

A large flock of seagulls is the central focus of the image. Many birds are captured in mid-flight, their wings blurred, creating a sense of dynamic movement. In the foreground, a wooden pier is crowded with seagulls, some standing and others pecking at the ground. The background shows a calm body of water reflecting the sky, with more birds scattered across the surface. The overall scene is set against a clear, light blue sky, suggesting a bright, sunny day.

THE DYNAMICS OF CHANGE

18-19 March 2024

Università Degli Studi di Milano

Sala Napoleonica, Via Sant'Antonio, 12, Milano

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ABOUT THIS WORKSHOP

The goal of this workshop is to shed new light on the dynamicity of change. Clearly, changes unfold over time, but what exactly makes change dynamic? Are specific changes made dynamic by specific features, or is there a general feature of dynamicity shared by all changes? If so, where is this feature to be found? In the physical underpinnings of world, in an account of time, the change makers; or might it be found even more fundamental in a proto-temporal understanding of dynamicity?

A joint event by the DFG-Network [Change and Change-Makers](#) and the [Centre for Philosophy of Time](#).

SCHEDULE

Monday, March 18, 2024

10:30-10:45	Florian Fischer & Giuliano Torrenco: Introduction
10:45-11:45	John Pemberton [Durham] Changing
12:00-13:00	Giuliano Torrenco [Milano/UAB] What is it for Time to Pass?
13:00-14:30	lunch break
14:30-15:30	Florian Fischer [Siegen] The Dynamic Foundation of the World
15:45-16:45	Martin A. Lipman [Leiden] The Passage of Time: Delineating the Phenomenon
17:00-18:00	Giovanni Merlo [Geneva] On feeling relieved that something is over
19:30	conference dinner

Tuesday, March 19, 2024

11:00-12:00	Cristian Mariani [Lugano] The Noise of Time
12:15-13:15	Vincent Grandjean [Zurich] Diachronic Indeterminacy
13:15-14:30	lunch break
14:30-15:30	Alison Fernandes [Dublin] Two Projects on the Direction of Time
15:45-16:45	Federico Viglione [Milano] Mereology of the Most Dynamic Time
17:00-18:00	Tim Maudlin [New York] Fundamental Dynamics for Quantum Theory: How to Get Wave Equations
18:00	closing & drinks

TALKS in order of presentation

John Pemberton [Durham]

Changing

In this talk I shall explore changing – focusing primarily on changing of position: instantaneous velocity. I shall outline two options available to God in creating the world. Under the first option, God first creates each space-time point and then compiles these into a mosaic. Neo-Humean worlds, such as those of Russell and Lewis, would be consistent with this construction. Here, as Russell explains, there is *'no such thing as velocity except in the sense of a real number which is the limit of a certain set of quotients'* (Principles of Mathematics). Under the second option God makes velocities real. I shall sketch and explore how God might construct such a world, outlining how in such a world God might create a present and set it to generate its future. I shall note the contrasting quality of dynamism between these two options, and suggest some reasons for thinking that our world falls under the second option.

Giuliano Torrenco [Milano/UAB]

What is it for Time to Pass?

What, if anything, are we talking about when we say that time passes? In the Western tradition, philosophical investigations on the nature of time divide between realist approaches according to which there is a truth beyond the metaphor of the passage, and anti-realist approaches according to which the passage of time is ultimately an illusion. In this contribution, I will overview various options for the realist and the antirealist with respect to the passage of time, and investigate their connections with the concept of qualitative change.

Florian Fischer [Siegen]

The Dynamic Foundation of the World

Change abounds. Change is found everywhere, but what makes change happen? Part of the research agenda of CCM is that changes do not simply occur, but are brought about by, what we call, change-makers. But the very idea of a change-maker comes with a conceptual

challenge. Namely the „ontological gap“ between the occurrence of the change-maker and actual change happening. This problem parallels the well-known problem of the relation between a disposition and its manifestation. I will argue that the proto-temporal concept of „dynamicity“ is the key to bridging the gap between change and change-maker.

Martin A. Lipman [Leiden]

The Passage of Time: Delineating the Phenomenon

How are we to parse the passage of time; is it a thing, or a property, or best expressed using a connective? What is the relation between the passage of time and change; is the one an enabler of the other, or is the passage of time nothing other than change? And what is the relation between the passage of time and moments in time? I will argue that the passage of time is to be expressed using a connective, that it can be identified with change, and that the passage of time makes moments in time come into existence. If this is correct, it is not so easy to accommodate the passage of time in one’s metaphysics. I’ll propose my own views both on the methodological aspect (on how to proceed) and on what sort of metaphysics is needed.

Giovanni Merlo [Geneva]

On feeling relieved that something is over

Arthur Prior’s ‘Thank Goodness That’s Over’ (TGTO) argument can be interpreted as making a case for tense realism in two steps: tensed relief requires tensed propositions, and tensed propositions require tensed facts, hence the reality of tensed relief presupposes the reality of tensed facts. Relativists (like Lewis) resist this argument at the second step: they think we can admit tensed propositions without admitting tensed facts. Absolutists (like Perry) get off the boat at the first step: they think we can admit tensed relief without admitting tensed propositions. In this paper, I will use a thought experiment to argue that Absolutism is problematic in a way that has not, so far, been fully appreciated: while this approach may allow us to make intelligible sense of our ways of expressing tensed relief, it does not allow us to make intelligible sense of tensed relief itself.

Cristian Mariani [Lugano]

The Noise of Time

The notions of indeterminacy (a feature of things or states of affairs) and indeterminism (a feature of the dynamics) often become confused in the physics literature on quantum mechanics. Philosophers have insisted many times that we should keep these two notions distinct, for we could in principle imagine mixed cases both of a determinate ontology evolving indeterministically and of an indeterminate ontology which evolves deterministically. While it is certainly true that at the purely conceptual level the notions are distinct, if we look at concrete cases we discover that they are more connected than we may have expected. On the one hand, I show that assuming the lack of determinacy in the ontology would pose some challenges to the standard definitions of determinism. On the other hand, I show that if indeterminism is supposed to be fundamental (as it is the case in some approaches to quantum mechanics) rather than merely emergent, then the very way in which the equations of motion are made stochastic will strongly suggest the presence of some ontological indeterminacy. To argue for these two claims, I will be focusing on the key concepts of 'maximal state' for the deterministic case, and of 'stochastic noise' for the indeterministic case.

Vincent Grandjean [Zurich]

Diachronic Indeterminacy

In this paper, I discuss a prominent objection to psychological accounts of personal identity over time: the fission objection. I argue that a specific approach to this objection, involving a type of metaphysical indeterminacy, has been overlooked in previous literature. This approach allows for the preservation of the commonly held belief that experience-memory serves as the criterion for personal diachronic identity, without separating survival from identity or resorting to multiple-occupancy. Specifically, I suggest that a person before fission is identical to one of the two resulting persons after fission, but it is indeterminate which one. Contrarily to previous claims, this approach does not conflict with classical logic or Tarskian semantics.

Alison Fernandes [Dublin]

Two Projects on the Direction of Time

There is a deep ambiguity within the project of accounting for the direction of time. One project is an explanatory one that centres on whether we need an intrinsic asymmetry to explain temporal asymmetries or whether time has at best a 'reduced direction'—a direction that metaphysically depends on the arrangement or orientation of other things, typically these same temporal asymmetries. But there is a second project, one that is not obviously tied to explanation or metaphysi-

cal dependence. This project centres on whether we should commit to a primitive direction of time because we should expect some kind of match between the features of fundamental laws and the fundamental geometry within which the laws operate (Arntzenius 2004; Arntzenius and Greaves 2009; North 2008).

In this paper, I distinguish these projects and assess their relation. *Prima facie*, these projects are distinct. Many of those committed to a conclusion in the first are agnostic about the second. However, there are two subtle ways in which these projects are related. First, assessing the need for an intrinsic direction of time in the second project requires considering the possibility of a reduced direction of time in the first project. Arguably a reduced direction of time can explain the roles required of an intrinsic direction of time in the second project, such as allowing one to state time-reversal asymmetric laws. Second, rejecting an intrinsic direction of time in both projects puts the reductionist in an unusual position with respect to naturalism. It turns out that, no matter what form of dynamics and boundary conditions we accept, neither time nor space could have privileged positions or directions. If so, our reasons for rejecting (or accepting the possibility of) an intrinsic direction of time do not depend on the form of our physical theories but on much deeper considerations concerning what we want physical theories to do.

Federico Viglione [Milano]

Mereology of the Most Dynamic Time

Philosophers of time usually distinguish between static and dynamic theories of temporal reality. However, it is not yet well understood why some theories of time should be described as dynamic, as opposed to static (Tallant & Ingram 2023, 207). Moreover, it is an issue to be explored whether some dynamic theories are more dynamic than others, and, if so, why. In this paper, I will recover a very broad definition of “dynamicity” from the literature, according to which a dynamic world changes over time (Miller 2013, 346; Correia and Rosenkranz 2018, 11; Tallant & Ingram 2023, 195), in the sense that, over time, there is a variation in what ultimately composes reality. Based on this broad definition, I argue that dynamicity comes in degrees: the more variation in what composes reality a theory allows, the more dynamic will it be. Given this, I argue that some temporal mereologies allow higher degrees of dynamicity. In particular, I argue that the most dynamic theory of time possible should not assume (determinate) atoms of time, be they extended or durationless. Lastly, I consider some strategies that temporal atomists may adopt to circumvent such limit. One strategy, which I consider to be promising, is to assume that, for some times, it is metaphysically indeterminate, in the sense of Barnes and Williams (2011), whether they are composed of further parts.

References

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Tim Maudlin [New York]

Fundamental Dynamics for Quantum Theory: How to Get Wave Equations

There are fundamental dynamical equations that govern fundamental entities and emergent dynamical equations that (approximately) describe the dynamics of emergent entities. For example, there is the classical theory of fluid dynamics based on Newtonian physics that is used to describe water waves, even though the fundamental Newtonian dynamical equation is not a wave equation. One strong suggestion of quantum phenomena such as two-slit interference is that the fundamental dynamics of the quantum state (wavefunction) must be some sort of wave dynamics.

I will discuss the fundamental mathematical features of the clearest example we have of fundamental wave dynamics—the free Maxwellian electromagnetic field—and then suggest how that gives insight into the structure of Schrödinger’s equation in quantum theory, including motivating both the use of complex numbers in the wavefunction and the implementation of “time-reversal” by complex conjugation.

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