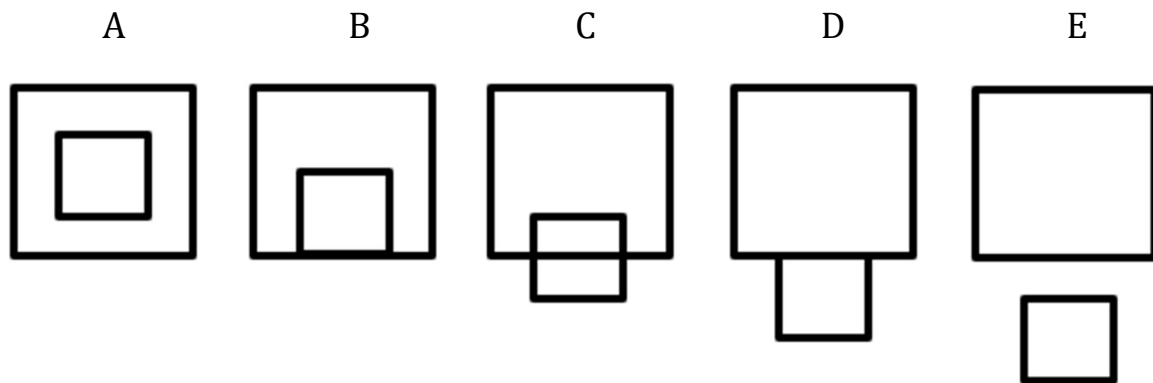


Ontische Bewegungstransformationen

1. In der vorliegenden Arbeit sollen die ontischen Bewegungstransformationen mit Hilfe der Kategorientheorie auf der Basis der differentiellen semiotischen Matrix (vgl. Bense 1975, S. 105) sowie der 5 ontotopologischen Strukturtypen (vgl. Toth 2015) formal definiert werden.

2. Gegeben seien zwei topologische Räume A und B mit $A \sqsubset B$ und $S = (A, B)$ sowie eine ontische Einbettungsrelation $L = (ex, ad, in)$. B soll nun so aus A in Richtung $U(S)$ verschoben werden, daß sich die Lagen für B nur hinsichtlich der Teilrelationen von L unterscheiden. (D.h., alle übrigen eventuellen Verschiebungen sind ausgeschlossen, da sie nicht-invariant sind.) Dann gibt es genau 5 mögliche Strukturtypen:



mit

$A \sqsubset B, A \sqsubset R(S, U), A \sqsubset R(S \sqcup U), A \sqsubset R(U, S), A \sqsubset U(B)$.

Im folgenden werden die 5 Strukturtypen mit Hilfe von differentiellen Zeichenklassen (vgl. Steffen 1981) definiert und durch je ein ontisches Modell illustriert.

ZKl diff A

((3.2, 3.1), (2.3, 2.1), (1.2, 1.3))



Kreuzstr. 40, 8008 Zürich

ZKl diff B

((3.2, 3.2), (2.3, 2.2), (1.2, 1.3))



Pfingstweidstr. 94, 8005 Zürich

ZKl diff C

((3.2, 3.1), (2.3, 2.2), (1.2, 1.3))



Rue Mouffetard, Paris

ZKl diff D

((3.2, 3.2), (2.3, 2.2), (1.2, 1.3))



Weidmannstr. 12, 8046 Zürich

Zkl diff E

$((3.2, 3.1), (2.3, 2.3), (1.2, 1.3))$



Rue de Bretagne, Paris

2. Wird A auf die angegebene Weise aus B herausbewegt, so kann man in einem weiteren Schritt die 5 möglichen Bewegungstransformationen aufeinander abbilden. Man erhält dadurch genau die im folgenden definierten 10 Möglichkeiten.

2.1. $A \rightarrow B$

$((3.2, 3.1), (2.3, 2.1), (1.2, 1.3))$

↓

$((3.2, 3.2), (2.3, 2.2), (1.2, 1.3)) \quad =$

$(((\text{id}_3, \text{id}_2), (\text{id}_3, \alpha)), ((\text{id}_2, \text{id}_3), (\text{id}_2, \alpha)), ((\text{id}_1, \text{id}_2), (\text{id}_1, \text{id}_3)))$

		M			O			I		
		Qu 1.1	Si 1.2	Le 1.3	Ic 2.1	In 2.2	Sy 2.3	Rh 3.1	Di 3.2	Ar 3.3
M	Qu 1.1	Qu-Qu 1.1 1.1	Qu-Si 1.1 1.2	Qu-Le 1.1 1.3	Qu-Ic 1.1 2.1	Qu-In 1.1 2.2	Qu-Sy 1.1 2.3	Qu-Rh 1.1 3.1	Qu-Di 1.1 3.2	Qu-Ar 1.1 3.3
	Si 1.2	Si-Qu 1.2 1.1	Si-Si 1.2 1.2	Si-Le 1.2 1.3	Si-Ic 1.2 2.1	Si-In 1.2 2.2	Si-Sy 1.2 2.3	Si-Rh 1.2 3.1	Si-Di 1.2 3.2	Si-Ar 1.2 3.3
	Le 1.3	Le-Qu 1.3 1.1	Le-Si 1.3 1.2	Le-Le 1.3 1.3	Le-Ic 1.3 2.1	Le-In 1.3 2.2	Le-Sy 1.3 2.3	Le-Rh 1.3 3.1	Le-Di 1.3 3.2	Le-Ar 1.3 3.3
O	Ic 2.1	Ic-Qu 2.1 1.1	Ic-Si 2.1 1.2	Ic-Le 2.1 1.3	Ic-Ic 2.1 2.1	Ic-In 2.1 2.2	Ic-Sy 2.1 2.3	Ic-Rh 2.1 3.1	Ic-Di 2.1 3.2	Ic-Ar 2.1 3.3
	In 2.2	In-Qu 2.2 1.1	In-Si 2.2 1.2	In-Le 2.2 1.3	In-Ic 2.2 2.1	In-In 2.2 2.2	In-Sy 2.2 2.3	In-Rh 2.2 3.1	In-Di 2.2 3.2	In-Ar 2.2 3.3
	Sy 2.3	Sy-Qu 2.3 1.1	Sy-Si 2.3 1.2	Sy-Le 2.3 1.3	Sy-Ic 2.3 2.1	Sy-In 2.3 2.2	Sy-Sy 2.3 2.3	Sy-Rh 2.3 3.1	Sy-Di 2.3 3.2	Sy-Ar 2.3 3.3
I	Rh 3.1	Rh-Qu 3.1 1.1	Rh-Si 3.1 1.2	Rh-Le 3.1 1.3	Rh-Ic 3.1 2.1	Rh-In 3.1 2.2	Rh-Sy 3.1 2.3	Rh-Rh 3.1 3.1	Rh-Di 3.1 3.2	Rh-Ar 3.1 3.3
	Di 3.2	Di-Qu 3.2 1.1	Di-Si 3.2 1.2	Di-Le 3.2 1.3	Di-Ic 3.2 2.1	Di-In 3.2 2.2	Di-Sy 3.2 2.3	Di-Rh 3.2 3.1	Di-Di 3.2 3.2	Di-Ar 3.2 3.3
	Ar 3.3	Ar-Qu 3.3 1.1	Ar-Si 3.3 1.2	Ar-Le 3.3 1.3	Ar-Ic 3.3 2.1	Ar-In 3.3 2.2	Ar-Sy 3.3 2.3	Ar-Rh 3.3 3.1	Ar-Di 3.3 3.2	Ar-Ar 3.3 3.3

2.2. $A \rightarrow C$

$((3.2, 3.1), (2.3, 2.1), (1.2, 1.3))$

↓

$((3.2, 3.1), (2.3, 2.2), (1.2, 1.3)) =$

$(((\text{id}_3, \text{id}_2), (\text{id}_3, \text{id}_1)), ((\text{id}_2, \text{id}_3), (\text{id}_2, \alpha)), ((\text{id}_1, \text{id}_2), (\text{id}_1, \text{id}_3)))$

		M			O			I		
		Qu 1.1	Si 1.2	Le 1.3	Ic 2.1	In 2.2	Sy 2.3	Rh 3.1	Di 3.2	Ar 3.3
M	Qu 1.1	Qu-Qu 1.1 1.1	Qu-Si 1.1 1.2	Qu-Le 1.1 1.3	Qu-Ic 1.1 2.1	Qu-In 1.1 2.2	Qu-Sy 1.1 2.3	Qu-Rh 1.1 3.1	Qu-Di 1.1 3.2	Qu-Ar 1.1 3.3
	Si 1.2	Si-Qu 1.2 1.1	Si-Si 1.2 1.2	Si-Le 1.2 1.3	Si-Ic 1.2 2.1	Si-In 1.2 2.2	Si-Sy 1.2 2.3	Si-Rh 1.2 3.1	Si-Di 1.2 3.2	Si-Ar 1.2 3.3
	Le 1.3	Le-Qu 1.3 1.1	Le-Si 1.3 1.2	Le-Le 1.3 1.3	Le-Ic 1.3 2.1	Le-In 1.3 2.2	Le-Sy 1.3 2.3	Le-Rh 1.3 3.1	Le-Di 1.3 3.2	Le-Ar 1.3 3.3
O	Ic 2.1	Ic-Qu 2.1 1.1	Ic-Si 2.1 1.2	Ic-Le 2.1 1.3	Ic-Ic 2.1 2.1	Ic-In 2.1 2.2	Ic-Sy 2.1 2.3	Ic-Rh 2.1 3.1	Ic-Di 2.1 3.2	Ic-Ar 2.1 3.3
	In 2.2	In-Qu 2.2 1.1	In-Si 2.2 1.2	In-Le 2.2 1.3	In-Ic 2.2 2.1	In-In 2.2 2.2	In-Sy 2.2 2.3	In-Rh 2.2 3.1	In-Di 2.2 3.2	In-Ar 2.2 3.3
	Sy 2.3	Sy-Qu 2.3 1.1	Sy-Si 2.3 1.2	Sy-Le 2.3 1.3	Sy-Ic 2.3 2.1	Sy-In 2.3 2.2	Sy-Sy 2.3 2.3	Sy-Rh 2.3 3.1	Sy-Di 2.3 3.2	Sy-Ar 2.3 3.3
I	Rh 3.1	Rh-Qu 3.1 1.1	Rh-Si 3.1 1.2	Rh-Le 3.1 1.3	Rh-Ic 3.1 2.1	Rh-In 3.1 2.2	Rh-Sy 3.1 2.3	Rh-Rh 3.1 3.1	Rh-Di 3.1 3.2	Rh-Ar 3.1 3.3
	Di 3.2	Di-Qu 3.2 1.1	Di-Si 3.2 1.2	Di-Le 3.2 1.3	Di-Ic 3.2 2.1	Di-In 3.2 2.2	Di-Sy 3.2 2.3	Di-Rh 3.2 3.1	Di-Di 3.2 3.2	Di-Ar 3.2 3.3
	Ar 3.3	Ar-Qu 3.3 1.1	Ar-Si 3.3 1.2	Ar-Le 3.3 1.3	Ar-Ic 3.3 2.1	Ar-In 3.3 2.2	Ar-Sy 3.3 2.3	Ar-Rh 3.3 3.1	Ar-Di 3.3 3.2	Ar-Ar 3.3 3.3

2.3. $A \rightarrow D$

$((3.2, 3.1), (2.3, 2.1), (1.2, 1.3))$

↓

$((3.2, 3.2), (2.3, 2.2), (1.2, 1.3)) =$

$(((\text{id}_3, \text{id}_2), (\text{id}_3, \alpha)), ((\text{id}_2, \text{id}_3), (\text{id}_2, \alpha)), ((\text{id}_1, \text{id}_2), (\text{id}_1, \text{id}_3)))$

	M			O			I		
	Qu 1.1	Si 1.2	Le 1.3	Ic 2.1	In 2.2	Sy 2.3	Rh 3.1	Di 3.2	Ar 3.3
M	Qu 1.1	Qu-Si 1.1 1.2	Qu-Le 1.1 1.3	Qu-Ic 1.1 2.1	Qu-In 1.1 2.2	Qu-Sy 1.1 2.3	Qu-Rh 1.1 3.1	Qu-Di 1.1 3.2	Qu-Ar 1.1 3.3
Si 1.2	Si-Qu 1.2 1.1	Si-Si 1.2 1.2	Si-Le 1.2 1.3	Si-Ic 1.2 2.1	Si-In 1.2 2.2	Si-Sy 1.2 2.3	Si-Rh 1.2 3.1	Si-Di 1.2 3.2	Si-Ar 1.2 3.3
Le 1.3	Le-Qu 1.3 1.1	Le-Si 1.3 1.2	Le-Le 1.3 1.3	Le-Ic 1.3 2.1	Le-In 1.3 2.2	Le-Sy 1.3 2.3	Le-Rh 1.3 3.1	Le-Di 1.3 3.2	Le-Ar 1.3 3.3
O	Ic 2.1	Ic-Qu 2.1 1.1	Ic-Si 2.1 1.2	Ic-Ic 2.1 1.3	Ic-In 2.1 2.2	Ic-Sy 2.1 2.3	Ic-Rh 2.1 3.1	Ic-Di 2.1 3.2	Ic-Ar 2.1 3.3
In 2.2	In-Qu 2.2 1.1	In-Si 2.2 1.2	In-Le 2.2 1.3	In-Ic 2.2 2.1	In-In 2.2 2.2	In-Sy 2.2 2.3	In-Rh 2.2 3.1	In-Di 2.2 3.2	In-Ar 2.2 3.3
Sy 2.3	Sy-Qu 2.3 1.1	Sy-Si 2.3 1.2	Sy-Le 2.3 1.3	Sy-Ic 2.3 2.1	Sy-In 2.3 2.2	Sy-Sy 2.3 2.3	Sy-Rh 2.3 3.1	Sy-Di 2.3 3.2	Sy-Ar 2.3 3.3
I	Rh 3.1	Rh-Qu 3.1 1.1	Rh-Si 3.1 1.2	Rh-Le 3.1 1.3	Rh-Ic 3.1 2.1	Rh-In 3.1 2.2	Rh-Rh 3.1 2.3	Rh-Di 3.1 3.2	Rh-Ar 3.1 3.3
Di 3.2	Di-Qu 3.2 1.1	Di-Si 3.2 1.2	Di-Le 3.2 1.3	Di-Ic 3.2 2.1	Di-In 3.2 2.2	Di-Sy 3.2 2.3	Di-Rh 3.2 3.1	Di-Di 3.2 3.2	Di-Ar 3.2 3.3
Ar 3.3	Ar-Qu 3.3 1.1	Ar-Si 3.3 1.2	Ar-Le 3.3 1.3	Ar-Ic 3.3 2.1	Ar-In 3.3 2.2	Ar-Sy 3.3 2.3	Ar-Rh 3.3 3.1	Ar-Di 3.3 3.2	Ar-Ar 3.3 3.3

2.4. $A \rightarrow E$

$((3.2, 3.1), (2.3, 2.1), (1.2, 1.3))$

↓

$((3.2, 3.1), (2.3, 2.3), (1.2, 1.3)) =$

$(((\text{id}_3, \text{id}_2), (\text{id}_3, \text{id}_1)), ((\text{id}_2, \text{id}_3), (\text{id}_2, \beta\alpha)), ((\text{id}_1, \text{id}_2), (\text{id}_1, \text{id}_3)))$

		M			O			I		
		Qu 1.1	Si 1.2	Le 1.3	Ic 2.1	In 2.2	Sy 2.3	Rh 3.1	Di 3.2	Ar 3.3
M	Qu	Qu-Qu	Qu-Si	Qu-Le	Qu-Ic	Qu-In	Qu-Sy	Qu-Rh	Qu-Di	Qu-Ar
	1.1	1.1 1.1	1.1 1.2	1.1 1.3	1.1 2.1	1.1 2.2	1.1 2.3	1.1 3.1	1.1 3.2	1.1 3.3
	Si	Si-Qu	Si-Si	Si-Le	Si-Ic	Si-In	Si-Sy	Si-Rh	Si-Di	Si-Ar
O	1.2	1.2 1.1	1.2 1.2	1.2 1.3	1.2 2.1	1.2 2.2	1.2 2.3	1.2 3.1	1.2 3.2	1.2 3.3
	Le	Le-Qu	Le-Si	Le-Le	Le-Ic	Le-In	Le-Sy	Le-Rh	Le-Di	Le-Ar
	1.3	1.3 1.1	1.3 1.2	1.3 1.3	1.3 2.1	1.3 2.2	1.3 2.3	1.3 3.1	1.3 3.2	1.3 3.3
I	Ic	Ic-Qu	Ic-Si	Ic-Le	Ic-Ic	Ic-In	Ic-Sy	Ic-Rh	Ic-Di	Ic-Ar
	2.1	2.1 1.1	2.1 1.2	2.1 1.3	2.1 2.1	2.1 2.2	2.1 2.3	2.1 3.1	2.1 3.2	2.1 3.3
	In	In-Qu	In-Si	In-Le	In-Ic	In-In	In-Sy	In-Rh	In-Di	In-Ar
I	2.2	2.2 1.1	2.2 1.2	2.2 1.3	2.2 2.1	2.2 2.2	2.2 2.3	2.2 3.1	2.2 3.2	2.2 3.3
	Sy	Sy-Qu	Sy-Si	Sy-Le	Sy-Ic	Sy-In	Sy-Sy	Sy-Rh	Sy-Di	Sy-Ar
	2.3	2.3 1.1	2.3 1.2	2.3 1.3	2.3 2.1	2.3 2.2	2.3 2.3	2.3 3.1	2.3 3.2	2.3 3.3
I	Rh	Rh-Qu	Rh-Si	Rh-Le	Rh-Ic	Rh-In	Rh-Sy	Rh-Rh	Rh-Di	Rh-Ar
	3.1	3.1 1.1	3.1 1.2	3.1 1.3	3.1 2.1	3.1 2.2	3.1 2.3	3.1 3.1	3.1 3.2	3.1 3.3
	Di	Di-Qu	Di-Si	Di-Le	Di-Ic	Di-In	Di-Sy	Di-Rh	Di-Di	Di-Ar
I	3.2	3.2 1.1	3.2 1.2	3.2 1.3	3.2 2.1	3.2 2.2	3.2 2.3	3.2 3.1	3.2 3.2	3.2 3.3
	Ar	Ar-Qu	Ar-Si	Ar-Le	Ar-Ic	Ar-In	Ar-Sy	Ar-Rh	Ar-Di	Ar-Ar
	3.3	3.3 1.1	3.3 1.2	3.3 1.3	3.3 2.1	3.3 2.2	3.3 2.3	3.3 3.1	3.3 3.2	3.3 3.3

2.5. $B \rightarrow C$

$((3.2, 3.2), (2.3, 2.2), (1.2, 1.3))$

↓

$((3.2, 3.1), (2.3, 2.2), (1.2, 1.3)) =$

$(((\text{id}_3, \text{id}_2), (\text{id}_3, \alpha^\circ)), ((\text{id}_2, \text{id}_3), (\text{id}_2, \text{id}_2)), ((\text{id}_1, \text{id}_2), (\text{id}_1, \text{id}_3)))$

		M			O			I		
		Qu 1.1	Si 1.2	Le 1.3	Ic 2.1	In 2.2	Sy 2.3	Rh 3.1	Di 3.2	Ar 3.3
M	Qu	Qu-Qu	Qu-Si	Qu-Le	Qu-Ic	Qu-In	Qu-Sy	Qu-Rh	Qu-Di	Qu-Ar
	1.1	1.1 1.1	1.1 1.2	1.1 1.3	1.1 2.1	1.1 2.2	1.1 2.3	1.1 3.1	1.1 3.2	1.1 3.3
	Si	Si-Qu	Si-Si	Si-Le	Si-Ic	Si-In	Si-Sy	Si-Rh	Si-Di	Si-Ar
O	1.2	1.2 1.1	1.2 1.2	1.2 1.3	1.2 2.1	1.2 2.2	1.2 2.3	1.2 3.1	1.2 3.2	1.2 3.3
	Le	Le-Qu	Le-Si	Le-Le	Le-Ic	Le-In	Le-Sy	Le-Rh	Le-Di	Le-Ar
	1.3	1.3 1.1	1.3 1.2	1.3 1.3	1.3 2.1	1.3 2.2	1.3 2.3	1.3 3.1	1.3 3.2	1.3 3.3
I	Ic	Ic-Qu	Ic-Si	Ic-Le	Ic-Ic	Ic-In	Ic-Sy	Ic-Rh	Ic-Di	Ic-Ar
	2.1	2.1 1.1	2.1 1.2	2.1 1.3	2.1 2.1	2.1 2.2	2.1 2.3	2.1 3.1	2.1 3.2	2.1 3.3
	In	In-Qu	In-Si	In-Le	In-Ic	In-In	In-Sy	In-Rh	In-Di	In-Ar
I	2.2	2.2 1.1	2.2 1.2	2.2 1.3	2.2 2.1	2.2 2.2	2.2 2.3	2.2 3.1	2.2 3.2	2.2 3.3
	Sy	Sy-Qu	Sy-Si	Sy-Le	Sy-Ic	Sy-In	Sy-Sy	Sy-Rh	Sy-Di	Sy-Ar
	2.3	2.3 1.1	2.3 1.2	2.3 1.3	2.3 2.1	2.3 2.2	2.3 2.3	2.3 3.1	2.3 3.2	2.3 3.3
I	Rh	Rh-Qu	Rh-Si	Rh-Le	Rh-Ic	Rh-In	Rh-Sy	Rh-Rh	Rh-Di	Rh-Ar
	3.1	3.1 1.1	3.1 1.2	3.1 1.3	3.1 2.1	3.1 2.2	3.1 2.3	3.1 3.1	3.1 3.2	3.1 3.3
	Di	Di-Qu	Di-Si	Di-Le	Di-Ic	Di-In	Di-Sy	Di-Rh	Di-Di	Di-Ar
I	3.2	3.2 1.1	3.2 1.2	3.2 1.3	3.2 2.1	3.2 2.2	3.2 2.3	3.2 3.1	3.2 3.2	3.2 3.3
	Ar	Ar-Qu	Ar-Si	Ar-Le	Ar-Ic	Ar-In	Ar-Sy	Ar-Rh	Ar-Di	Ar-Ar
	3.3	3.3 1.1	3.3 1.2	3.3 1.3	3.3 2.1	3.3 2.2	3.3 2.3	3.3 3.1	3.3 3.2	3.3 3.3

2.6. $B \rightarrow D$

$((3.2, 3.2), (2.3, 2.2), (1.2, 1.3))$

↓

$((3.2, 3.2), (2.3, 2.2), (1.2, 1.3)) =$

$(((\text{id}_3, \text{id}_2), (\text{id}_3, \text{id}_2)), ((\text{id}_2, \text{id}_3), (\text{id}_2, \text{id}_2)), ((\text{id}_1, \text{id}_2), (\text{id}_1, \text{id}_3)))$

	M			O			I		
	Qu 1.1	Si 1.2	Le 1.3	Ic 2.1	In 2.2	Sy 2.3	Rh 3.1	Di 3.2	Ar 3.3
M	Qu 1.1	Qu-Si 1.1 1.2	Qu-Le 1.1 1.3	Qu-Ic 1.1 2.1	Qu-In 1.1 2.2	Qu-Sy 1.1 2.3	Qu-Rh 1.1 3.1	Qu-Di 1.1 3.2	Qu-Ar 1.1 3.3
	Si 1.2	Si-Qu 1.2 1.1	Si-Si 1.2 1.2	Si-Le 1.2 1.3	Si-Ic 1.2 2.1	Si-In 1.2 2.2	Si-Sy 1.2 2.3	Si-Rh 1.2 3.1	Si-Di 1.2 3.2
	Le 1.3	Le-Qu 1.3 1.1	Le-Si 1.3 1.2	Le-Le 1.3 1.3	Le-Ic 1.3 2.1	Le-In 1.3 2.2	Le-Sy 1.3 2.3	Le-Rh 1.3 3.1	Le-Di 1.3 3.2
O	Ic 2.1	Ic-Qu 2.1 1.1	Ic-Si 2.1 1.2	Ic-Le 2.1 1.3	Ic-Ic 2.1 2.1	Ic-In 2.1 2.2	Ic-Sy 2.1 2.3	Ic-Rh 2.1 3.1	Ic-Di 2.1 3.2
	In 2.2	In-Qu 2.2 1.1	In-Si 2.2 1.2	In-Le 2.2 1.3	In-Ic 2.2 2.1	In-In 2.2 2.2	In-Sy 2.2 2.3	In-Rh 2.2 3.1	In-Di 2.2 3.2
	Sy 2.3	Sy-Qu 2.3 1.1	Sy-Si 2.3 1.2	Sy-Le 2.3 1.3	Sy-Ic 2.3 2.1	Sy-In 2.3 2.2	Sy-Sy 2.3 2.3	Sy-Rh 2.3 3.1	Sy-Di 2.3 3.2
I	Rh 3.1	Rh-Qu 3.1 1.1	Rh-Si 3.1 1.2	Rh-Le 3.1 1.3	Rh-Ic 3.1 2.1	Rh-In 3.1 2.2	Rh-Sy 3.1 2.3	Rh-Rh 3.1 3.1	Rh-Di 3.1 3.2
	Di 3.2	Di-Qu 3.2 1.1	Di-Si 3.2 1.2	Di-Le 3.2 1.3	Di-Ic 3.2 2.1	Di-In 3.2 2.2	Di-Sy 3.2 2.3	Di-Rh 3.2 3.1	Di-Ar 3.2 3.3
	Ar 3.3	Ar-Qu 3.3 1.1	Ar-Si 3.3 1.2	Ar-Le 3.3 1.3	Ar-Ic 3.3 2.1	Ar-In 3.3 2.2	Ar-Sy 3.3 2.3	Ar-Rh 3.3 3.1	Ar-Ar 3.3 3.3

2.7. $B \rightarrow E$

$((3.2, 3.2), (2.3, 2.2), (1.2, 1.3))$

↓

$((3.2, 3.1), (2.3, 2.3), (1.2, 1.3)) =$

$(((\text{id}_3, \text{id}_2), (\text{id}_3, \alpha^0)), ((\text{id}_2, \text{id}_3), (\text{id}_2, \beta)), ((\text{id}_1, \text{id}_2), (\text{id}_1, \text{id}_3)))$

		M			O			I		
		Qu 1.1	Si 1.2	Le 1.3	Ic 2.1	In 2.2	Sy 2.3	Rh 3.1	Di 3.2	Ar 3.3
M	Qu	Qu-Qu	Qu-Si	Qu-Le	Qu-Ic	Qu-In	Qu-Sy	Qu-Rh	Qu-Di	Qu-Ar
	11	11 1.1	11 1.2	11 1.3	11 2.1	11 2.2	11 2.3	11 3.1	11 3.2	11 3.3
	Si	Si-Qu	Si-Si	Si-Le	Si-Ic	Si-In	Si-Sy	Si-Rh	Si-Di	Si-Ar
O	12	12 1.1	12 1.2	12 1.3	12 2.1	12 2.2	12 2.3	12 3.1	12 3.2	12 3.3
	Le	Le-Qu	Le-Si	Le-Le	Le-Ic	Le-In	Le-Sy	Le-Rh	Le-Di	Le-Ar
	13	13 1.1	13 1.2	13 1.3	13 2.1	13 2.2	13 2.3	13 3.1	13 3.2	13 3.3
I	Ic	Ic-Qu	Ic-Si	Ic-Le	Ic-Ic	Ic-In	Ic-Sy	Ic-Rh	Ic-Di	Ic-Ar
	21	21 1.1	21 1.2	21 1.3	21 2.1	21 2.2	21 2.3	21 3.1	21 3.2	21 3.3
	In	In-Qu	In-Si	In-Le	In-Ic	In-In	In-Sy	In-Rh	In-Di	In-Ar
	22	22 1.1	22 1.2	22 1.3	22 2.1	22 2.2	22 2.3	22 3.1	22 3.2	22 3.3
	Sy	Sy-Qu	Sy-Si	Sy-Le	Sy-Ic	Sy-In	Sy-Sy	Sy-Rh	Sy-Di	Sy-Ar
	23	23 1.1	23 1.2	23 1.3	23 2.1	23 2.2	23 2.3	23 3.1	23 3.2	23 3.3
	Rh	Rh-Qu	Rh-Si	Rh-Le	Rh-Ic	Rh-In	Rh-Sy	Rh-Rh	Rh-Di	Rh-Ar
	31	31 1.1	31 1.2	31 1.3	31 2.1	31 2.2	31 2.3	31 3.1	31 3.2	31 3.3
	Di	Di-Qu	Di-Si	Di-Le	Di-Ic	Di-In	Di-Sy	Di-Rh	Di-Di	Di-Ar
	32	32 1.1	32 1.2	32 1.3	32 2.1	32 2.2	32 2.3	32 3.1	32 3.2	32 3.3
	Ar	Ar-Qu	Ar-Si	Ar-Le	Ar-Ic	Ar-In	Ar-Sy	Ar-Rh	Ar-Di	Ar-Ar
	33	33 1.1	33 1.2	33 1.3	33 2.1	33 2.2	33 2.3	33 3.1	33 3.2	33 3.3

2.8. $C \rightarrow D$

$((3.2, 3.1), (2.3, 2.2), (1.2, 1.3))$

↓

$((3.2, 3.2), (2.3, 2.2), (1.2, 1.3)) =$

$(((\text{id}_3, \text{id}_2), (\text{id}_3, \alpha)), ((\text{id}_2, \text{id}_3), (\text{id}_2, \text{id}_2)), ((\text{id}_1, \text{id}_2), (\text{id}_1, \text{id}_3)))$

		M			O			I		
		Qu 1.1	Si 1.2	Le 1.3	Ic 2.1	In 2.2	Sy 2.3	Rh 3.1	Di 3.2	Ar 3.3
M	Qu	Qu-Qu	Qu-Si	Qu-Le	Qu-Ic	Qu-In	Qu-Sy	Qu-Rh	Qu-Di	Qu-Ar
	11	11 1.1	11 1.2	11 1.3	11 2.1	11 2.2	11 2.3	11 3.1	11 3.2	11 3.3
	Si	Si-Qu	Si-Si	Si-Le	Si-Ic	Si-In	Si-Sy	Si-Rh	Si-Di	Si-Ar
O	12	12 1.1	12 1.2	12 1.3	12 2.1	12 2.2	12 2.3	12 3.1	12 3.2	12 3.3
	Le	Le-Qu	Le-Si	Le-Le	Le-Ic	Le-In	Le-Sy	Le-Rh	Le-Di	Le-Ar
	13	13 1.1	13 1.2	13 1.3	13 2.1	13 2.2	13 2.3	13 3.1	13 3.2	13 3.3
I	Ic	Ic-Qu	Ic-Si	Ic-Le	Ic-Ic	Ic-In	Ic-Sy	Ic-Rh	Ic-Di	Ic-Ar
	21	21 1.1	21 1.2	21 1.3	21 2.1	21 2.2	21 2.3	21 3.1	21 3.2	21 3.3
	In	In-Qu	In-Si	In-Le	In-Ic	In-In	In-Sy	In-Rh	In-Di	In-Ar
	22	22 1.1	22 1.2	22 1.3	22 2.1	22 2.2	22 2.3	22 3.1	22 3.2	22 3.3
	Sy	Sy-Qu	Sy-Si	Sy-Le	Sy-Ic	Sy-In	Sy-Sy	Sy-Rh	Sy-Di	Sy-Ar
	23	23 1.1	23 1.2	23 1.3	23 2.1	23 2.2	23 2.3	23 3.1	23 3.2	23 3.3
	Rh	Rh-Qu	Rh-Si	Rh-Le	Rh-Ic	Rh-In	Rh-Sy	Rh-Rh	Rh-Di	Rh-Ar
	31	31 1.1	31 1.2	31 1.3	31 2.1	31 2.2	31 2.3	31 3.1	31 3.2	31 3.3
	Di	Di-Qu	Di-Si	Di-Le	Di-Ic	Di-In	Di-Sy	Di-Rh	Di-Di	Di-Ar
	32	32 1.1	32 1.2	32 1.3	32 2.1	32 2.2	32 2.3	32 3.1	32 3.2	32 3.3
	Ar	Ar-Qu	Ar-Si	Ar-Le	Ar-Ic	Ar-In	Ar-Sy	Ar-Rh	Ar-Di	Ar-Ar
	33	33 1.1	33 1.2	33 1.3	33 2.1	33 2.2	33 2.3	33 3.1	33 3.2	33 3.3

2.9. $C \rightarrow E$

$((3.2, 3.1), (2.3, 2.2), (1.2, 1.3))$

↓

$((3.2, 3.1), (2.3, 2.3), (1.2, 1.3)) =$

$(((\text{id}_3, \text{id}_2), (\text{id}_3, \text{id}_1)), ((\text{id}_2, \text{id}_3), (\text{id}_2, \beta)), ((\text{id}_1, \text{id}_2), (\text{id}_1, \text{id}_3)))$

	M			O			I		
	Qu 1.1	Si 1.2	Le 1.3	Ic 2.1	In 2.2	Sy 2.3	Rh 3.1	Di 3.2	Ar 3.3
M	Qu 1.1 1.1	Qu-Si 1.1 1.2	Qu-Le 1.1 1.3	Qu-Ic 1.1 2.1	Qu-In 1.1 2.2	Qu-Sy 1.1 2.3	Qu-Rh 1.1 3.1	Qu-Di 1.1 3.2	Qu-Ar 1.1 3.3
Si 1.2 1.2	Si-Qu 1.2 1.1	Si-Si 1.2 1.2	Si-Le 1.2 1.3	Si-Ic 1.2 2.1	Si-In 1.2 2.2	Si-Sy 1.2 2.3	Si-Rh 1.2 3.1	Si-Di 1.2 3.2	Si-Ar 1.2 3.3
Le 1.3 1.3	Le-Qu 1.3 1.1	Le-Si 1.3 1.2	Le-Le 1.3 1.3	Le-Ic 1.3 2.1	Le-In 1.3 2.2	Le-Sy 1.3 2.3	Le-Rh 1.3 3.1	Le-Di 1.3 3.2	Le-Ar 1.3 3.3
O	Ic 2.1 2.1	Ic-Qu 2.1 1.2	Ic-Si 2.1 1.3	Ic-Ic 2.1 2.1	Ic-In 2.1 2.2	Ic-Sy 2.1 2.3	Ic-Rh 2.1 3.1	Ic-Di 2.1 3.2	Ic-Ar 2.1 3.3
In 2.2 2.2	In-Qu 2.2 1.1	In-Si 2.2 1.2	In-Le 2.2 1.3	In-Ic 2.2 2.1	In-In 2.2 2.2	In-Sy 2.2 2.3	In-Rh 2.2 3.1	In-Di 2.2 3.2	In-Ar 2.2 3.3
Sy 2.3 2.3	Sy-Qu 2.3 1.1	Sy-Si 2.3 1.2	Sy-Le 2.3 1.3	Sy-Ic 2.3 2.1	Sy-In 2.3 2.2	Sy-Sy 2.3 2.3	Sy-Rh 2.3 3.1	Sy-Di 2.3 3.2	Sy-Ar 2.3 3.3
I	Rh 3.1 3.1	Rh-Qu 3.1 1.2	Rh-Si 3.1 1.3	Rh-Ic 3.1 2.1	Rh-In 3.1 2.2	Rh-Sy 3.1 2.3	Rh-Rh 3.1 3.1	Rh-Di 3.1 3.2	Rh-Ar 3.1 3.3
Di 3.2 3.2	Di-Qu 3.2 1.1	Di-Si 3.2 1.2	Di-Le 3.2 1.3	Di-Ic 3.2 2.1	Di-In 3.2 2.2	Di-Sy 3.2 2.3	Di-Rh 3.2 3.1	Di-Di 3.2 3.2	Di-Ar 3.2 3.3
Ar 3.3 3.3	Ar-Qu 3.3 1.1	Ar-Si 3.3 1.2	Ar-Le 3.3 1.3	Ar-Ic 3.3 2.1	Ar-In 3.3 2.2	Ar-Sy 3.3 2.3	Ar-Rh 3.3 3.1	Ar-Di 3.3 3.2	Ar-Ar 3.3 3.3

2.10. $D \rightarrow E$

$((3.2, 3.2), (2.3, 2.2), (1.2, 1.3))$

↓

$((3.2, 3.1), (2.3, 2.3), (1.2, 1.3)) =$

$(((\text{id}_3, \text{id}_2), (\text{id}_3, \alpha^0)), ((\text{id}_2, \text{id}_3), (\text{id}_2, \beta)), ((\text{id}_1, \text{id}_2), (\text{id}_1, \text{id}_3)))$

		M			O			I		
		Qu 1.1	Si 1.2	Le 1.3	Ic 2.1	In 2.2	Sy 2.3	Rh 3.1	Di 3.2	Ar 3.3
M	Qu 1.1	Qu-Qu 1.1 1.1	Qu-Si 1.1 1.2	Qu-Le 1.1 1.3	Qu-Ic 1.1 2.1	Qu-In 1.1 2.2	Qu-Sy 1.1 2.3	Qu-Rh 1.1 3.1	Qu-Di 1.1 3.2	Qu-Ar 1.1 3.3
	Si 1.2	Si-Qu 1.2 1.1	Si-Si 1.2 1.2	Si-Le 1.2 1.3	Si-Ic 1.2 2.1	Si-In 1.2 2.2	Si-Sy 1.2 2.3	Si-Rh 1.2 3.1	Si-Di 1.2 3.2	Si-Ar 1.2 3.3
	Le 1.3	Le-Qu 1.3 1.1	Le-Si 1.3 1.2	Le-Le 1.3 1.3	Le-Ic 1.3 2.1	Le-In 1.3 2.2	Le-Sy 1.3 2.3	Le-Rh 1.3 3.1	Le-Di 1.3 3.2	Le-Ar 1.3 3.3
O	Ic 2.1	Ic-Qu 2.1 1.1	Ic-Si 2.1 1.2	Ic-Le 2.1 1.3	Ic-Ic 2.1 2.1	Ic-In 2.1 2.2	Ic-Sy 2.1 2.3	Ic-Rh 2.1 3.1	Ic-Di 2.1 3.2	Ic-Ar 2.1 3.3
	In 2.2	In-Qu 2.2 1.1	In-Si 2.2 1.2	In-Le 2.2 1.3	In-Ic 2.2 2.1	In-In 2.2 2.2	In-Sy 2.2 2.3	In-Rh 2.2 3.1	In-Di 2.2 3.2	In-Ar 2.2 3.3
	Sy 2.3	Sy-Qu 2.3 1.1	Sy-Si 2.3 1.2	Sy-Le 2.3 1.3	Sy-Ic 2.3 2.1	Sy-In 2.3 2.2	Sy-Sy 2.3 2.3	Sy-Rh 2.3 3.1	Sy-Di 2.3 3.2	Sy-Ar 2.3 3.3
I	Rh 3.1	Rh-Qu 3.1 1.1	Rh-Si 3.1 1.2	Rh-Le 3.1 1.3	Rh-Ic 3.1 2.1	Rh-In 3.1 2.2	Rh-Sy 3.1 2.3	Rh-Rh 3.1 3.1	Rh-Di 3.1 3.2	Rh-Ar 3.1 3.3
	Di 3.2	Di-Qu 3.2 1.1	Di-Si 3.2 1.2	Di-Le 3.2 1.3	Di-Ic 3.2 2.1	Di-In 3.2 2.2	Di-Sy 3.2 2.3	Di-Rh 3.2 3.1	Di-Di 3.2 3.2	Di-Ar 3.2 3.3
	Ar 3.3	Ar-Qu 3.3 1.1	Ar-Si 3.3 1.2	Ar-Le 3.3 1.3	Ar-Ic 3.3 2.1	Ar-In 3.3 2.2	Ar-Sy 3.3 2.3	Ar-Rh 3.3 3.1	Ar-Di 3.3 3.2	Ar-Ar 3.3 3.3

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