C1

Data Quality and Quantity

Data quality heavily impacts the visual output. It involves why and how data are collected, which questions were asked, and the use of proxy data.

Information Literacy

Task Complexity

Generalization

Transparency

Context of Use

Data Quality and Quantity C1

1. Does the visualization consider **how and why data is gathered**, such as the questions asked, and whether proxy data is used?
2. How does the visualization address **data quality challenges**?
3. How does the visualization tackle the **complexity of urban data**, considering the challenges posed by **details, volume**, and **type of data**?
4. How does the visualization handle data from sources like social media and citizen input? Are **ethical and privacy concerns** taken into account?

C2

Physical Context and Infrastructure

City visualizations must carefully consider how data is gathered from the city. It is possible to view the physical and technical city infrastructure as cultural artifacts and to see urban visualizations as cultural expressions.

Information Literacy

Task Complexity **Generalization**

Transparency **Context of Use**

Physical Context and Infrastructure

C2

1. Does the visualization reflect the **data collection circumstances** and design choices in a thoughtful way?
2. How well does the visualization capture the **cultural aspects** by treating the city's infrastructure as cultural artifacts, and urban phenomena as cultural expressions?
3. How effectively does the visualization type, such as dashboards, help in **monitoring and controlling** urban infrastructure?
4. Does the visualization successfully tackle the challenge of showing how the physical city interacts with the **user's sense of place**?

C3

Complexity and Interconnections

Urban data is getting more complex due to growth and variety, as well as the connections between data and its analysis. A critical technical goal is to ensure our tools and techniques allow flexible and coherent data sharing.

Information Literacy

Task Complexity

Generalization

Transparency

Context of Use

Complexity and Interconnections

C3

1. Does the visualization handle **complex urban data** well, considering its growth and connections?
2. Do the tools used in the visualization allow for easy and adaptable **sharing** of data?
3. Does the visualization accurately show **real-world situations**, supporting its intended purpose effectively?
4. How appropriate are the **data metrics** for the intended purpose?

C4

Availability and Accessibility

Data analysis isn't just for experts anymore. Citizens, businesses, and others use and gain benefit from data-driven methods. To meet their needs, open data access should also offer tools and methods for understanding, exploring, and utilizing the data.

Information Literacy

Task Complexity

Generalization

Transparency

Context of Use

Availability and Accessibility C4

1. Who is the **intended audience** of this visualization?
2. Are there **tools and techniques** available alongside the visualization to help users understand, explore, and effectively use the data?
3. How well does the visualization accommodate different levels of **literacy, goals, and usage patterns** among users?
4. Does the visualization consider the specific **contexts** in which people will be using it?

C5

Standards for Tools and Tech

Visualizations should allow interactions like filtering and selecting, while also promoting analysis at various levels of detail. Additionally, visualization tools should be user-friendly for individuals with diverse levels of analytical skills and confidence.

Information Literacy

Task Complexity

Generalization

Transparency

Context of Use

Standards for Tools and Tech C5

1. Does the visualization allow users to **interact**, while supporting analysis at **various levels of detail**?
2. How well does the visualization cater to individuals with **different levels of analytical skills** and confidence?
3. Is the visualization designed to work across **various platforms** and devices (mobile and web)?
4. How does the visualization explore the potential of **emerging technologies** like VR and AR to enhance data experiences?

C6

Appropriate Visualization and Data Choice

Meeting the needs of varied urban stakeholders and citizens is tough. Converting abstract data into real-world insights can be challenging, and typical analytics visualizations might not convey a clear meaning.

Information Literacy

Task Complexity **Generalization**

Transparency **Context of Use**

Appropriate Visualization and Data Choice

C6

1. How does the **visualization choice** address the challenge of serving the diverse needs of urban stakeholders?
2. How does the visualization bridge the gap between **abstract data** and **real-world situations**?
3. Does the visualization employ **standard forms** that are clear and meaningful to a broad audience?
4. How well does the visualization capture nuanced and **meaningful information**, considering metrics that might be overlooked?

C7

Outreach and Engagement

Outreach aims to engage the public, provide needed information, and reach targeted users. Challenges include maintaining attention, incorporating diverse feedback, and dealing with subjective data. Data cannot provide the total picture.

Information Literacy

Task Complexity

Generalization

Transparency

Context of Use

Outreach and Engagement C7

1. How does the visualization **engage** the public and **reach** its intended users?
2. Does the visualization encourage **citizen participation** and enhance civic engagement?
3. Is the visualization **transparent, responsible, and accessible**, considering both appeal and accurate representation?
4. What should be the **evaluation criteria** that align with the engagement goals and objectives of the visualization?

C8

Inclusivity and Diversity

We must involve a wider range of people by making tools, techniques, and data accessible and personally relevant through suitable data choices. This means letting underrepresented citizens contribute and being aware of biases while respecting social norms.

Information Literacy

Task Complexity **Generalization**

Transparency Context of Use

Inclusivity and Diversity C8

1. What parts of this visualization are **inclusive**?
2. How can we make the visualization more **diverse and inclusive**?
3. Does this visualization change how people **act** or **create habits**? What **ethical and privacy** factors should be remembered?
4. How does this visualization **build trust** among different groups, by showing where it comes from and letting people **contribute**?

C9

Data and Visual Literacy

Data and visual literacy go beyond reading; they involve becoming comfortable with thinking that involves data and the use of data-driven tools.

Information Literacy

Task Complexity

Generalization

Transparency

Context of Use

Data and Visual Literacy C9

1. How does the visualization support users with **thinking about** and **using data**?
2. Does the visualization support learning by **guiding users** and allowing them to **explore different aspects** of the data?
3. How does the visualization address the **broader need** for clear data communication?

C10

Citizen Trust

Civic trust affects all human-focused topics: Who controls data? What happens to our digital foot-print? Where is our data used? Uncertainty surrounds data use and ownership, sparking debates about truth and trustworthiness. This underlines the importance of giving data creators more control.

Information Literacy

Task Complexity

Generalization

Transparency

Context of Use

Citizen Trust

C10

1. Who **produces, owns, manages, frames and/or distributes** the data?
2. How does this visualization ensure citizens **control** their data?
3. What data does this visualization **include** and **leave out**?
4. How does the visualization include **crucial perspectives**?

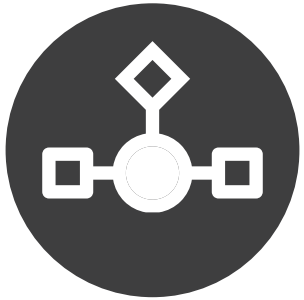
Information Literacy

D1

Information literacy is the ability to use information well, which varies among people (novice to expert). When making metrics and designs to show information, we must consider these differences. Designers should understand users' knowledge levels, incorporate diverse viewpoints, and balance data awareness with overwhelming distractions.

Information Literacy

D1



Task Complexity

D2

Systems differ in complexity based on tasks (C4, C5). Simple tasks need simple interfaces, while complex ones require deeper data exploration from different angles (C3, C6, C8, C9). Complex tasks might require training or breaking them into smaller parts (C6, C9).

Task Complexity

D2

Simple — Complex

Generalization

D3

Some systems show data relevant to most cities, like traffic or crime rates. Others focus on unique needs of a small city group (C7). Local context matters due to culture, data sources, and more (C6, C8, C2, C3). Visualizations for one city might help others as a starting point to begin with adjustments (C6).

Generalization

D3

General ●——————● Specific

Transparency

D4

Trust is crucial for data acceptance and use (C7, C10). To establish trust, we must reveal data origin, quality, and visualization methods (C1, C3, C4, C6). For public health data, knowing sources builds confidence. Sometimes, implicit transparency suffices – like assuming dependable transit data for urban redevelopment. Clear applications explain their actions, such as depicting data choices.

Transparency

D4

Context of Use

D5

Designers should adapt data visualizations to fit the situation (C6). This involves considering time, attention, and context – like whether it's a standalone tool or part of a larger system (analysis app vs in-home display). For instance, homeowners using an app to check energy use it briefly to ensure all is well (C4). Experts, like an electrician fixing an issue, need detailed data within their specialty, which homeowners wouldn't use (C9).

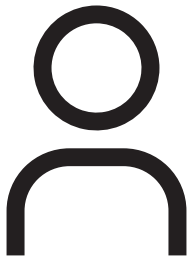
Context of Use

D5

Glance ●——————● Focused

Information Literacy

D1

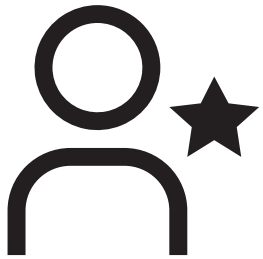


NOVICE

Novice ——— Expert

Information Literacy

D1



EXPERT

Novice ——— Expert

Task Complexity

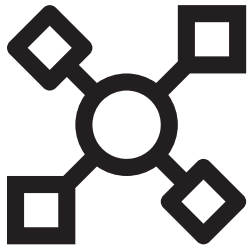
D2

SIMPLE

Simple ●——————● Complex

Task Complexity

D2

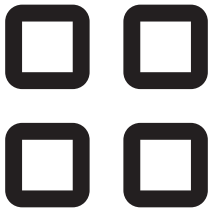


COMPLEX

Simple ●——————● Complex

Generalization

D3

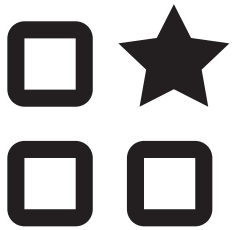


GENERAL

General ●——————● Specific

Generalization

D3

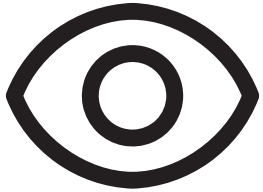


SPECIFIC

General ●——————● Specific

Transparency

D4



EXPLICIT

Implicit ●——● Explicit

Transparency

D4

IMPLICIT

Implicit ●——● Explicit

Context of Use

D5

GLANCE

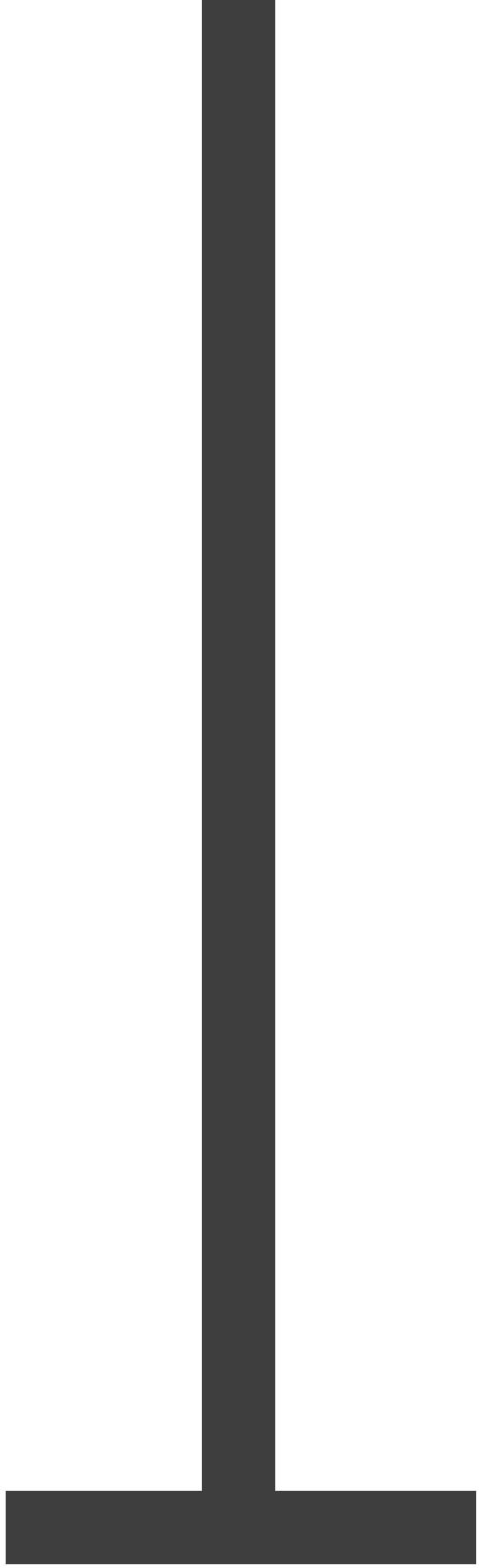
Glance ●——————● Focused

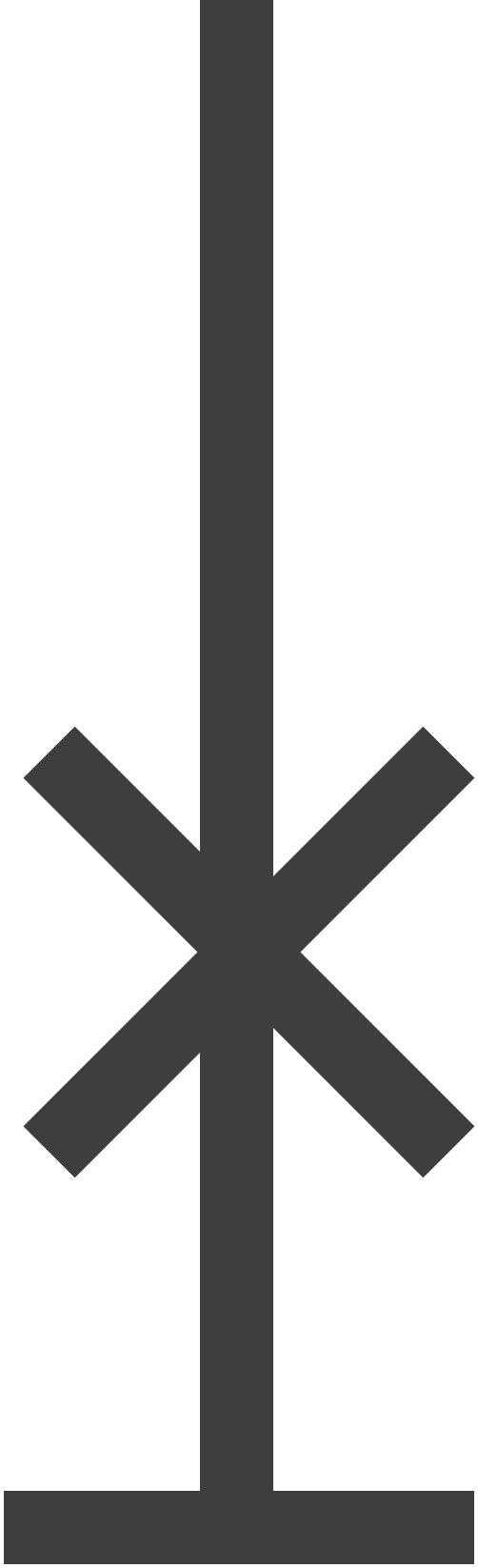
Context of Use

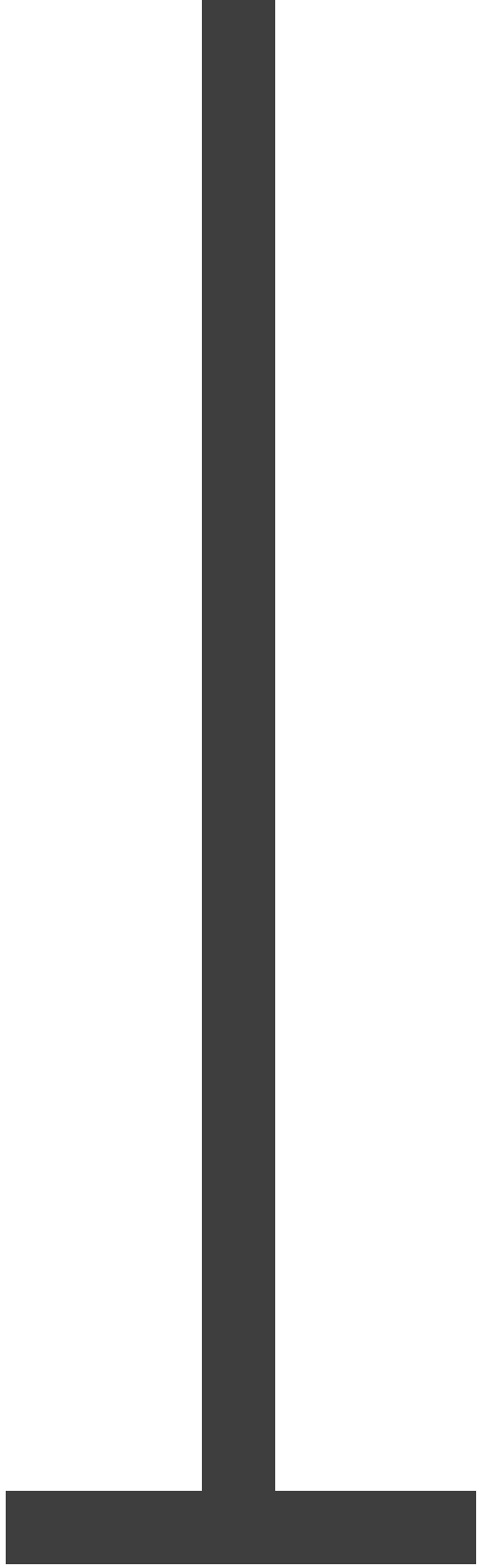
D5

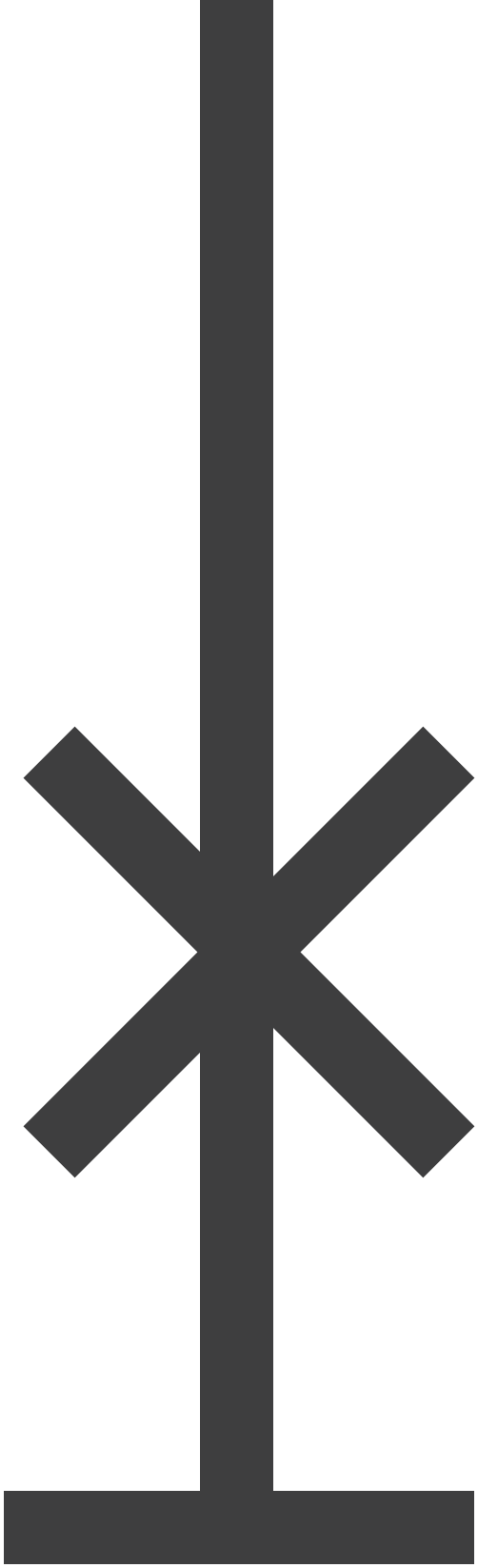
FOCUSED

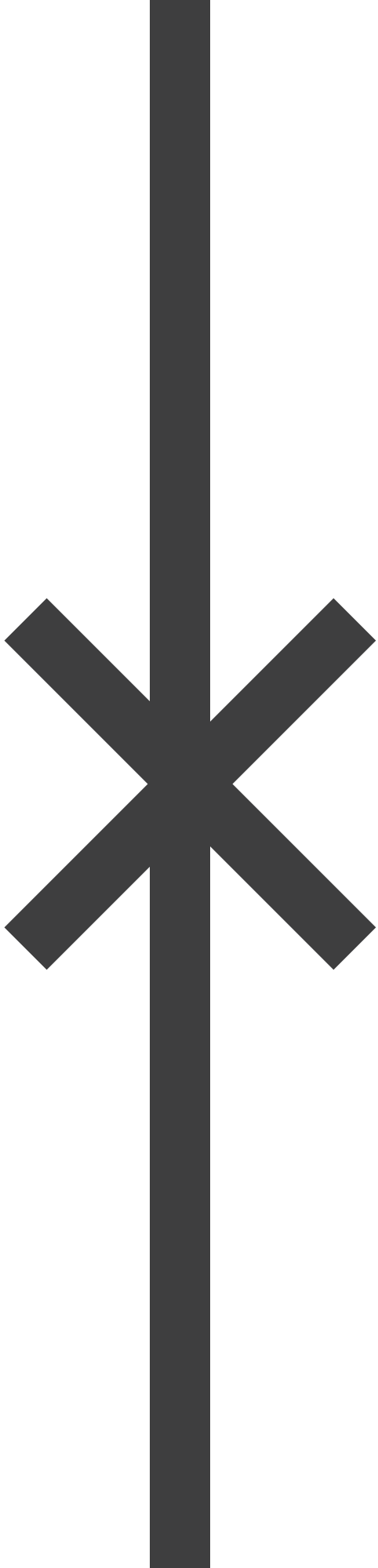
Glance ●——————● Focused

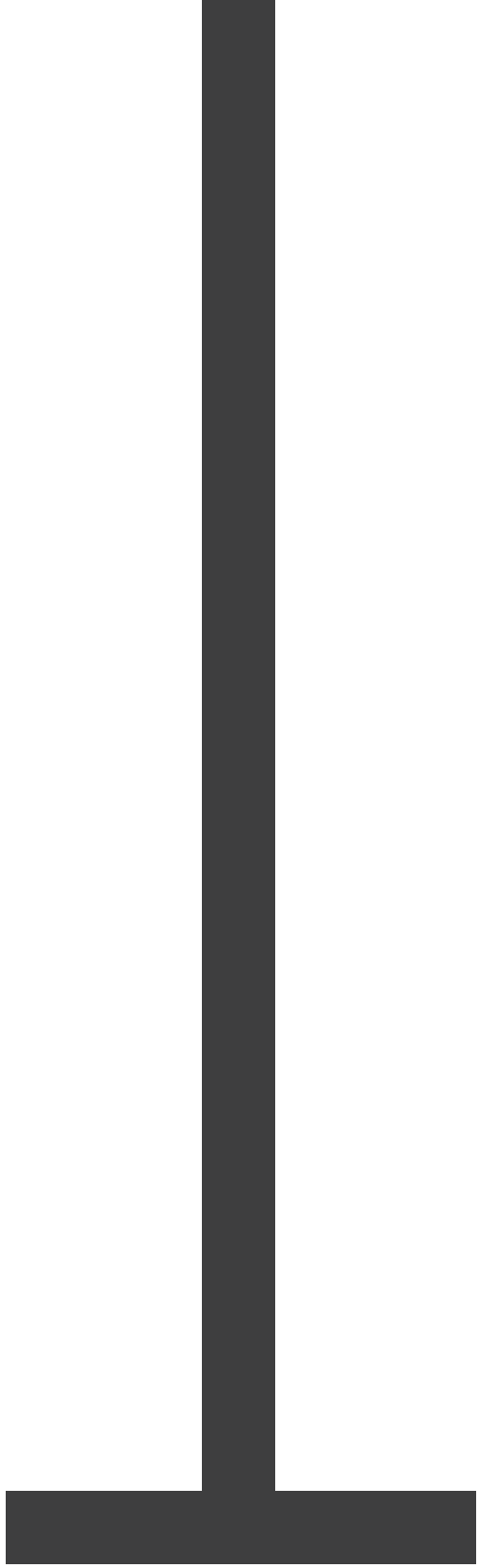


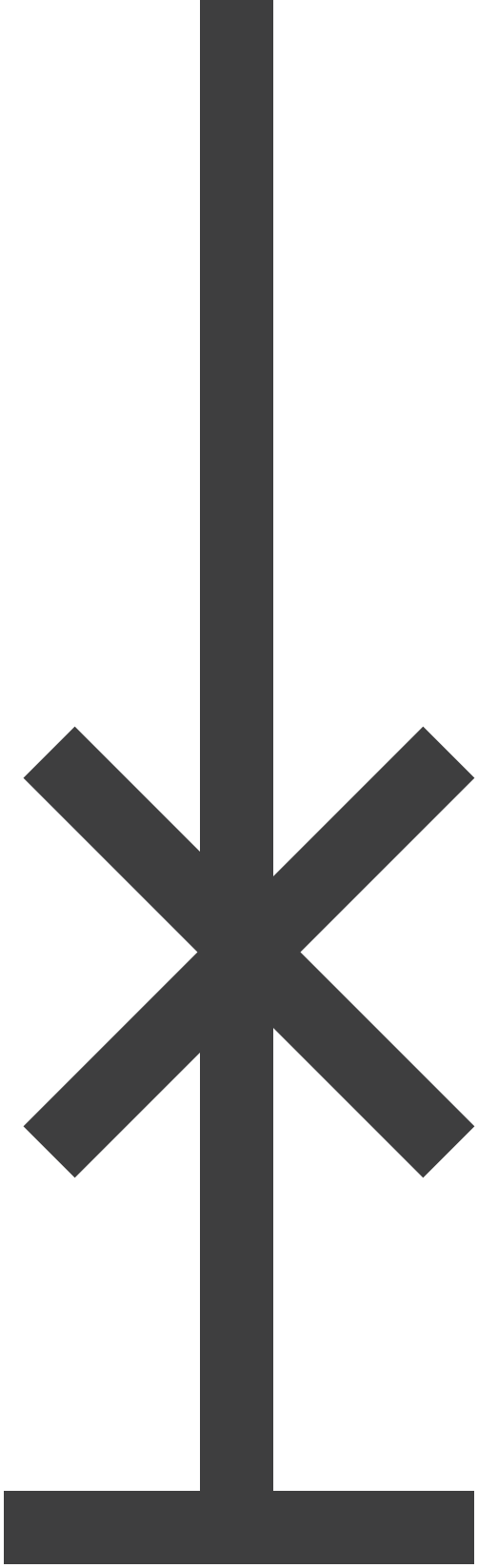


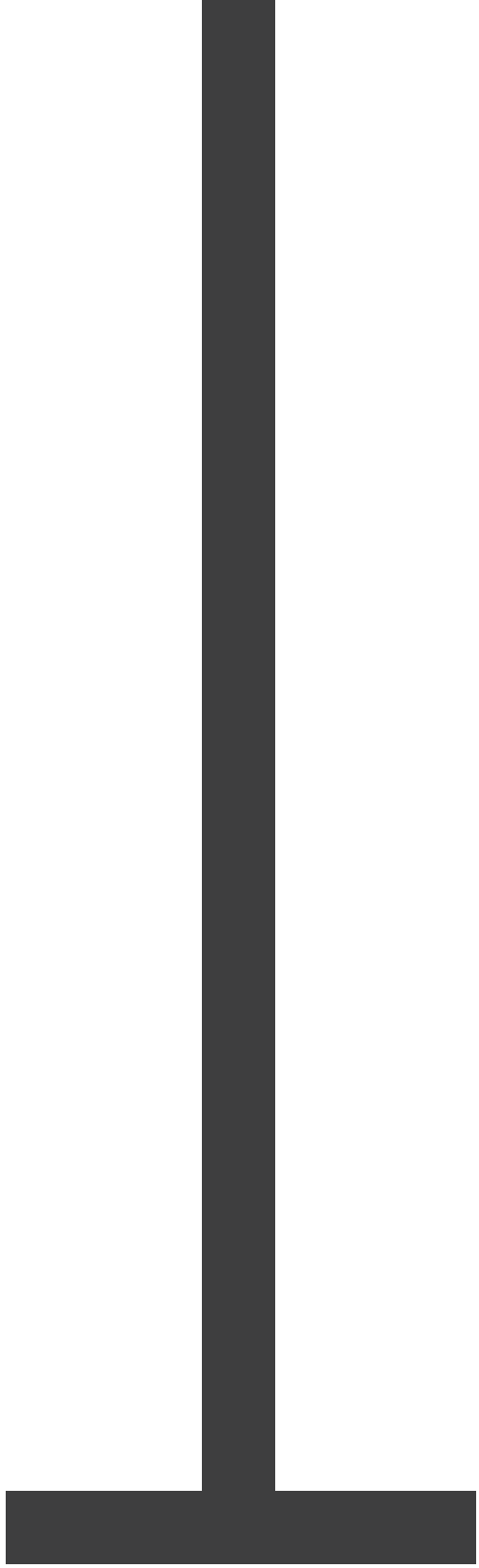


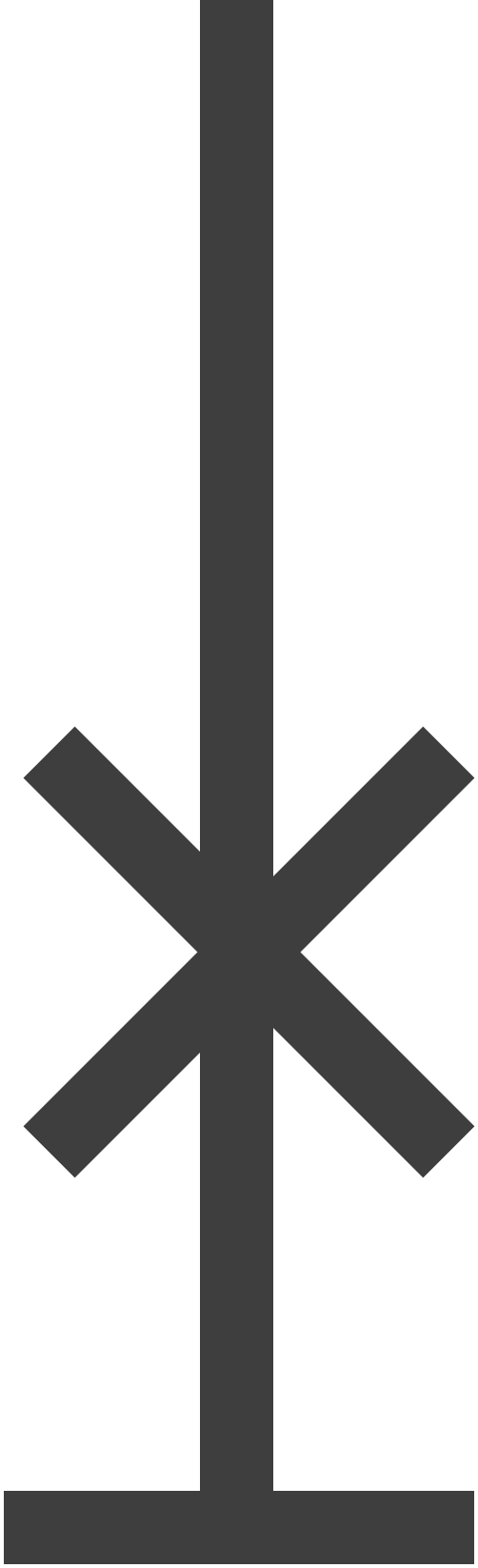


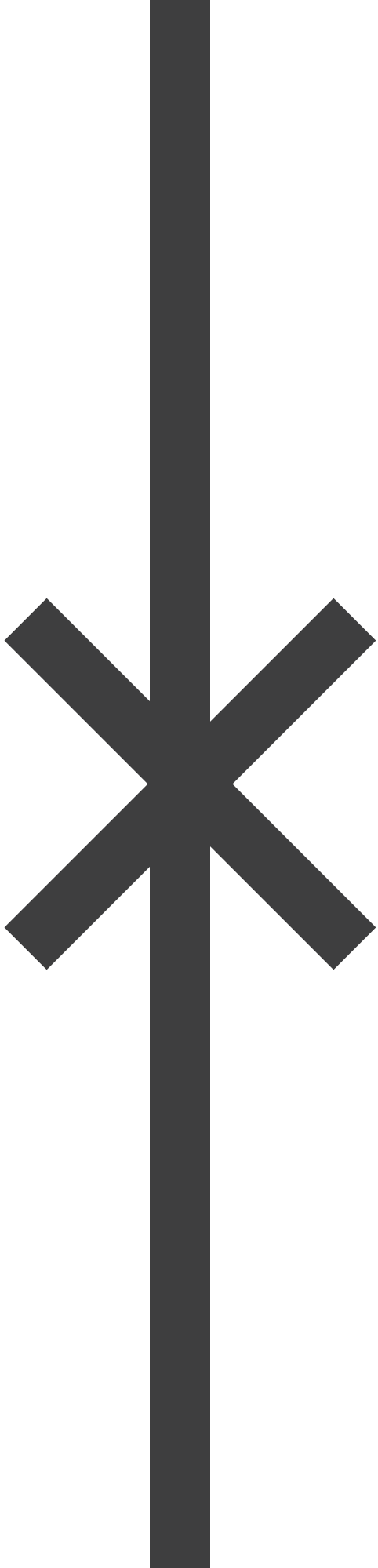


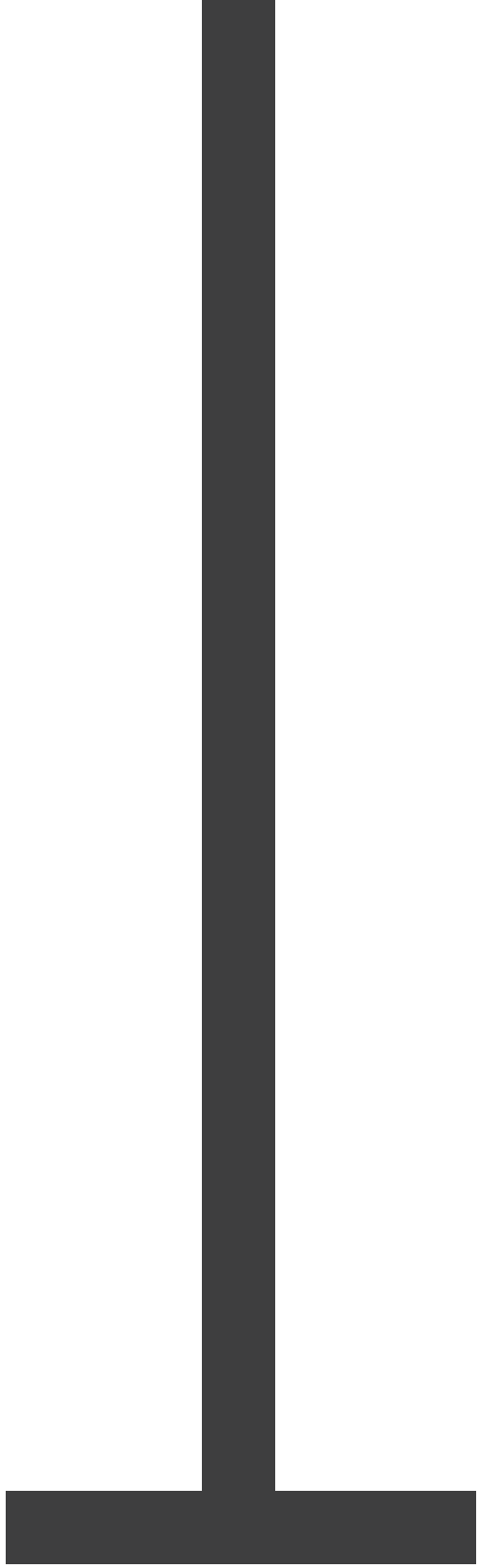


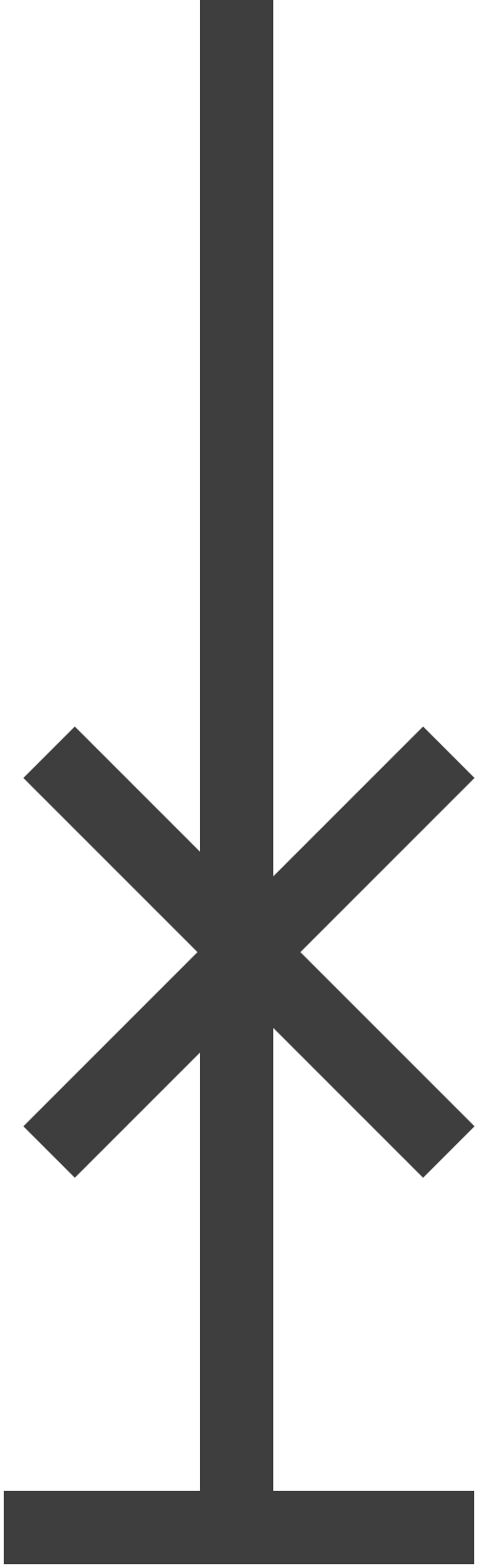


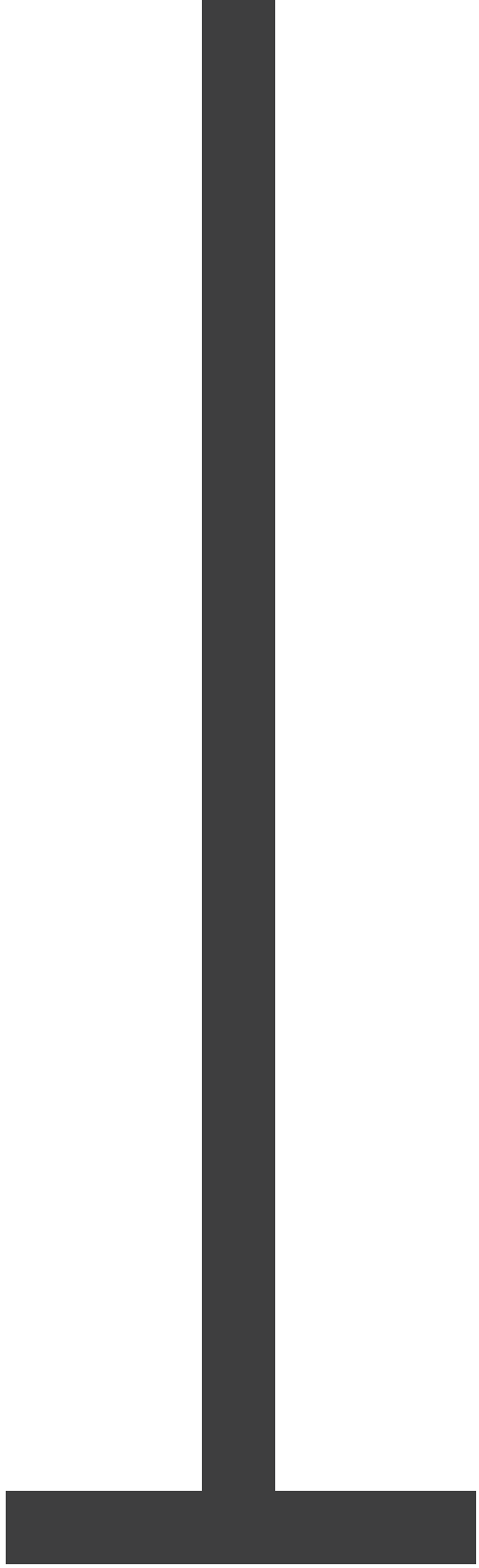


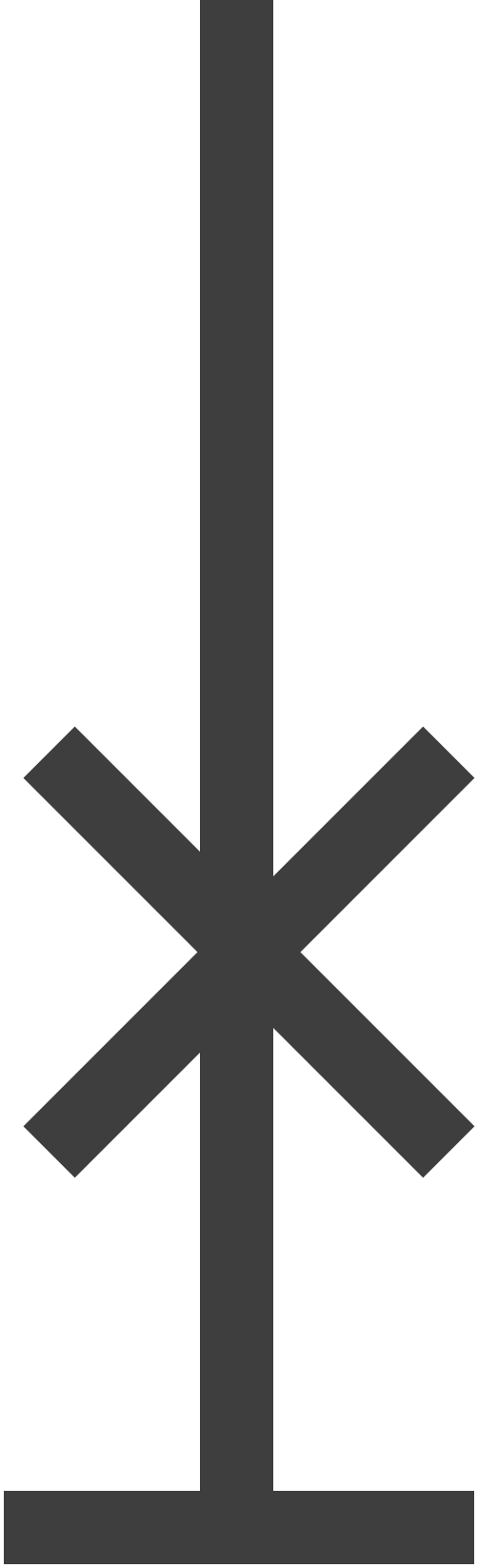


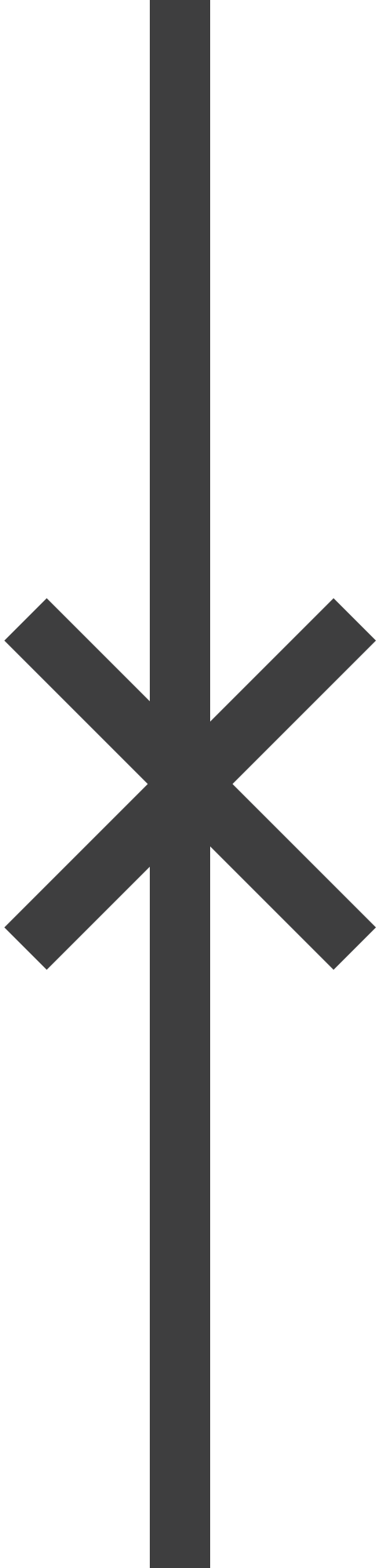












The UDV Cards are a collaboration between: **Damla Çay, Sebastian Meier and Till Nagel**

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