); I0942 (M198); I1003, I1006 (M459)	R-PF6162 / R-M198 / R-M459	7
R1b (relict)	I1020 (KMS75), <i>I0980 (M269)</i> , <i>I1028 (L1433)</i>	R1b-M269 / R1b-L1433	3
Q (Okunev)	I1007 (Q-M346), I1017 (Q-FT239746)	Q-M346 / Q-FT239746	2

The Y-profile of the 32 Sintashta men: R-Z93-descending 20/32 (62.5 %) — the Z2123 branch (10), the Z2124 + Z2125 branch (8), basal Z93/Z94 (2); basal R1a (7); R1b — three relict Yamnaya — Poltavka — Catacomb lineages (3); Q of the Okunev stem (2). The mtDNA profile of 55 individuals (32 male +23 female): West Eurasian 54/55 (98.2 %), East Eurasian 1/55 (1.8 %). The high diversity of the maternal lines amid the stability of the paternal is an observed pattern of two-sided exogamy, consistent with the DAEX model, not a proven mechanism.

BLOCK 3 · THE POST-SINTASHTA MLBA FAN: 43 SAMPLES ACROSS 14 SITES

The empirical picture of the divergence of the eight R-Z93 macro-branches in the 300—700 years after the closure of Sintashta. Across 14 sites of Central, Eastern and Western Kazakhstan, Zhetysu, the Upper Irtysh and Minusinsk, an unfolded picture of diversification is recorded. The Koken link (Gill 2025) yields three bearers of R-S23592 (KKN083, KKN085, KKN096) with a common ancestor ~2200 BCE — a precise anchoring to the root node of the Volume I mainline. The source for the whole sample, except where noted: Narasimhan 2019.

Конец ознакомительного фрагмента.

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