

Structuralism as a Grounding Thesis

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Structuralism: “the structure is in some sense prior to the individuals”.

Even the identity and individuality of objects depends on the relational structure of the world (Ladyman and Ross, *Everything Must Go*, p. 130).

Individuals are nothing over and above the nexus of relations in which they stand (*ibid* p. 138).

Relational structure is ontologically more fundamental than individual objects (Ladyman, *On the Identity and Diversity of Objects in a Structure*, p. 24).

1 Structuralism and Ground

Structuralist motivation: if the individuals were prior to the structure they would be “superfluous structure”.

Individualistic facts are those that concern particular individuals. *Qualitative facts* are those that concern the distribution of qualitative properties and/or relations without concerning which individuals instantiate them.

A structuralist template: Individualistic facts (if such there be) are *grounded in* qualitative facts (but in such a way as to make sense of symmetries!)

What structuralism is *not*:

- Individualistic facts supervene on qualitative facts.
- Individuals are individuated by their role in the structure (if individuation is understood modally).
- Individuals ontologically depend on the structure.

2 What Are the Qualitative Grounds?

If structuralism is a claim about what grounds what, it's absolutely vital that we are given a theory of *what the grounding facts are like*.

Algebraic Structuralism:

- The fundamental ontology is a collection of primitive n-place relations. It includes I^2 , the 2-place relation we ordinarily understand as holding between x and y if and only if x is identical to y .
- Complex n-place relations are then built as follows. Let P^n be the n-place relation we ordinarily understand as holding of individuals $x_1 \dots x_n$ if and only if $\phi(x_1 \dots x_n)$. And let Q^m be the m-place relation we ordinarily understand as holding of individuals $y_1 \dots y_m$ if and only if $\psi(y_1 \dots y_m)$. Then
 1. $\sim P^n$ is the n-place relation we ordinarily understand as holding of $x_1 \dots x_n$ if and only if it is not the case that $\phi(x_1 \dots x_n)$;
 2. $(P^n \ \& \ Q^m)$ is the $\max(n, m)$ -place relation that we ordinarily understand as holding of $x_1 \dots x_k$ if and only if $\phi(x_1 \dots x_n)$ and $\psi(x_1 \dots x_m)$, where $k = \max(n, m)$;
 3. σP^n is the n-place relation we ordinarily understand as holding of $x_1 \dots x_n$ if and only if $\phi(x_n x_1 x_2 \dots x_{n-1})$;
 4. ιP^n is the n-place relation we ordinarily understand as holding of $x_1 \dots x_n$ if and only if $\phi(x_2 x_1 x_3 \dots x_n)$;
 5. If $n \geq 1$, then cP^n is the (n-1)-place relation that we ordinarily understand as holding of $x_2 \dots x_n$ if and only if there is something x_1 such that $\phi(x_1 \dots x_n)$; otherwise cP^n is the 0-place relation P^n ;
 6. pP^n is the (n+1)-place relation that we ordinarily understand as holding of $x_1 \dots x_{n+1}$ if and only if $\phi(x_2 \dots x_n x_{n+1})$.
- The fundamental facts of the world are all of the form

P^0 obtains

where P^0 is constructed out of primitive relations in the above way.

Interesting Consequence: There is only one fundamental fact, the World Fact!

Limitation: If there are infinitely many objects, the above approach would need an algebratizations of an infinitary logic. (Help!)

3 How Are the Individualistic Facts Grounded?

Logical form of grounding facts:

the X ground Y

where X and Y range over facts and X is a plural variable.

Singularism: Y is a singular variable.

Pluralism: Y is a plural variable.

Structuralism: Let I be the set of all individualistic facts. Let Q be the set of all fundamental qualitative facts (i.e. the singleton containing the World Fact!). Then:

The members of I are grounded in the members of Q , though no member of I has a ground on its own.