THE DYNAMIC PRESENT

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Bio-processism

Living organisms are processes, not Aristotelian substances.

At any time, a living body consists of a certain quantity of matter, organised in a particular and highly intricate way; but over time there is a wholesale turnaround of the matter, while preserving the same organisation.

That it is a *living* body depends essentially on this process by which it is constantly rebuilding itself; if the process stops, the matter may remain, but the body is no longer living.

The body, *qua* living, is thus better identified with the process than with the matter.

(References: Schoenheimer 1942; Jonas 1966; Dupré 2012)

Geo-processism

Heraclitus: *On those who enter the same river, ever different waters flow*

The Thames we see in London now is the same river that Julius Caesar's troops crossed in 54 B.C.

But the water is (almost) completely different.

Therefore, the river is not the water.

A river could be either:

- a channel associated with a water-flow process (*primarily* an object); or
- a water-flow process associated with a channel (*primarily* a process).

Geo-processism (continued)

But in the case of *ocean currents*, *whirlpools*, *hurricanes*, and *tornadoes* there is no "channel". These phenomena are processual through and through.

Yet we often treat them as objects: At any time they have a *size*, *shape*, *position*, and *material constitution*, which can (and do) change over time.

We even give them names ("Hurricane Katrina").

Geo-processism: Many geographical "entities" are processes primarily and only secondarily objects ("dual-aspect phenomena").

(References: Galton 2003, 2004)

Radical Processism

Bio-processism: A living organism is a complex network of coordinated processes maintaining a stable organisation realised by a continuously changing ensemble of material constituents.

Geo-processism: Many meteorological and hydrological phenomena are processes maintaining a stable configuration in a continuously changing ensemble of material constituents.

Radical Processism: *Everything* that we would normally call an "object" is ultimately processual in nature.

Everyday objects as "slow processes".

(References: Seibt 2016 (SEP entry))

Cautionary Note: Remarks on "Process"

Perdurantism identifies both objects and processes as four-dimensional, spatio-temporally extended entities. As such, objects and processes may be treated as ontologically the same; but *this is not processism*.

In many modern ontologies, such as BFO (Basic Formal Ontology),

- Processes are spatio-temporally extended entities with temporal parts, as in perdurantism (traditional occurrents/perdurants);
- Objects are only spatially extended, having no temporal parts and therefore existing as wholes at each moment of their existence (traditional substances/continuants/endurants).

This view is *incompatible with processism*.

Processes as continuant-like

At each moment that a process is in operation it has certain qualities, and these qualities may change over time:

- A motion may become faster or slower, or change direction.
- A sound may become louder or softer, or change in pitch or timbre.
- A flow may become more or less turbulent

Thus a process can be said to exist as a whole at each moment that it is in operation.

This is *not* true of events; if an event is said to change, this must be understood to mean that some process constitutive of the event changes. An event *is* a perdurant.

(References: Stout 1997, 2003; Galton 2006, 2008)

Processes, Change, and Motion

For Processism, processes are independent entities, not merely dependent on substances.

Since change and motion are processes, this implies that Processism must reject the "at-at" theory of change and motion, according to which:

- There is nothing more to change than different states holding at different times;
- There is nothing more to motion than an object's occupying different positions at different times.

Russell (for): The "static" theory of change.
Bergson (against): It treats movement *as though it were made of immobilities*.

Continuity

Assumption: Motion and quantitative change are almost always continuous. If there are discontinuities, these are isolated occurrences.

On this assumption, the times *at* which states hold on the at-at theory must* be instants, and the instants must form a continuum — i.e., isomorphic to $(\mathbb{R}, <)$.

Hence, on the at-at theory, any time interval must be composed of infinitely many infinitely small components. This model has been extraordinarily fruitful in the application of mathematics to the physical sciences.

But is it believable as a description of reality?

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* Subject to certain caveats.

The Nature of the Present Moment

Every part of the past was once present, so whatever the present is like, it must surely have the following property: *The past is constructed of parts which are of a similar nature to the present*.

If the present is an instant, then the past must be constructed of instants.

This is already problematic since no amount of unextended instants can sum to an extended interval.

And if the present is an instant, of zero or infinitesimal duration, how can there be processes going on *now*?

There is no room in an instant for anything to change!

Instants vs Moments

The terms "instant" and "moment" are often used interchangeably.

But consider their etymologies:

- Instant = "standing in". This suggests something static.
- Moment = "movement". This is dynamic.

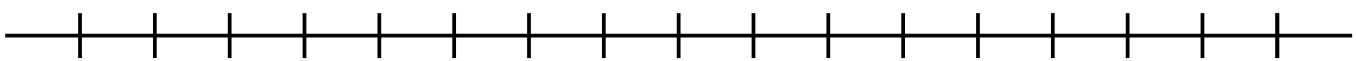
Let us speak of *the present moment* without assuming this is dimensionless like an instant.

In fact, the present moment must be extended in order to have room for change and movement.

But how?

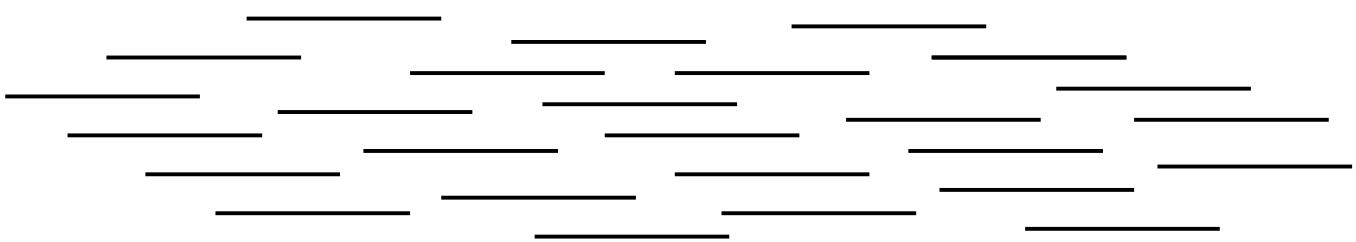
Two pictures

- Discrete moments:



  Any change occurring in one moment must smoothly link up with its continuation in the next moment.

- Overlapping moments:



  Continuity is assured by the fact of overlap (cf. Dummett's "fuzzy realism" (2000)).

We do not have to assume that these moments have well-defined beginnings and endings: they could "fade in" and "fade out".

The Specious Present

Our second picture recalls the notion of the *specious present*, the present time as given in experience:

James (1890): *The specious present has . . . a vaguely vanishing backward and forward fringe.*
The unit of composition of our perception of time is a duration, *with a bow and a stern, as it were — a rearward- and a forward-looking end.*

Whitehead (1929): *There is no such thing as nature at an instant posited by sense-awareness.What sense-awareness delivers over for knowledge is nature through a period.*

Bergson (1946): *Our consciousness tells us that when we speak of our present we are thinking of a certain interval of duration. What duration? It is impossible to fix it exactly, as it is something rather elusive.*

Instants are derived from Intervals, not vice versa

James (1909): *The literally present moment is a purely verbal supposition, not a position; the only present ever realised concretely being the 'passing moment' in which the dying rearward of time and its dawning future forever mix their lights.*

Bergson (1946): *What precisely is the present? If it is a question of the present instant — I mean of a mathematical instant which would be to time what the mathematical point is to the line — it is clear that such an instant is a pure abstraction, an aspect of the mind: it cannot have real existence.*

Walker (1947): *Un instant n'est pas une expérience de base, physique ou psychologique, mais est un concept dérivé d'expériences ayant une certaine durée temporelle. Le caractère temporel d'une expèrience doit être dépeint comme un intervalle, plutôt que comme un point.*

Digression: Instantaneous Velocities and States of Motion

If changes in value of a quantity Q are plotted by a function $q : T \to \mathbb{R}$ then the derivative $\frac{\mathrm{d}q}{\mathrm{d}t}$ gives the rate of change of Q at each instant. This depends on values of q at other instants, so it is not an inherent property of the instant itself.

But some have held that there are inherent *instantaneous states of change* obtaining at instants. The velocity at one instant *explains* the subsequent change of position.

If we "abolish" instants, then there are no instantaneous velocities, whether primitive or derived, only average velocities; so the problem *goes away*.

(References: Tooley 1988; Bigelow & Pargetter 1989; Arntzenius 2000; Carroll 2002; Meyer 2003; Smith 2003)

Instants as articulations of time

Aristotle on Zeno's paradoxes: *The conclusion that it is impossible to reach a limit is a result of dividing the magnitude in a certain way*.

Likewise Bergson: [Zeno's paradoxes] *all . . . involve the conviction that one can treat movements as one treats space, divide it without taking account of its articulations.*

What are these "articulations"?

A movement (or other change) can only be considered to be composed of parts insofar as these parts are marked out by boundaries formed by *qualitative discontinuities* in reality.

Examples of Qualitative Discontinuities

- The sudden onset of some sound.
- The inception or termination of movement of a rigid body.
- The first contact between two bodies in collision.
- The attainment of the highest point in the trajectory of a ball thrown vertically upwards.

In idealisation, all of these take place at instants — in reality, it is not possible to pinpoint them to less than a (very short) interval.

It is events such as these which *punctuate* time and enable us to mark off more-or-less precise intervals bounded by more-or-less precise instants. (And we construct time-measuring devices to generate an endless supply of such events for us to use in this way.)

Where does discontinuity come from?

How can there be discontinuities of any sort in a continuous world?

As experiencing, perceiving, cognising subjects we endow the continuous fabric of the world with *qualities* which carve up continuous value spaces into discrete regions.

The boundaries between these regions are the qualitative discontinuities which form the salient articulations in things.

The motion of the ball thrown upwards is quantitatively continuous throughout; but the space of velocities is carved into "upwards" and "downwards", with "stationary" marking the boundary. The transition from upward to downward velocity marks a qualitative discontinuity.

The Appeal to Experience

Are we justified in founding our theories of time and process on subjective features of human experience: the specious present and the salience of qualitative discontinuities?

In the final instance, *what else have we to go on?*

We extend the reach of experience through instrumentation that allows us to examine spatial and temporal extents much smaller than any accessible to the unaided senses.

But the times and spaces revealed in this way are still *extents*: there is nothing to suggest that those extents are really made of extensionless (or infinitesimal) atoms — and reason seems to tell us that they cannot be.

The Picture So Far

A dynamic, extended present, made up of processes in the act of happening, smoothly evolving as the moments pass, but punctuated by qualitative discontinuities which form the articulations of time.

- Dynamic — there is change in the present: things are changing *now*.
- Extended — to accommodate change: there is no change in an instant.
- Processes in the act of happening — processes exist in the now, and their happening is constituted of present changes.
- Smoothly evolving — all our experience and reason suggests that quantitative changes are continuous.
- But punctuated — qualitative discontinuities supervene on quantitative continuity, arising from the way qualities carve up continuous value-spaces.

What About Objects?

If processes are the ultimate reality, what becomes of objects?

According to Processism, objects are *islands of stability* in the flux, arising when collections of processes interact in such a way as to preserve some constancy of form.

Bickhard (2008): [In a process metaphysics] *change becomes the default, and it is stability, should such occur, that requires explanation.*

Bergson (1946): *Movement is reality itself, and what we call immobility is a certain state of things analogous to that produced when two trains move at the same speed, in the same direction, on parallel tracks: each of the trains is immovable to the travellers seated in the other.*

Everyday Objects

Ordinary solid objects — this table, that pebble — exemplify an extreme form of stability, that makes them seem quite inert, the opposite of processual.

The processes that constitute their existence are submicroscopic: the incessant interplay of atomic and subatomic motions combining to hold the things together in the face of potentially disruptive forces conspiring to pull them apart.

We cannot see the processes, but we see the resulting stability, which misleads us into thinking that that it is the stability, and not the processes, that is fundamental.

Very Small Objects

We explain macroscopic objects in terms of patterns of activity of microscopic ones. But what about the microscopic objects themselves?

We tend to think of atoms and subatomic particles as *things*: hard little chunks of reality that aggregate to produce hard or soft big chunks of reality.

But Physics tells us they are nothing like that!

On current thinking "particles" turn out to be something like disturbances in a quantum field — a kind of process.

Processism would appear to be at least *compatible* with fundamental physics, and possibly *necessitated* by it.

Objects in a World of Processes

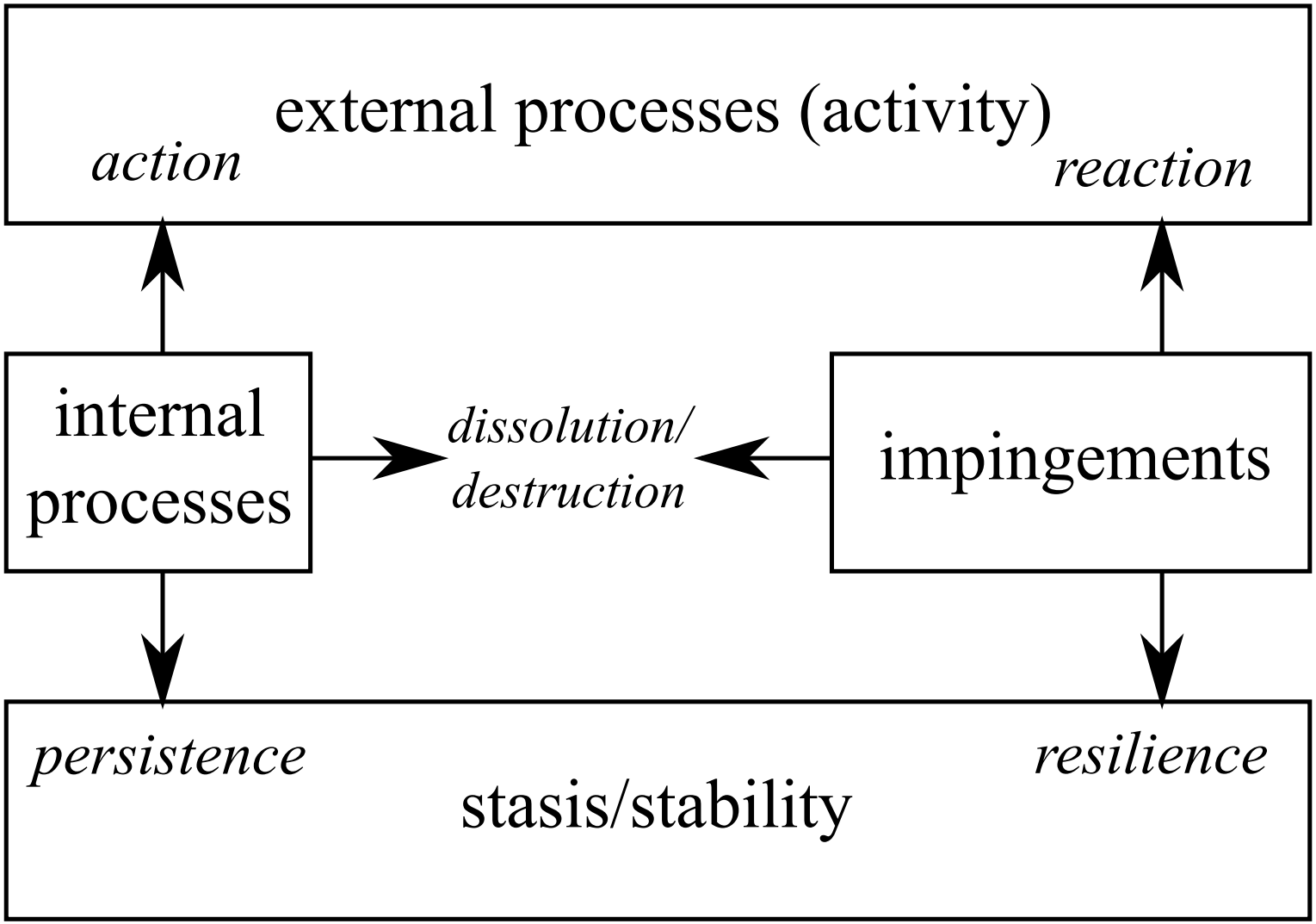
While the *existence* of an object is constituted by the stable interplay of internal processes, its *significance* for us lies in its interactions with rest of the world.

We come to *know* objects through these interactions, but must *explain* them through the internal processes.

Galton & Mizoguchi (2009): [An object is] *an* interface *between its internal and external processes: . . . a point of stability in the world in virtue of which certain processes are characterised as internal, and others as external.*

Compare Moreno & Barandiaran's (2004) distinction between the *internal-constitutive* and *external-interactive* processes exhibited by cellular systems.

An OBJECT image-schema



The OBJECT image-schema is specified entirely in terms of processes.

If such a schema successfully captures our notion of what it is for there to be an object, then objects must be dependent on processes.

For a thoroughgoing process ontology one needs to go further than this and show that objects are dependent on *nothing but* processes — that objects are through and through processual.

If the present is truly dynamic, then this conclusion seems inescapable.

THANK YOU FOR LISTENING

Any Questions?