Goals

Need for a relation that is

- ▶ agnostic about numerical change (transformation_of, derives_from)
- ▶ agnostic about the distinction between budding and derivation
- ▶ transitive closure

Develops_from

C *develops_from* D if and only if, for any x and any time t, the following holds: if x instantiates C at time t, then

1. EITHER for some time t_1, x instantiates D at t_1 and t_1 **precedes** t, and there is no time interval t_2 such that x instantiates C at t_2 and x instantiates D at t_2;

2. OR for some time t_1, there is some y such that y instantiates D at t_1 and x **arises_from** y.

Arises_from

x **arises_from** y is defined recursively in the following way:

1. if x **succeeds** y, then x **arises_from** y;
2. if x **buds_from** y, then x **arises_from** y;
3. if x **arises_from** y and y **succeeds** z, then x **arises_from** z;
4. if x **arises_from** y and y **buds_from** z, then x **arises_from** z;
5. x **arises_from** y holds only because of (1)-(4).

Succeeds

x **succeeds** y if and only if

1. x begins to exist at the same instant of time at which y ceases to exist;
2. there is some anatomical structure z such that z is **part_of** y when y ceases to exist and z is **part_of** x when x begins to exist.

Buds_from

x **buds_from** y if and only if

1. there is some anatomical structure z such that z is **part_of** y immediately before x begins to exist, and x **succeeds** z;
2. x continues to exist for some interval of time from the point when y begins to exist;
3. at no time t, x is **part_of** y **at** t.