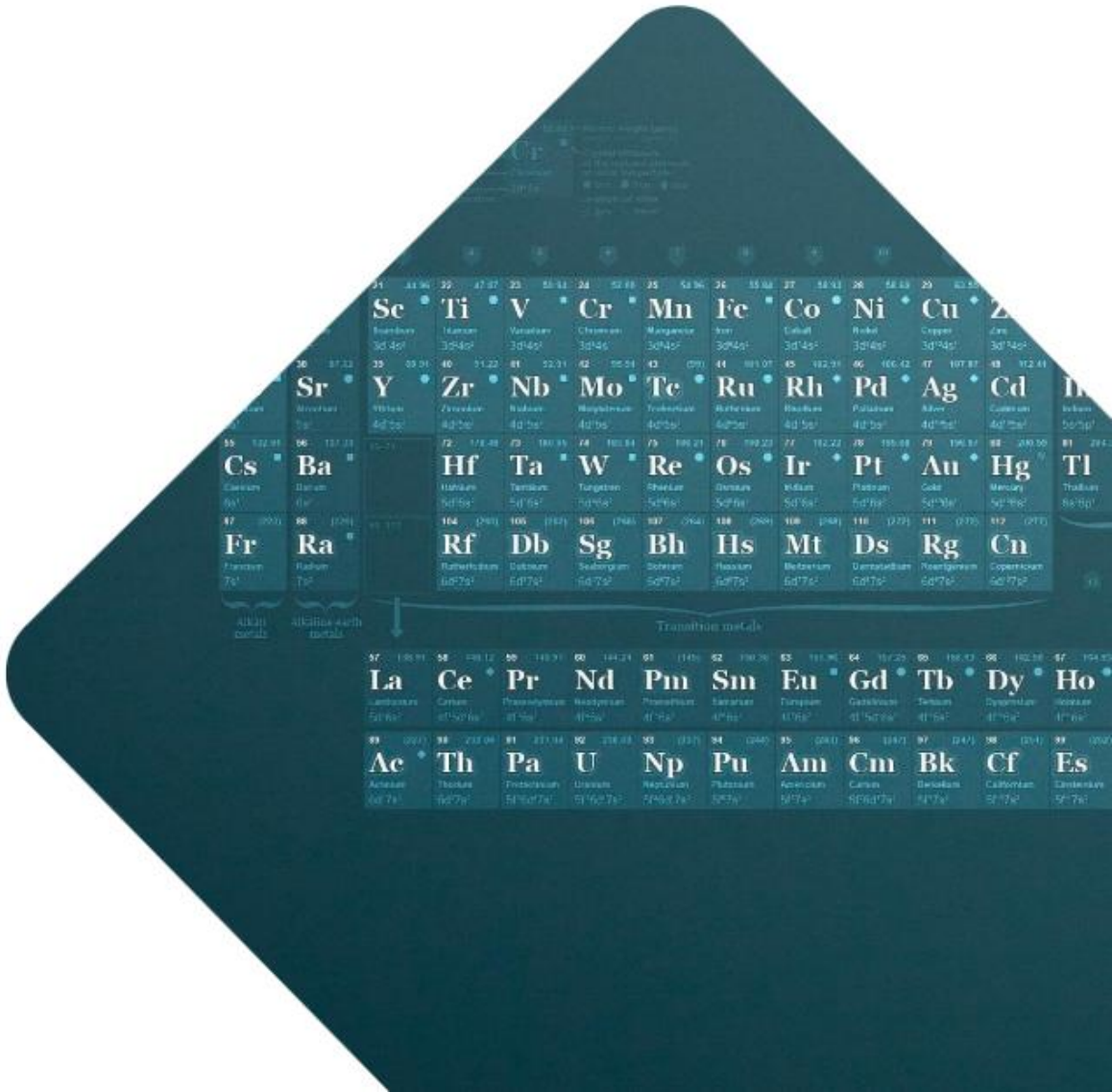
HARMONY IN THE STARS AND ATOMS: EXPLORING THE COSMIC CONNECTION BETWEEN THE PERIODIC TABLE

ARITRA SANYAL
RESEARCH SCHOLAR
JADAVPUR UNIVERSITY (INDIA)



INTRODUCTION

1. Sharma et al. (2024) — Periodic Table Paper:

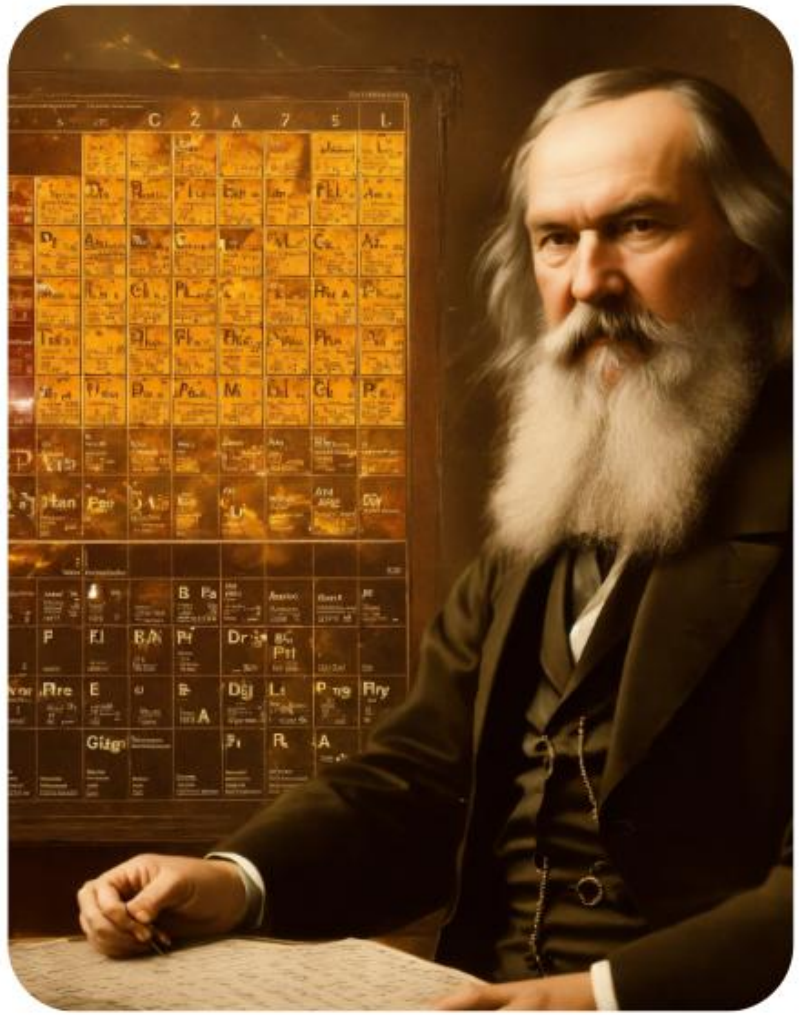
Kamna Sharma, Deepak Kumar Das, and Saibal Ray,
"Research status of the periodic table: a bibliometric analysis,"
Foundations of Chemistry, vol. 26, pp. 301–314, 2024.
DOI: 10.1007/s10698-024-09509-x

2. Sharma et al. (2025) — HR Diagram Paper:

Kamna Sharma, Deepak Kumar Das, and Saibal Ray,
"Hertzsprung–Russell diagram: a bibliometric analysis for the status report of research in the period 1991–2023,"
under review in Modern Physics Letters A

MENDELEEV'S PERIODIC TABLE – THE BEGINNING

The origins and foundational principles of the periodic table developed by Dmitri Mendeleev in 1869.



ARRANGED ELEMENTS BY ATOMIC MASS

In 1869, Dmitri Mendeleev arranged chemical elements according to their atomic mass, establishing the periodic system.

PREDICTED UNDISCOVERED ELEMENTS

71 Lu

Mendeleev famously predicted the existence and properties of elements not yet discovered at his time.

ORGANIZED ELEMENTS BY PROPERTIES

He grouped elements with similar chemical characteristics, revealing periodic chemical relationships.

MODERN TABLE USES ATOMIC NUMBER

113 Nh

Today's periodic table is based on atomic number rather than atomic mass for element arrangement.

VISUAL REPRESENTATION: MENDELEEV'S TABLE

118 Og

The early form of the periodic table designed by Mendeleev is a foundational visual for chemistry history.

WHAT THE PERIODIC TABLE TELLS US

Understanding key arrangements and properties of elements

1 ELEMENTS ARRANGED BY ATOMIC NUMBER

The periodic table organizes elements sequentially by their atomic numbers.

2 ORGANIZATION BY GROUPS AND FAMILIES

Elements are grouped into columns that share similar chemical properties.

3 ARRANGEMENT BY PERIODS

Horizontal rows represent periods reflecting increasing energy levels.

4 SHOWS ELEMENT REACTIVITY TRENDS

The table reveals patterns in how elements react chemically.

5 INDICATES ELECTRON CONFIGURATION

Element placement reflects their outer electron arrangements.

6 HIGHLIGHTS BEHAVIORAL SIMILARITIES

Elements in the same group demonstrate similar chemical behavior.

WHERE DO ELEMENTS COME FROM?

Understanding stellar origins of elements in the universe

HYDROGEN AND HELIUM ORIGINS

Hydrogen and helium were produced during the Big Bang, forming the universe's simplest elements.

FORMATION OF HEAVIER ELEMENTS

Heavier elements are synthesized inside stars through nuclear fusion processes over their lifetimes.

SUPERNOVA DISPERSAL

Supernova explosions scatter newly formed elements out into space, enriching the cosmos.

LIFECYCLE VISUALIZATION

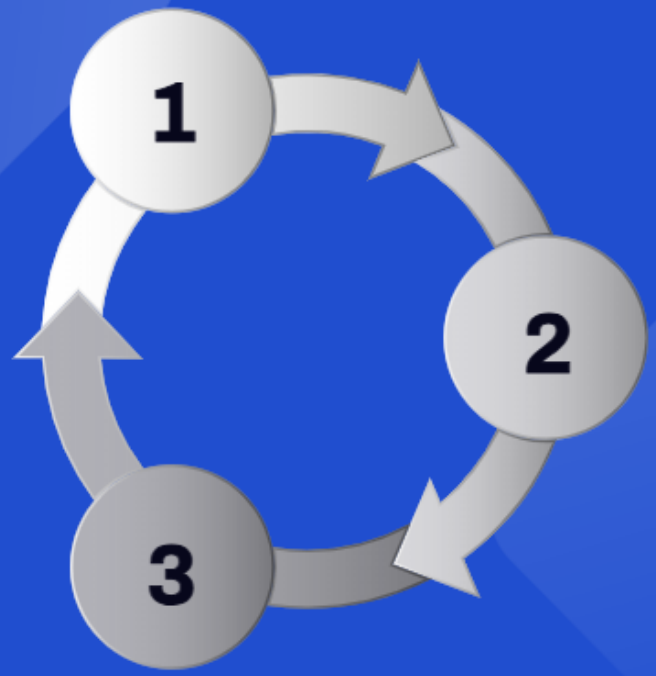
The star's lifecycle includes stages leading to supernova and subsequent element dispersal.

STELLAR NUCLEOSYNTHESIS

The Creation of Elements in Stars

HYDROGEN TO HELIUM FUSION

Stars primarily convert hydrogen into helium through nuclear fusion, releasing energy in the process.



FORMATION OF HEAVY ELEMENTS

During supernovae, stars explode, creating heavy elements like gold and uranium from iron and other nuclei.

ATOMS FROM STARS

Every atom in your body has formed in a star, highlighting our deep cosmic connection.

PERIODIC TABLE IS UNIVERSAL

Exploring how the periodic table maps cosmic ingredients beyond Earth

ELEMENTS ARE NOT EARTH-ONLY

The elements in the periodic table are found throughout the universe, not just on Earth.

STARS GENERATE COSMIC ELEMENTS

Stars across the cosmos create the same elements listed in the periodic table through stellar processes.

PERIODIC TABLE MAPS COSMIC INGREDIENTS

The periodic table serves as a universal map for the fundamental ingredients of all matter in the cosmos.

CONNECTING STARS TO THE PERIODIC TABLE

Exploring the Symbolism between Stars and Element Groups

BRIGHT STARS & ELEMENT GROUPS

Certain bright stars in constellations have symbolic links to groups of elements, enhancing our understanding of both realms.

FACTORS AFFECTING SYMBOLISM

Symbolic connections are based on **brightness, stability, reactivity,** and the **color** of stars within their constellations.

CONSTELLATION POSITION

The **position** of stars in constellations plays a crucial role in determining their symbolic links to **element groups** in the periodic table.

Exploring Orion: The Hunter Constellation

A detailed look at Orion's mythology, stars, and astronomical significance

Mythology

01

Represents a hunter in Greek mythology.

Key Stars

02

Includes **Betelgeuse** and **Rigel**, the brightest stars.

Orion's Belt

03

A straight line of **three stars** useful for navigation.

Celestial Location

04

Located on the **celestial equator** for easy viewing.

Winter Visibility

05

Best viewed during **winter evenings** in the sky.

Orion Nebula

06

Home to the **Orion Nebula**, a stellar formation area.

CONNECTING ORION TO THE PERIODIC TABLE

Exploring Stellar Nucleosynthesis and Elements

1. **BETELGEUSE - ALKALI METALS**

   Betelgeuse represents alkali metals, known for their bright appearance and high reactivity, making them fascinating to study.

2. **RIGEL - ALKALI EARTH METALS**

   Rigel symbolizes alkaline earth metals that are characterized by stability and vibrant colors, showing their unique properties.

3. **BELLATRIX - TRANSITION METALS**

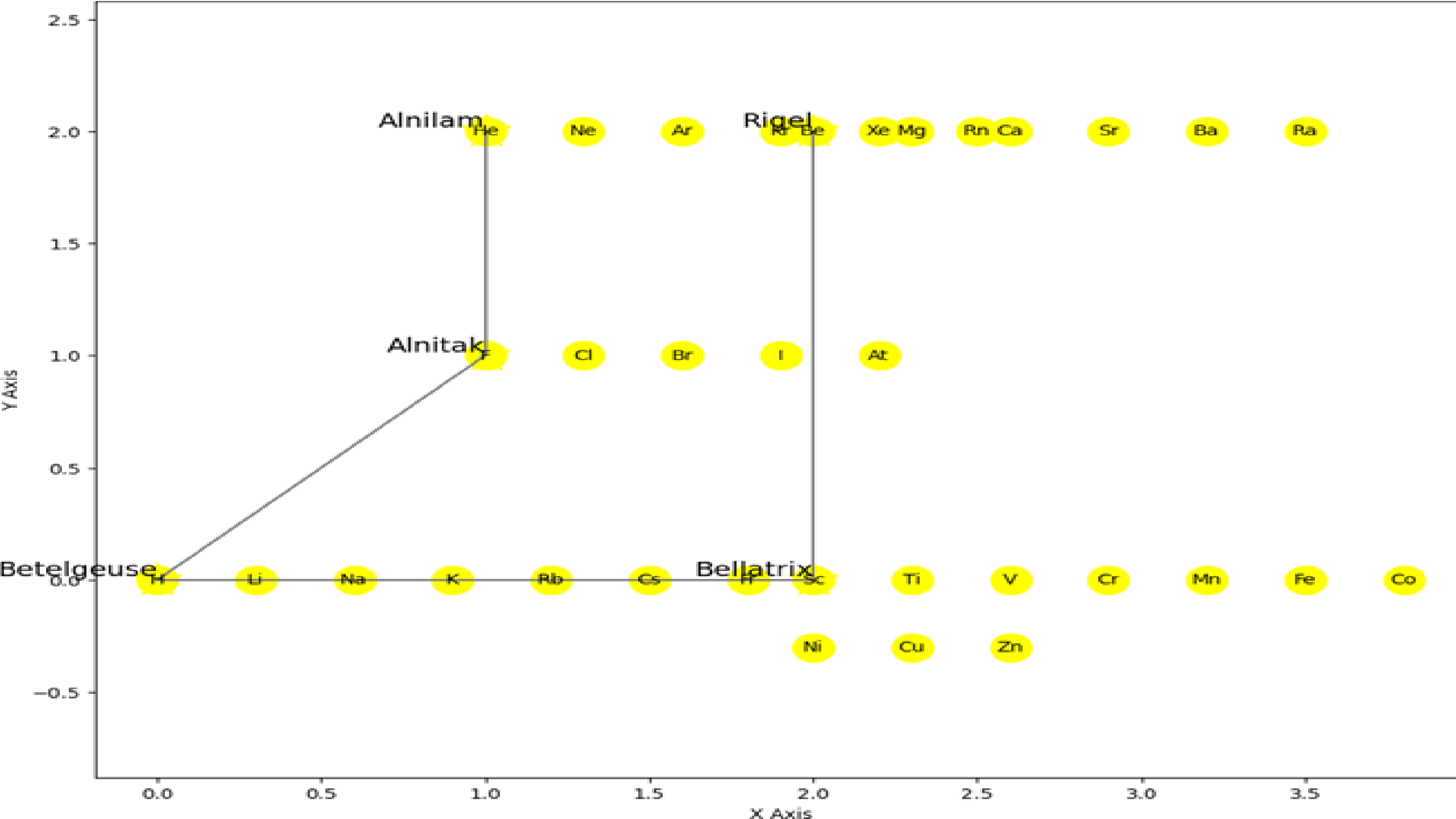
   Bellatrix embodies transition metals, which are notable for their versatility and essential roles in various chemical processes.

4. **ALNITAK - HALOGENS**

   Alnitak represents halogens, known for their essential roles in life and chemical reactivity, crucial for various compounds.

5. **ALNILAM - NOBLE GASES**

   Alnilam symbolizes noble gases, recognized for their stability and inertness, contributing to diverse applications in technology.


Alnilam
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Exploring Ursa Major: The Great Bear and Its Significance

A closer look at Ursa Major's stars, myths, and cultural importance

Ursa Major is known as the Great Bear.

This constellation is prominent in the northern sky, easily recognizable.

Contains the famous Big Dipper asterism.

The Big Dipper is a significant asterism within Ursa Major, aiding navigation.

Serves as a navigational tool historically.

Different cultures have used Ursa Major for navigation due to its visibility.

Stars are relatively close to Earth.

The stars in this constellation are nearby, facilitating easier studies.

Rich in myths across various cultures.

Ursa Major features in Native American and Greek stories depicting its bear.

URSA MAJOR & PERIODIC TABLE

Linking Astronomy and Chemistry

DUBHE → ALKALI METALS

Dubhe correlates with alkali metals, the highly reactive elements found in Group 1.

MERAK → ALKALINE EARTH METALS

Merak represents alkaline earth metals, essential in various chemical reactions.

PHECDA → TRANSITION METALS

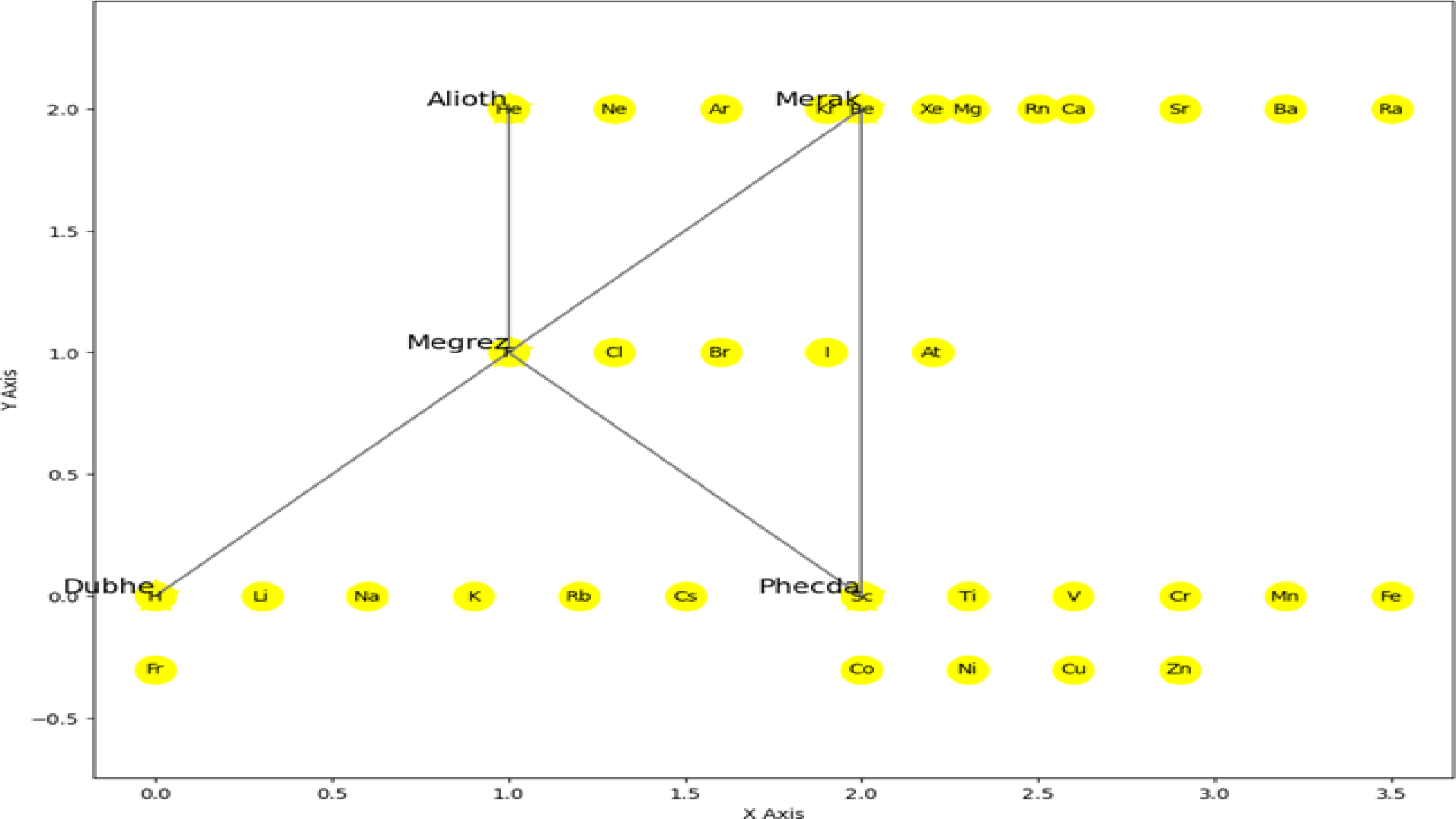
Phecda symbolizes transition metals, known for their complex bonding and utility.

MEGREZ → HALOGENS

Megrez is associated with halogens, elements that are critical for numerous applications.

ALIOTH → NOBLE GASES

Alioth connects with noble gases, recognized for their inertness and stability.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Exploring the Sagittarius Constellation: The Archer

Dive into the celestial wonders of Sagittarius and its rich mythology

Sagittarius Overview

Sagittarius, known as **The Archer**, points towards the Milky Way's center.

Teapot Asterism

The **Teapot asterism** aids in locating various astronomical objects.

Key Positioning

This constellation is strategically positioned pointing to the **Milky Way's center**.

Astronomical Significance

Sagittarius encompasses a wealth of fascinating **astronomical objects** to explore.

Notable Nebulae

Home to the **Lagoon Nebula** and **Trifid Nebula**, rich in star fields.

Cultural Myths

In mythology, Sagittarius is often associated with **hunting and archery**.

SAGITTARIUS & PERIODIC TABLE

Exploring Cosmic and Atomic Connections

KAUS AUSTRALIS → ALKALI METALS

Kaus Australis represents the alkali metals, known for their high reactivity and existence in various natural compounds.

NUNKI → ALKALINE EARTH METALS

Nunki signifies alkaline earth metals, critical for various biological processes and known for their metallic properties.

KAUS BOREALIS → TRANSITION METALS

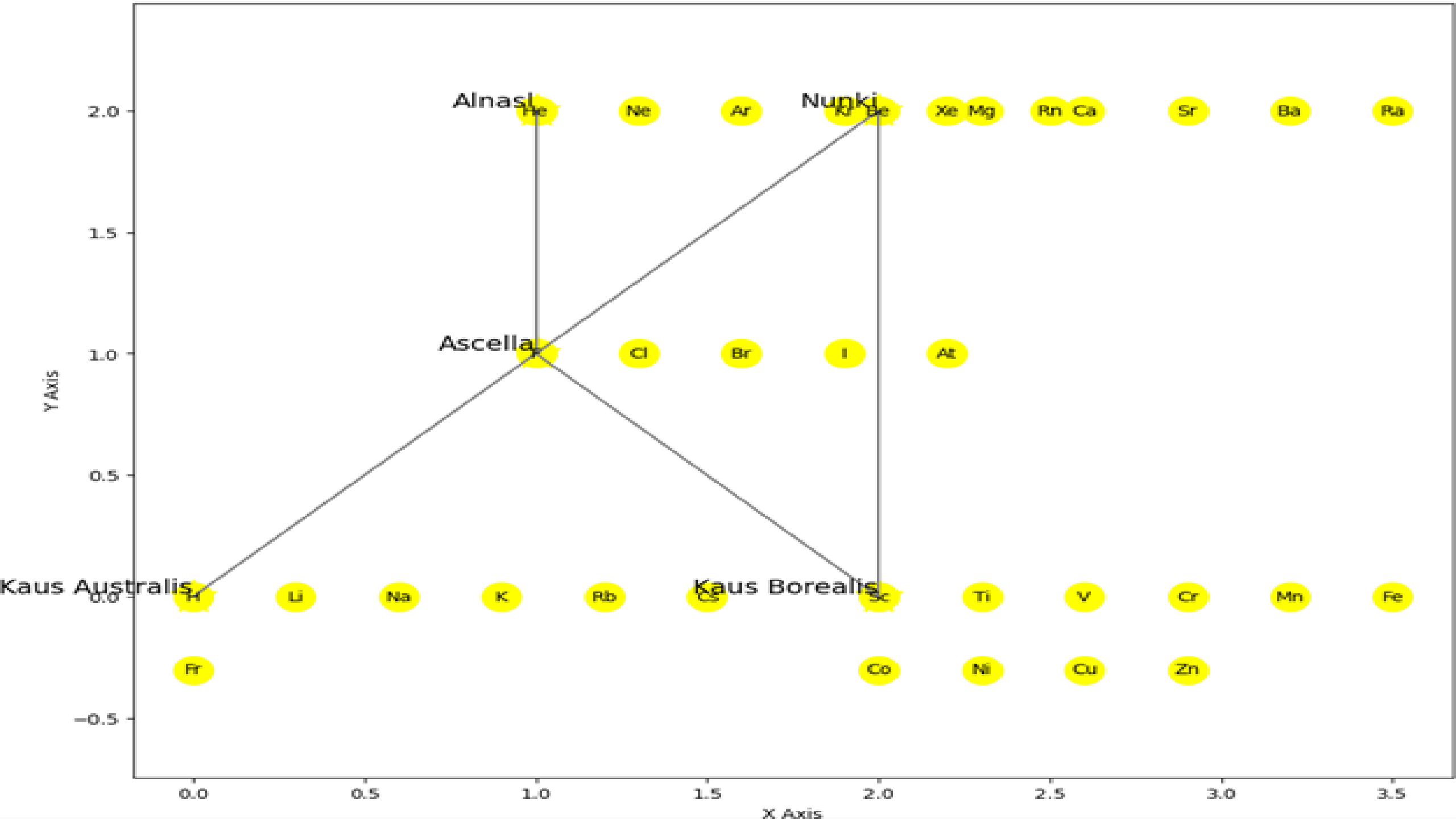
Kaus Borealis corresponds to transition metals, characterized by their capability to form variable oxidation states.

ASCELLA → HALOGENS

Ascella is linked to the halogens, a group of highly reactive nonmetals essential in numerous chemical reactions.

ALNASL → NOBLE GASES

Alnasl relates to noble gases, known for their lack of reactivity due to complete valence electron shells.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Exploring the Constellation Cygnus: The Swan

Learn about Cygnus, its stars, significance, and myths

01

Symbol of grace and beauty

Cygnus, known as the Swan, represents elegance in the night sky, with its distinctive shape.

02

Home to Northern Cross asterism

The Northern Cross is a prominent asterism within Cygnus, easily recognizable for stargazers.

03

Notable star: Deneb

Deneb, one of the brightest stars, serves as the tail of the swan and is part of the Summer Triangle.

04

Associated with Greek mythology

Cygnus is linked to tales of Zeus transforming into a swan, highlighting its cultural significance.

05

Astronomical significance: Cygnus X-1

Cygnus X-1 is a notable black hole candidate, marking its importance in astronomical studies.

CYGNUS & THE PERIODIC TABLE

Mapping Stars to Groups of Elements in the Periodic Table

- **DENEB CORRESPONDS TO ALKALI METALS**

  Deneb represents Alkali metals known for their high reactivity and softness.

- **SADR SYMBOLIZES ALKALINE EARTH METALS**

  Sadr is linked with Alkaline earth metals, typically reactive and vital in compounds.

- **ALBIREO STANDS FOR TRANSITION METALS**

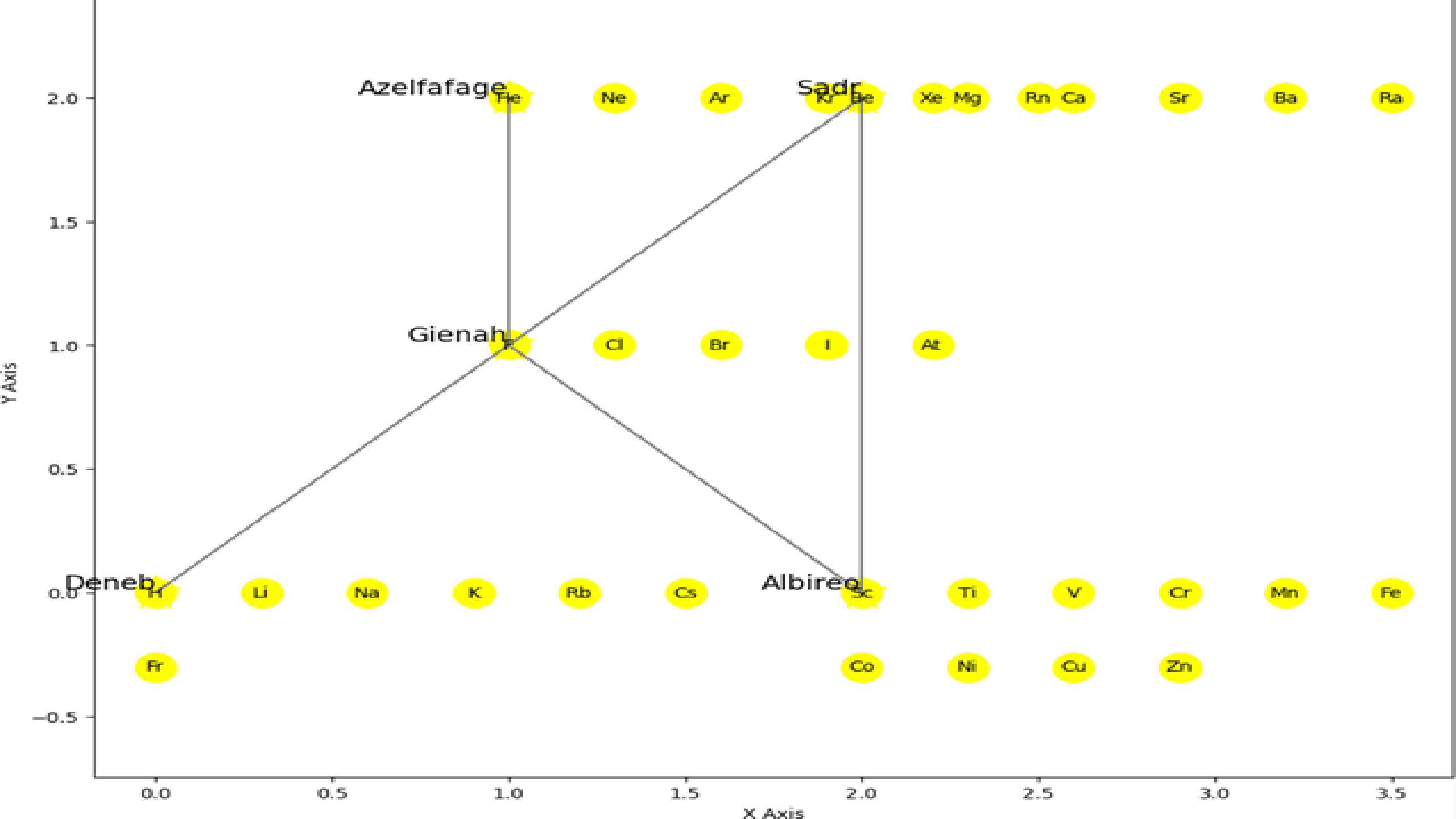
  Albireo indicates Transition metals, noted for varied oxidation states and conductivity.

- **GIENAH DENOTES HALOGENS**

  Gienah is associated with Halogens, highly reactive nonmetals in the periodic table.

- **AZELFAFAGE REPRESENTS NOBLE GASES**

  Azelfafage symbolizes Noble gases, inert and stable elements in the periodic chart.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Exploring the Constellation Pegasus: The Winged Horse

Discover the significance and features of Pegasus, a key constellation in the night sky.

- **Asterism: Great Square**

  The prominent feature of the constellation Pegasus is the **Great Square of Pegasus**, which serves as a recognizable pattern in the sky during autumn nights.

- **Notable Objects: Andromeda**

  Among the many galaxies visible in the region, the **Andromeda Galaxy** stands out, making Pegasus a significant constellation for stargazers and astronomers alike.

- **Cultural Significance**

  Throughout history, Pegasus has been associated with **creativity and inspiration**, appearing in various mythologies, especially in ancient Greek tales.

- **Mythical Origins**

  According to Greek mythology, **Pegasus** emerged from the blood of Medusa, linking it to themes of transformation and artistry in ancient narratives.

- **Viewing Season**

  The constellation is best viewed in the **autumn months**, making it a seasonal favorite for amateur astronomers and sky enthusiasts.

PEGASUS & THE PERIODIC TABLE

Mapping Pegasus Stars to Periodic Table Groups

MARKAB CORRESPONDS TO ALKALI METALS

Markab star is linked to the Alkali metals group in the periodic table, known for their high reactivity.

SCHEAT REPRESENTS ALKALINE EARTH METALS

Scheat is associated with Alkaline earth metals which are slightly less reactive than Alkali metals.

ALGENIB MATCHES TRANSITION METALS

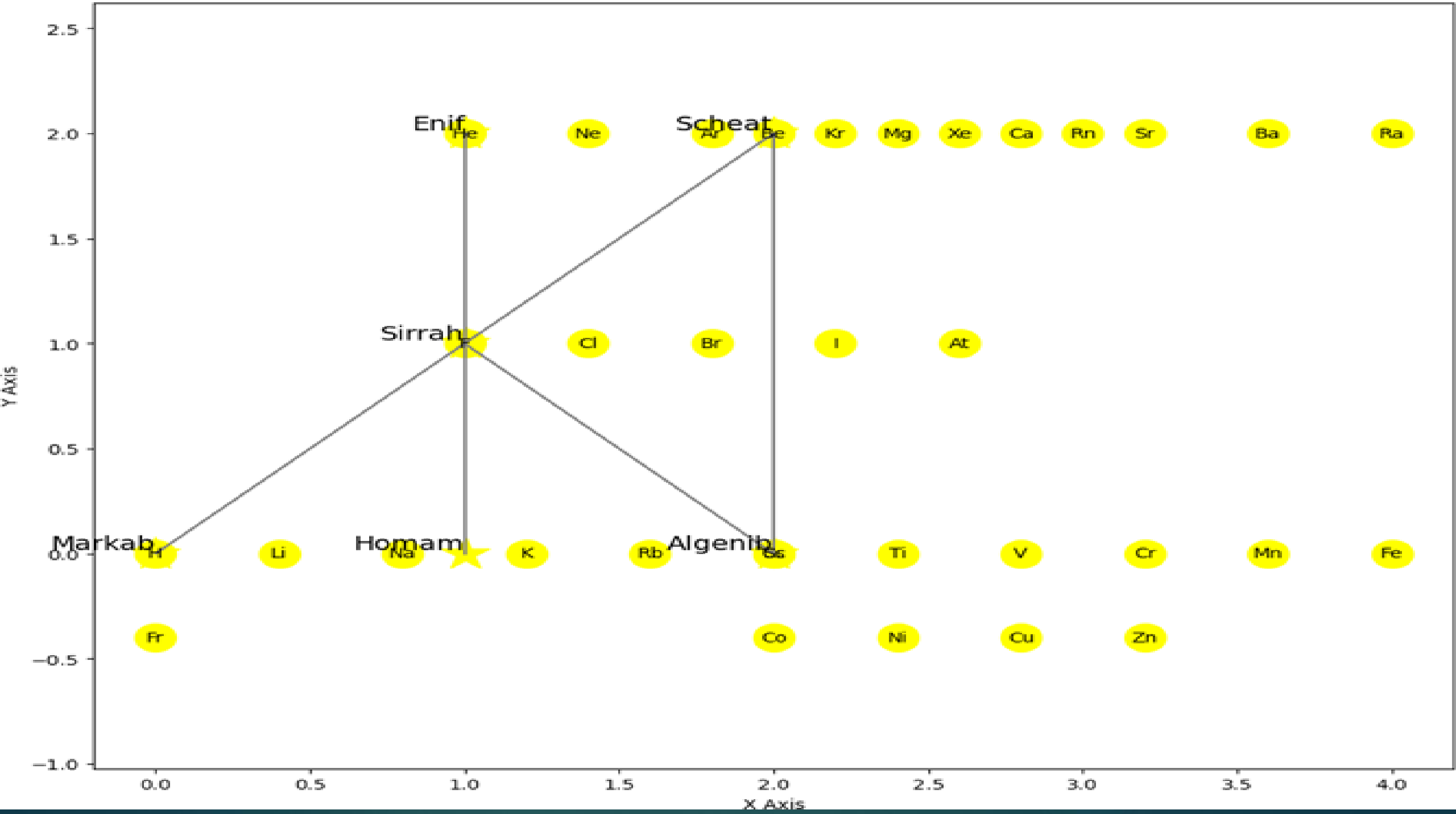
Algenib corresponds to the Transition metals, known for their conductivity and diverse properties.

SIRRAH LINKED TO HALOGENS

Sirrah star is connected to the Halogens, a group of highly reactive nonmetals.

ENIF RELATES TO NOBLE GASES

Enif star corresponds with the Noble gases, characterized by their inertness and stability.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Exploring Cassiopeia: The Queen of the Sky

Discover the myths and significance of Cassiopeia in various cultures

Distinctive Shape

01

Cassiopeia is easily recognizable due to its **distinctive W shape**. This unique formation makes it one of the most recognizable constellations in the northern sky, aiding in celestial navigation.

Cultural Significance

02

In Greek mythology, **Cassiopeia** represents a queen known for her beauty and vanity. This cultural importance has led to various interpretations and stories across different civilizations, enriching our understanding of its legacy.

Notable Deep-Sky Object

03

Among the notable features of Cassiopeia is the **Cassiopeia A supernova remnant**. This remnant is one of the strongest radio sources in the sky, making it a significant subject of study in astronomy.

CASSIOPEIA & THE PERIODIC TABLE

Exploring the connection between stellar nucleosynthesis and the elements

SCHEDAR → ALKALI METALS

Schedar is associated with alkali metals crucial for various chemical reactions.

CAPH → ALKALINE EARTH METALS

Caph signifies the alkaline earth metals that are key components in both stars and Earth.

TSIH → TRANSITION METALS

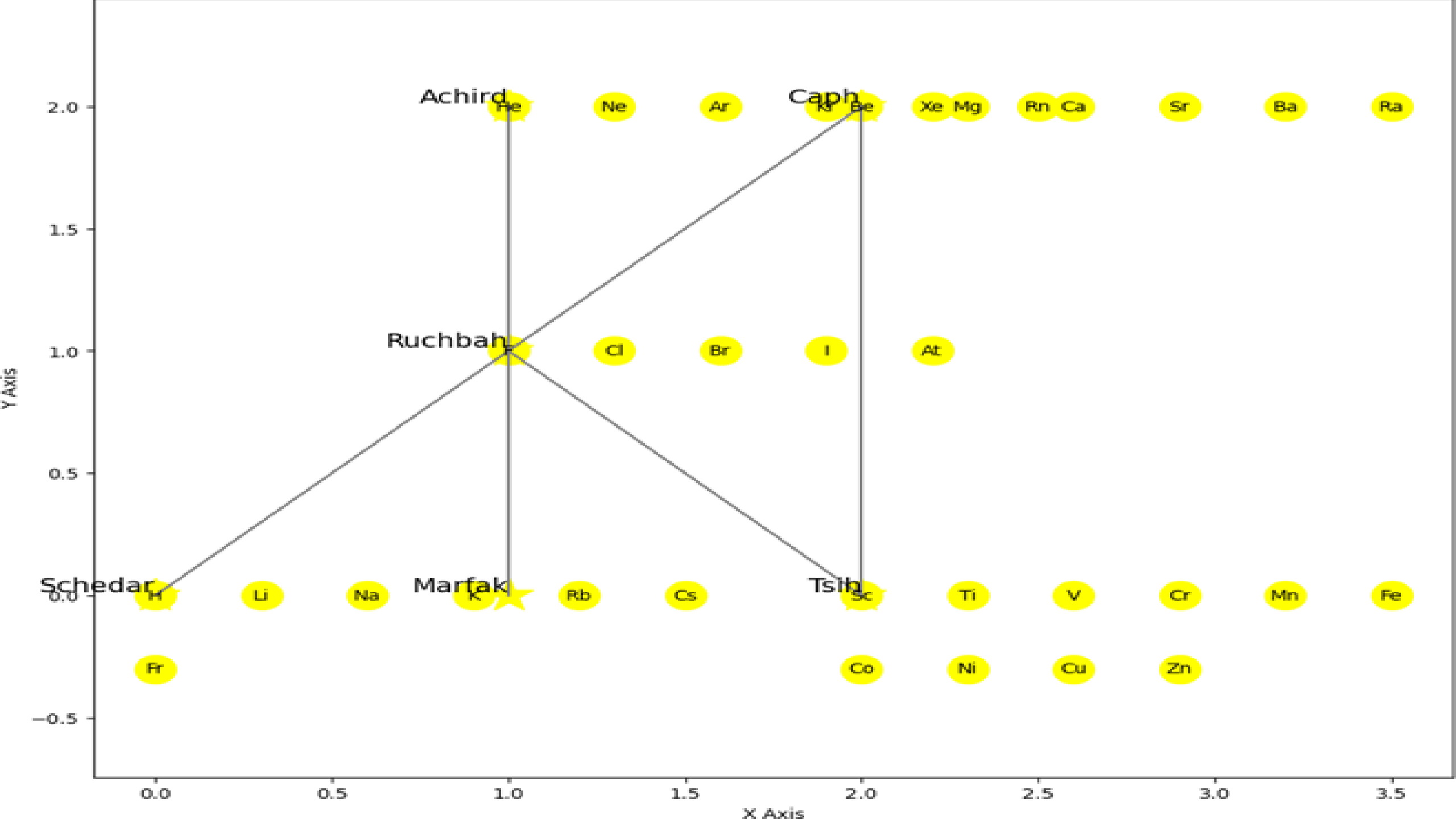
Tsih represents transition metals known for their properties and significance in stellar cores.

RUCHBAH → HALOGENS

Ruchbah is linked to halogens, elements important for chemical processes in the universe.

ACHIRD → NOBLE GASES

Achird relates to noble gases, which are unreactive yet play a role in various stellar phenomena.


Achird
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CONCLUSION: HARMONY BETWEEN ELEMENTS AND STARS

Summary of the universal connection reflected in the periodic table and cosmos

1

MENDELEEV'S TABLE ORIGINATES FROM CHEMISTRY

The periodic table was initially developed as a chemical framework for organizing elements.

2

IT MAPS THE UNIVERSE'S ELEMENTS

The table now serves as a cosmic map, connecting chemical elements to universal phenomena.

3

STARS FORGE THE CHEMICAL ELEMENTS

Stellar nucleosynthesis in stars creates the elements represented in the table.

4

CONSTELLATIONS REFLECT CHEMICAL NATURE

Star groupings or constellations symbolically mirror the chemical properties of elements.

5

MICROSCOPIC AND MACROSCOPIC HARMONY

There is a natural harmony between atomic structures and vast cosmic formations.

- Every time we look at the elements, we're really looking at the history of stars, galaxies, and the birth of life itself.

"The nitrogen in our DNA,
the calcium in our teeth,
the iron in our blood,
the carbon in our apple pies
were made in the interiors of
collapsing stars."

: Carl Sagan


THANK
YOU