parent of a parent of a parent of *y*... and so on. (As we could say '*x* is an ancestor of *y* in the Parent-series'.) While 'x is a parent of y' is not transitive, 'x is an ancestor of y' is.

The same structure holds for the relations 'x causally depends on y' and 'x is a cause of y'. Causation is the ancestral of the relation of causal dependence.

The problem of redundant causation

Something seems a case of redundant causation when it is obvious that c causes e, but it is not true that if c had not occurred, e would not have occurred (i.e. there seems to be causation without causal dependence). Two different kinds of redundant causation are central:

1. **Overdetermination**: e *actually* has two independent causes, c1 and c2. Since c1 and c2 are independent, either would occur without the other. In the closest world where c1 does not occur, e still occurs, because c2 brings it about. And vice-versa with c2. So e causally depends on neither c1 nor c2.
   Example: two independent assassins shoot and kill the tyrant. Arguably in such a case, if the first assassin had not fired, the second would still have killed the tyrant. And the same applies to the second.
2. **Pre-emption**: c actually causes e, but there is a 'back-up' cause waiting to cause e if c fails. So e does not causally depend on c.
   Example: one assassin shoots and kills the tyrant. But another is waiting to shoot just in case the first one misses. The first one doesn't miss, so his shot is the cause of the death. But it isn't true that if the first had missed, the tyrant would not have died.

Lewis can respond to overdetermination by pointing out that we have no good reason to treat these events as distinct. If these occurrences are exactly simultaneous, then they seem to be (parts of) the same event.

Lewis can deal with standard pre-emption by appealing to his definition of causation in terms of a chain of causally dependent events. The first assassin's shot causes the tyrant's death because there is a chain of events between this shooting and the death. Each event in this chain is causally dependent on the one before, but this does not mean that the death is causally dependent on the shooting. So the fact that there is a back-up does not stop the shot causing the death.

Late pre-emption

However, we should distinguish early pre-emption and late pre-emption:

> **Early pre-emption:** c causes e, but there is a 'back-up' cause waiting to cause e if c fails to happen. So e does not causally depend on c. Here the pre-empting cause is imagined to occur well before e, so that there is a causal chain of events between the pre-empted cause and e.
>
> **Late pre-emption:** c causes e, but there is a second, parallel process that would have caused e if c or any of its intermediary effects c*, c'... etc. had failed. Here the pre-empting cause is imagined to occur immediately before c, so that there is no causal chain of events between the pre-empted cause and e.

In *Causation: A Users Guide,* L.A. Paul and Ned Hall discuss examples of late preemption. Here's a clear case:

> Suzy and Billy, two friends, both throw rocks at a bottle. Suzy is quicker, and consequently it is her rock, and not Billy's, that breaks the bottle. But Billy, though not as fast, is just as accurate: Had Suzy not thrown, or had her rock somehow been interrupted mid-flight, Billy's rock would have broken the bottle moments later. This case, like [cases of early pre-emption], features a cause of an event that is accompanied by a backup, sufficient to bring about the effect in the cause's absence. But unlike those cases, the actual cause fails either to interrupt the backup process, or to interact with it in such a way as to render it insufficient for the effect.

The counterfactual theory of causation is equipped to deal with early pre-emption, but has difficulties with late pre-emption. (Lewis responds to late pre-emption cases by highlighting that events are 'modally fragile', so that if the pre-empting cause had its way, a slightly different event would have been the result, which renders it false that the actual effect would have occurred had the actual cause not happened. How satisfactory is this reply?)