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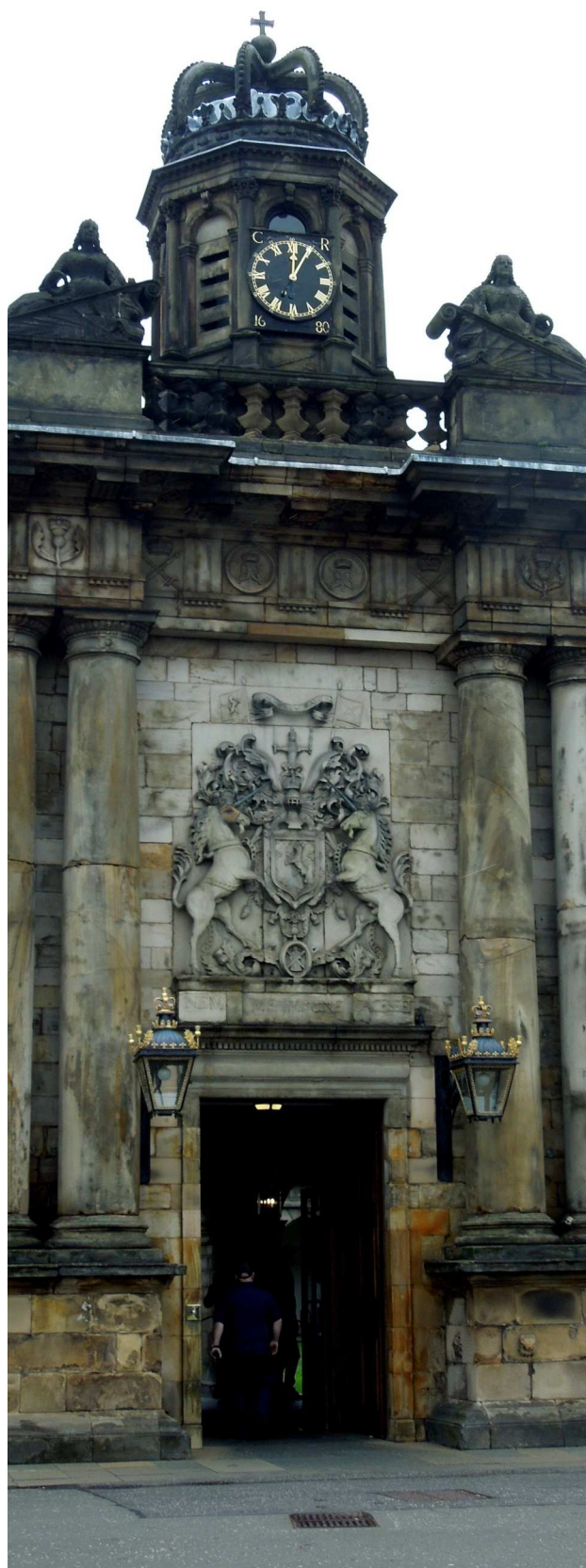
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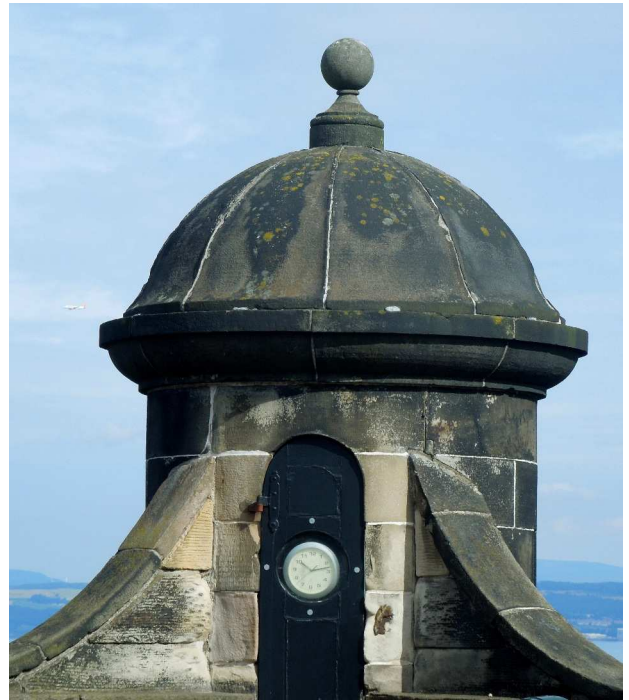
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IN REVIEW: EDINBURGH 2016

WRITTEN BY ALEXANDRA MEANY

I learned about the International Society for the Study of Time last spring as a pupil of Dr. Paul Harris' at Loyola Marymount University and an ongoing project on time in Los Angeles and a summer research grant landed me and my curiosities at the 2016 Conference in Edinburgh. As a graduate student earning her MA with a pointed interest in theories of time and space and the way these theories emerge in American literature I had high hopes for a conference dedicated to interdisciplinary and multifaceted approaches to time. Edinburgh's tour de force of rigorous intellectualism paired with equally provoking creative installations did not disappoint. The unique set up of the ISST's conference differs from the cafeteria-style, choose-your-own-adventure, conferences I have attended elsewhere, in that sessions do not overlap and panels are never happening concurrently. Rather ISST fosters a collaborative, community-oriented conference by spreading consecutive panels out over five days, with the society's traditional "free" third day reserved for activities and exploring Edinburgh. This organization eliminated the dilemma of choosing between equally exciting panels scheduled for the same time slot and instead encouraged all who attended the conference to attend each member's presentation. I was able to see almost everyone at the conference present.

As a scholar who frequents conferences centered around literature, the interdisciplinary element to the Edinburgh conference exposed me to invaluable interdisciplinary panels including presentations on law, physics, and even animation. Among the rich, detailed and



evocative presentations, some of the panels that stood out were JeeLoo Liu's detailed exploration of time as it is understood in Taoist and Buddhist traditions in her presentation, "Now and Eternity: A Comparative Philosophical Study," Jeffrey J. Cohen's presentation on representations of Noah's Ark in his piece "Unconformity," and David Sloan's mind-bending lecture on time's arrow in Neother's Theorem and the possibility of one past with two futures. Perhaps the most exciting feature of Edinburgh's conference was the appearance of renowned author of *The Bone Clocks* and *Cloud Atlas* David Mitchell. As a student who has researched and studied Mitchell's work, hearing him read his work on a panel as a co-presenter alongside Paul Harris was second only to DJ-PJ's (aka Pierre Jardin) jivey and rhythmic experimental exercise in poetry: "Time's Urgency Insurgency: A Rockin' Remix." I've only named a few of many presentations which have introduced me to concepts that have resonated with me in the months since the conference and have since spilled over into my own research. I look forward to many more conferences with the society and am gracious to have been accepted so warmly into a community of brilliant scholars with an invigorating interest in the complexities and multidimensional aspects of time. ■



ALCINA, Opera by Georg Friedrich Händel, 3h 50m, Hauptbühne Opernhaus, Zürich, Switzerland, Dec. 31, 2016 - Jan. 10, 2016



A MESSAGE FROM THE PRESIDENT

WRITTEN BY **RAJI STEINECK**
PHOTOGRAPHY BY **MONIKA RITTERHAUS**

In Handel's opera *Alcina*, which I recently had the pleasure of watching in Zurich with a friend, the valiant warrior Bradamante arrives on an enchanted island to rescue her lover Ruggiero, who fell for the witch who gives the opera its name. Alcina is in the habit of luring men to her and turning them into animals once she has had her fill with them. But in the course of the opera, it becomes clear that she, for once, has truly fallen in love with Ruggiero. As a consequence, she involuntarily forfeits her dark powers, and Ruggiero eventually leaves her to return to Bradamante.

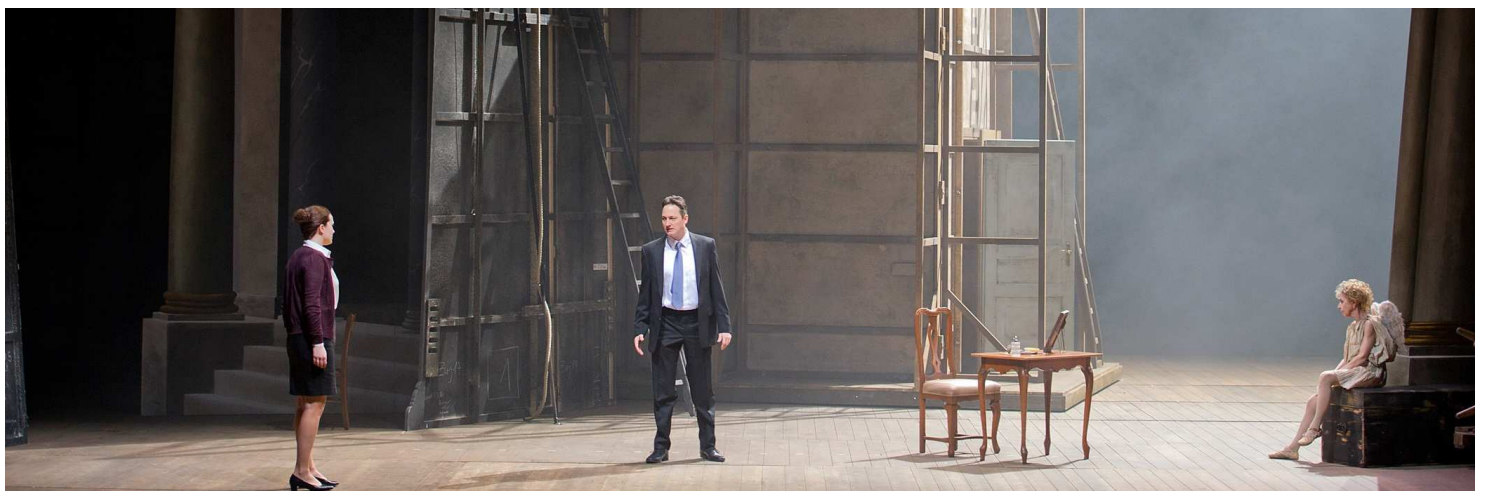
But before he does so, he sings to the green pastures of Alcina's bewitched island. He knows they are set to vanish, because he himself has decided to break Alcina's spells. He has already made his choice: he will return to the real world, to his lover Bradamante, and to martial pride and glory. And yet he is wistful about the illusions that he is going to destroy. „Verdi prati“ is set as a simple air, which is all the more poignant because we have heard Ruggiero sing brave coloraturas defending first his love for Alcina and then his decision to abandon her, and because the beauty of its melody is in contrast with the harsh verdict of its words: “you beautiful meadows and pleasant forests, your beauty will vanish, [...] and you will be reduced to the horrors of your previous state.” Never mind the throngs of men turned into wild beasts, who will be returned to their human state once the spells are broken. But to do what?



In the Zurich production, the scenery is turned around for the next act: what you see is the backside of the palaces and gardens, painted in black. And it becomes increasingly clear that when reality takes over again, it is the masters of war who will be in charge.

I liked the opera, because its story and its music defy translation into simple moral messages for today. Yes, there are the men who are turned into animals after falling for Alcina's spell. But there is also the horror of disillusionment, or, more to the point: the lingering question whether the "reality" Ruggiero returns to is more than a socially accepted form of delusion. And yet again: are today's sorcerer's really providing for green pastures and pleasant forests, the disenchantment of which one might regret? Once again, I was made to remember J.T. Fraser's words: "... it is possible to imagine a world without mass murders, but it is not possible to imagine humans who will not declare, in innumerable many ways, 'Death, be not proud. ...' because the conflict that gives rise to such a rhetorical command — the conflict between the knowledge of an end of the self and the desire to negate that knowledge — is at the very foundation of being human." The challenge, then, is to

find a way to negotiate that conflict that does accept both the knowledge and the desire, something which Handel accomplished wonderfully in his opera. In present-day's world, it is a challenge that seems to become ever more pressing. The point is not to seek a solution that would forsake one for the other, which is, on all counts, a recipe for de-humanizing the world. Fraser envisioned the interdisciplinary study of time as a field where a reasoned dialogue would be possible between the sciences, the humanities, and the arts — each in its way an indispensable, but also incomplete way of accounting for the multi-layered conditions of human existence. ISST has been a forum for this endeavor for 50 years now, and I invite you to continue in participating in its mission. In this year, we will find a venue for our next triennial conference (in 2019), and — more importantly — decide about its theme. If you have suggestions to make, please do send them to the council. But you are also welcome to use our various channels of communication — from facebook and the mailing lists to submissions to KronoScope and its forum — to present your thoughts and findings on time-related matters. ■



MEMBER SPOTLIGHT

Another History of Time: A View of Time from Myths and Legends of Antiquity

MIQUEL LLADÒ SERRANO

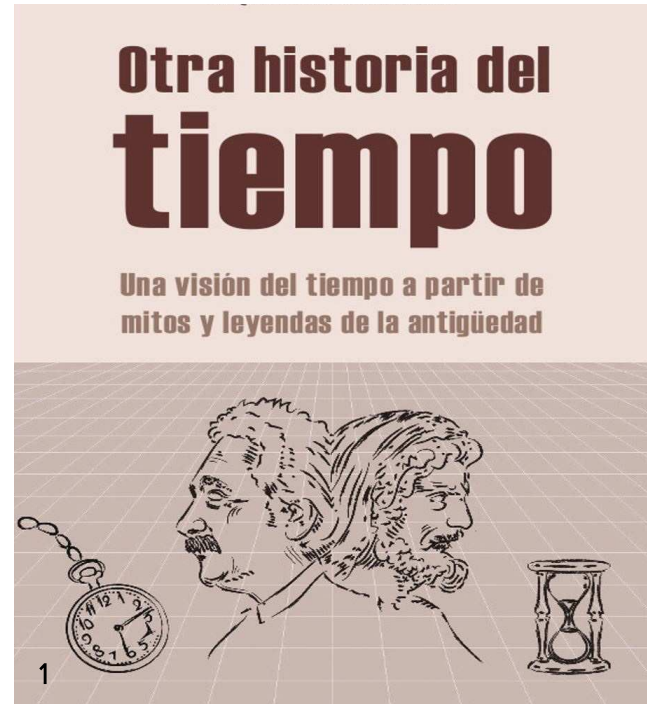
Unlike other works of divulgation about time, in this book I present from a philosophical perspective different stories of antiquity related to aspects of time, such as “origin of time”, “accelerated time”, “stopped time”, “eternal return”, “time travel”, “qualitative time”, “end of time” and several others. It is, therefore, a time vision complementary to the habitual ones.

Time Structures

GUS KOEHLER

Time Structures, Inc. (TSI) is a virtual company that has provided senior executives in the private sector, government, and higher education with forward looking, innovative and ground-breaking research in economic development and other key policy areas to help them make strategic breakthroughs in positioning their organizations to respond to and take advantage of immediate and emerging challenges and opportunities.

This past summer, Time Structures, Inc. delivered the keynote speech, "Temporal-Space Mysteries of a Complex System: Performance of an Instant in Time" at the 25th anniversary of The Society for Chaos Theory in Psychology and Life Science in Salt Lake City at The University of Utah, which drew deeply on JT Fraser's work viewing from the perspective of Topology of an Instant as described by the Borsuk-Ulam Theorem. Later this winter, Time Structures, Inc. will offer the panel, "Investigation of a Foundation for New Poetic-Scientific Research Instruments" at Mercy College in New York. Will include



panelist's original art, holopoetry, and a piano composition depicting the edge of chaos in living beings.

An S-shaped pattern in the perceived passage of time: how social interaction governs temporal experience

MICHAEL G. FLAHERTY

Variation in the passage of time is perceived against the backdrop of standard temporal units. Under certain conditions, we perceive time to be passing slowly. In other settings, our subjective temporal experience is roughly synchronized with the objective time of clocks or calendars. And given different circumstances, we perceive time to have passed quickly. Drawing from 740 narratives that depict distortion in the perceived passage of time, I formulate a theory that accounts for the full range of variation in temporal experience. This theory can be represented by an S-shaped figure. According to this theory, variation in the perceived passage of time reflects variation in the density of experience per standard

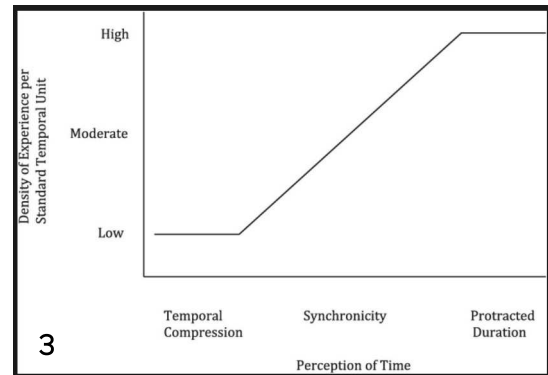
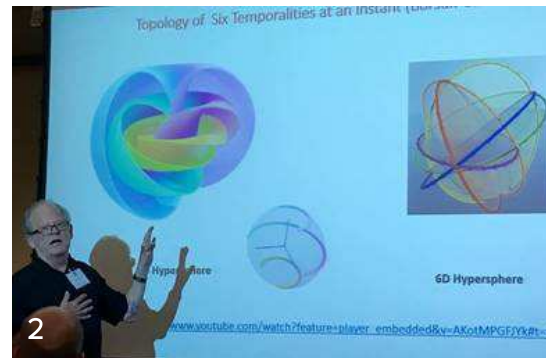
temporal unit. In turn, the density of experience per standard temporal unit is conditioned by the dynamics of social interaction. In its original form, however, this theory assumes that one's circumstances shape one's temporal experience in deterministic fashion. Consequently, based upon interviews with 406 disparate people, I conceptualize time work (or temporal agency) as one's efforts to control, manipulate, or customize one's own temporal experience or that of others. I conclude with some directions for future research.

100 Years of Now Library

HELGA NOWOTNY

Under pressure from the present, contemporary thinking often lacks both an awareness of history and a future horizon. How did we develop this fixation on an instant, on the present moment? In the first volume, *Die Zeit der Algorithmen*, the science researcher Helga Nowotny, author of the visionary book *Eigenzeit* (1989), and HKW director Bernd Scherer examine how notions of time evolved between capitalism, armed conflicts and technological progress, how time is experienced today, what alternatives there may be to the ever more global raster of acceleration and timing and what role the peripheries and margins of the algorithm play in it all.

The following volumes in the series published by Matthes & Seitz will take up pivotal issues from the past 100 years: the housing question, the modernity of the artistic avant-gardes, the correlation between war and technology, the impact of historic feminist and anarchist movements, questions of political classification systems, disruptions in the planet's metabolism as well as data production and cybernetics, the history of produced music and the school of the future.



- 1 **Miquel Lladó Serrano**, *Another History of Time. A View of Time from Myths and Legends of Antiquity* (*Otra historia del tiempo. Una vision del tiempo a partir de mitos y leyendas de la antigüedad*) Edición Personal. Madrid, 2017, 213 pp., Spanish.
- 2 **Gus Koehler**, *Temporal-Space Mysteries of a Complex System: Performance of an Instant in Time*, Society for Chaos Theory in Psychology and the Life Science, The University of Utah, Salt Lake City.
- 3 **Michael G. Flaherty**, *An S-shaped pattern in the perceived passage of time: how social interaction governs temporal experience*, Language and Cognition, FirstView Article, Cambridge University Press, Feb. 2016. 1 - 25 pp. English.
- 4 **Helga Nowotny**, *100 Years of Now Library* (Opening Volume). Editor: Bernd Scherer. Publisher: Matthes & Seitz Berlin, 2016. 68 pp. German.

ROSE HARRIS-BIRTILL WINS FOUNDER'S PRIZE FOR NEW SCHOLARS 2016

CELEBRATING EXCELLENCE IN 'LOOKING DOWN TIME'S TELESCOPE OF MYSELF':
REINCARNATION AND GLOBAL FUTURES IN DAVID MITCHELL'S FICTIONAL WORLDS



AWARDED BY **ISST COUNCIL**

Every year, The ISST invites submissions for the Founder's Prize for New Scholars, which recognizes outstanding critical or creative work by an emerging academic or artist. The prize is given in memory of J. T. Fraser, Founder of the International Society for the Study of Time, who was instrumental in fostering the careers of many emerging timesmiths. For the most recent selection, the prize-winning essay was chosen from essays written for presentation at the triennial conference in Edinburgh, June 26 - July 2, 2016.

Proud winner of the 2016 Founder's Prize for New Scholars, Rose Harris-Birtill is a Doctoral Researcher in English at the University of St Andrews in the UK, working on her thesis 'Mitchell's Mandalas: Mapping David Mitchell's Textual Universe'.

"I am very grateful to the ISST for the honour of being awarded the Founder's Prize for New Scholars, and for all the valuable work that it does to include and support its newest members," says Harris-Birtill. "It's great to be part of such a thriving organisation, and I very much look forward to the next conference."

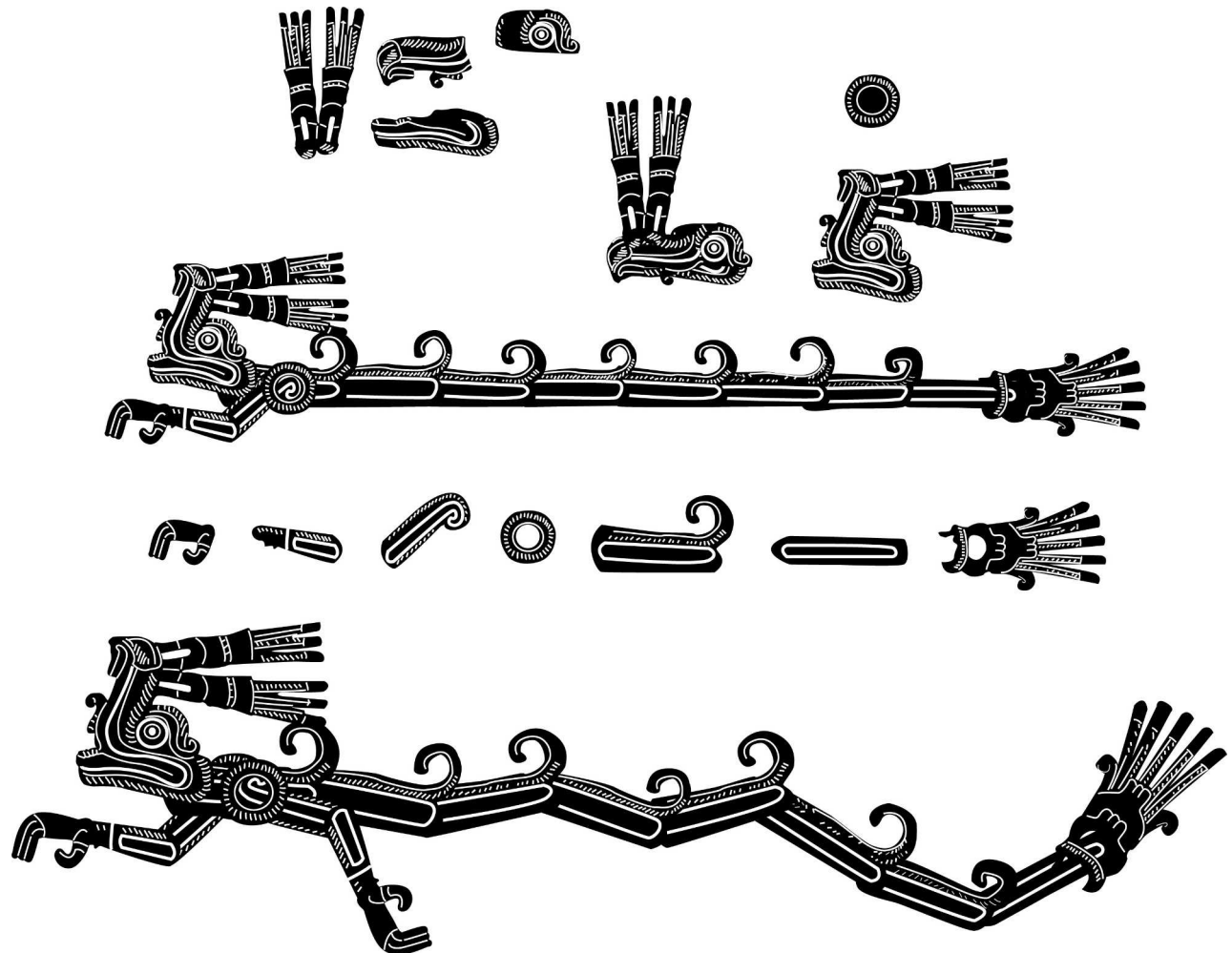
Harris-Birtill's paper investigates the use of reincarnation across the oeuvre of British author David Mitchell (b. 1969), exploring its deployment in his work's structures, narratives and characterisation to understand the cycles of impermanence and regeneration that underpin his fascination with global temporality. Her paper explores Mitchell's writing and how he forms an interconnected 'über novel' populated with shared characters, connecting the author's short stories, libretti and novels into a continuous terrain. Ideas of cyclicity are visible across these works, for example, in Ghostwritten's

approach to human tragedy in Mitchell's writing for opera, becoming most prominent in *The Bone Clocks* (2014). In this novel, the chakra-wielding Horologists are reincarnated over many centuries in a war against the carnivorous Anchorites, who drink souls to halt time's effects on their bodies. Undercutting the novel's mythologies, the realism of the dystopic near-future at the tale's end foregrounds an ethical engagement with the harmful trajectories of Western consumerism. If the novel is seen within the context of his wider writing, a pattern emerges that reveals a metamodern oscillation between the finality of the dystopic and the possibility of ecological redemption.

Drawing on these textual reworkings of the Buddhist philosophy of *samsara*, or the cycle of life, death, and rebirth, Harris-Birtill's paper investigates the links between the author's interest in Buddhism and its secular manifestation in the treatment of time in his speculative fictions. These works use the trope of reincarnation as part of an ethical approach to the Anthropocene, exploring the concept of 'reincarnation time' as a temporal model that warns of the dangers of seeing the past as separate from the future, and suggests that an understanding of generational interdependence and causality are urgently needed in order to challenge the linear 'end of history' narrative of global capitalism. ■

ANIMATING THE BORGIA CODEX

SPOTLIGHT Q&A JOSÉ GARCÍA-MORENO



WRITTEN BY EMILY DiCARLO



José García-Moreno, *Los Huesos Tienen Memoria / Bones Have Memory*, 2016. Animation 3D Mapping Projection on a Ten Sugar Skulls Altar or "Tzompantli". Dimensions variable. COURTESY OF ARTIST; MUSEUM DOLORES OLMEDO, MEXICO CITY..

Q: Could you begin by telling me briefly about your animation project?

A: *Los Huesos Tienen Memoria / Bones Have Memory* is an animation-installation I did recently at the Museum Dolores Olmedo in Mexico City. It is Animation 3D Mapping or animated images projected onto an altar of sugar skulls or "Tzompantli". The images are inspired by prehispanic figures from the Codex Borgia.

Q: What is the Codex Borgia?

A: The Codex Borgia or Códice Yoalli Ehécatl is a pre-Columbian manuscript which is both ritual and divinatory. It is made of animal skins and is folded into 39 sheets.

Q: What is the relationship between time and the Codex Borgia?

A: The first eight pages list 260 day-signs which are divided in "trecenas" or 13-days-cycles. Pages 9 to 13 are divided into four quarters. Each quarter contains one of the twenty day signs (20 x 13 = 260). Pages 15 to 17 depict deities associated with childbirth. Pages 29 to 46 refer to cycles of 20 days or "veintenas" and pages 73 depicts the gods Mictlantecuhtli and Quetzalcoatl seated back-to-back. They likewise have day signs attached to various parts of their bodies, and the entire scene is encircled by day signs. Mictlantecuhtli is the god of

Death and Quetzalcoatl is the feathered serpent which has given the fire to men, Promethean God. Both gods rule the life of humankind.

Q: The Museum Dolores Olmedo seems to be the perfect site to exhibit this project. Can you provide additional background on the museum?

A: The Museum Dolores Olmedo is located in Xochimilco, in Mexico City. The Dolores Olmedo Museum is housed in a rambling stone structure, originally dating from the 16th-century, formerly known as the Hacienda La Noria. Since the museum opened its doors to the public in September of 1994, its greatest treasure is its painting. The world's most important collections of works by Diego Rivera and Frida Kahlo are housed here permanently.

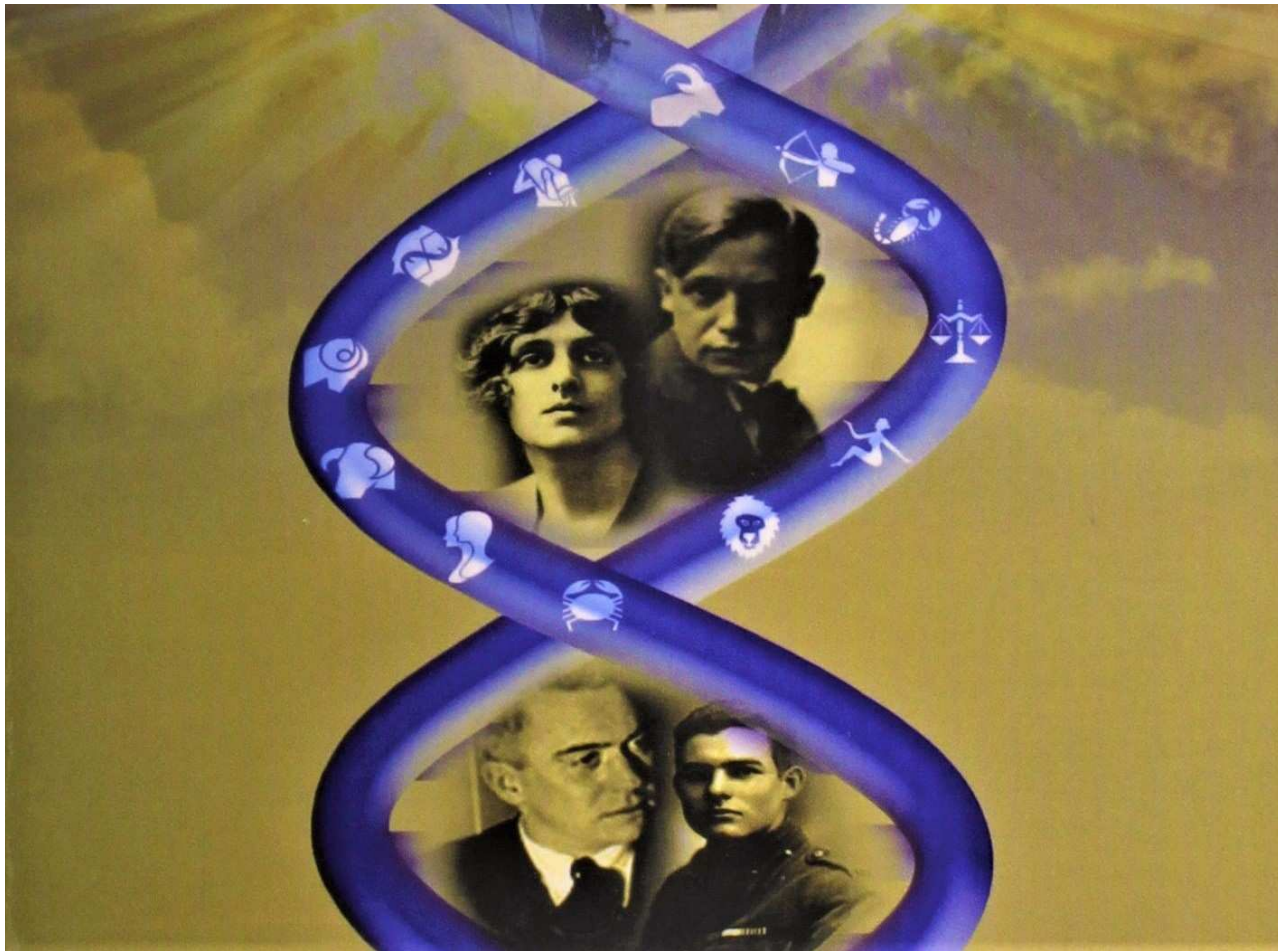
Q: Could you tell me more about the concepts presented in *Los Huesos Tienen Memoria / Bones Have Memory*?

A: The animation is part of a "day-of-the-dead" installation, *Los Huesos Tienen Memoria (Bones Have Memory)* in collaboration with Mexican artist, Betsabé Romero. The purpose of this installation is to bring a Mexican tradition, such as Day of the Dead, into new ways which explore political commentary, and new aesthetic means such as 3D animation mapping. The political commentary of *Bones Have Memory* reflects on the brutality of recent massacres attributed to Drug Cartels and the Mexican Army. On the other hand, the installation reflects on Mexican obsession with death, which permeates through every aspect of daily life. The animation is projected on 11 sugar skulls which form an altar for the dead or "tzompantli". Characters such as Mictlantecuhtli and Quetzalcoatl interpret forces of death and renewal. ■



MEASURING PERSONAL AND COLLECTIVE HISTORY

QUANTITATIVE APPROACHES AND POETICAL VISIONS, BETWEEN "TIME" AS IT IS SEEN IN PHYSICS AND "TIME" AS IT APPEARS IN AGING, IN CHRONOLOGY, IN ASTRONOMY AND IN PERSONAL AND COLLECTIVE NARRATIVES



WRITTEN BY **ELIZABETHA LEVIN**

1. Introduction

This article is in three parts. The first part mentions different aspects of time and introduces a generalized concept of time [1], common for both "ordinary" physical and "complex" sociological and cultural systems. This concept of generalized time makes possible to comprehend physical and creative processes within one framework and provides a common ground for discussion of the temporal algorithms governing our bodies and our minds, our material world and our lives.

The second part of this article describes the Effect of Celestial Twins (ECT), which shows that from the moment of birth, our personal potentials are constrained by the cultural, historical and geopolitical limits of our times (*Zeitgeist*), and those limits are shared and altered by all those (so-called "celestial twins") who share the same generalized time of birth (the so-called Theta-factor) [2].

Being related to Prigogine's internal time, the Theta-factor is an important measurable factor, which, in addition to heredity and environment, describes patterns of human development. When linked together with the natural celestial clocks, it depicts individual and collective oscillations and may serve as a compass showing historical changes of the generational potentials.

The article's third part is a synoptic view of *The Clock of the Phoenix* [3]. Based on the extensive historical data over the last 3000 years, it shows that at the end of every long-term Neptune-Pluto cycle (with periodicity of about 493 years) the cultural world comes to its critical junction of disruption, the so-called "Hour of the Phoenix." The generations of passionate

individuals born during these radical periods of transition (ranging in our epoch from 15 to 30 years) are responsible for setting time-tables for the developing social and cultural "scripts" during the following 493 years.

2. Time Definitions and Measurements

Today time is meaningful only at the level of physical bodies, and not at the level of desires, thinking or feelings. Although time in physics remains a fundamental concept [4], it is widely accepted that we have learned how to measure it. Consequently, time became tightly associated with duration and it was even suggested that "time is what is measured by a clock" [5].

Yet is it indeed true that we can accurately measure something without defining it first? Can we differentiate between "duration" and "aging"? Can we measure the periods of time between events without either knowing what the instant of time is or without having a clear concept of events and processes?

To answer these questions let us first consider why the notion of time in daily life remains different from the notion of time in physics. Elsewhere I have described multiple differences between the uniform time in physics and the multiple times as they are understood in the life sciences [1]. Here I shall briefly mention just three of them.

Unlike the abstract physical concept of the Eddington's arrow of time, in the life sciences various phenomena have recorded various cycles, such as diurnal, lunar, annual, etc. [5, 6]. These cycles are related to the astronomical times, which are neither uniform nor linear [7].

The modern timekeepers, responsible for the atomic clocks, confirm the fact that we have moved into an era of multiple time scales. On one hand, we have fast atomic clocks, which provide a standard of frequency, but cannot determine the interval elapsed since any initial epoch in the past. On the other hand, our calibration of mundane clocks remains dependent on astronomical observations. From time to time we have to introduce the leap seconds, days or months, depending on different kinds of celestial motions and rotations in our solar system [8].

Unlike the uniform physical time, multiple biological rhythms describe different kinds of events, taking place on several temporal scales. To explore them, J.B.S. Haldane has introduced five different timescales with different corresponding ranges of time intervals, namely, the molecular (10^{-5} s to 1s), the physiological (10^{-2} s to 1h), the ontogenetic (up to a lifetime), the historical (covering many generations) and the evolutionary (may be longer than 10,000 years) [9]. Later David Bohm suggested the existence of a multiple perplexed and relatively autonomous levels of biological times, such as neurophysiological, psychological, conscious and unconscious times "going on, perhaps on levels of which we have at present no notion at all" [10]. He compared this new system of time with "a radio wave carrying a television program: "The very fast radio wave contains enfolded within it the much slower times that are depicted in the program" [10]. Such interplay between multiple biological rhythms is so complex that contemporary biophysics has recognized its failure to define a single concept of time. A.P. Levich summed this

up by stating that "clocks may be quite different in their nature, they are based on totally different physical principles and they are not necessarily reducible to each other" [11].

Today physics recognizes only one time. On the contrary, in life sciences, Ilya Prigogine has introduced the idea of two basically different (though related) kinds of time known as "age time" and "watch time" [10]. "Age time" (or internal time of the studied system) belongs to the ontogenetic timescale; it begins at zero-point of an individual's birth and reflects one's aging until one's death. "Watch time", known also as ordinary or planetary time of the environment, belongs either to the historical or to the evolutionary timescale; it has no definite beginning or end and there are no absolute watch-dating methods that work throughout long historical periods.

While the question of the interplay between age time and watch time remains unexplored in physics, it requires especial attention in all life sciences. Physics suggests that repeating the same experiment over and over again will produce the same results. In life sciences those born at different epochs, years or seasons will find different initial conditions and will be synchronized with different biological rhythms. For example, in medicine, already in the 16th century Gerolamo Cardano noticed that life expectancy of a human being is dependent on the historical time of his birth. Today we witness an increase of life span and rapid developments in methodologies of rejuvenation. Consequently, age time, as counted by the number of annual cycles since the moment of birth, does not reflect the real biological age of a person and

does not show whether that person is close to the end of his or her life span. Furthermore, in biology it was reported that not only the year, but even the month of birth is of crucial importance: "Human populations show robust annual rhythms in health and well-being, and the birth month can have lasting effects that persist throughout life" [6].

In cultural studies the existence of periodical waves in the intensity of artistic life was detected both on the personal level (due to the personal development or aging) and on the social level (due to the cultural evolution of the society as a whole). There were reports of monthly or seasonal variations in human creative potential [12, 13], as well as the large-term variations in the eventfulness of the cultural life in different centuries [14]. In historical studies, such researchers as Oswald Spengler, Lev Gumilev and Karl Jaspers have suggested periodicity in birth and decline of civilizations. All these studies confirm the assumption of the complex non-homogenous nature of both age and watch times and lead to the conclusion that further studies are needed. The goal of this study is to deepen our understanding in these issues, and for this purpose we need first to clarify how we measure age time and watch time.

The starting point of age time is marked as a zero point. Afterwards it is measured by the number of diurnal, lunar and annual cycles counted since the moment of birth. Since the introduction of the Gregorian calendar in the 16th century, many countries gradually adopted the procedure of reckoning the starting point of age time as the calendar date of the moment of birth (i.e. the corresponding watch time).

Watch time is evaluated using calendars in which time is expressed in dates. Any date (such as September 7, 2016) is not a real number, but a string of alphanumeric characters, which is reckoned by a nexus of non-conjoined and not-commeasurable quasi-cyclical processes that combines years (as measured by ephemerides), months (as measured by lunar phases) and days (as measured by Earth rotation about its axis) together with the number of cycles counted since specific arbitrarily chosen zero-points. Dates are based on a whimsical combination of decimal, duodecimal, and sexagesimal systems, and their units do not bear constant relation to one another. Summing up, the date of an event is a whole set of data, which is partly cyclic (related to different celestial motions), partly linear (due to counting of cycles) and partly arbitrary (due to historical changes in zero-points and the introduction of various leap intervals). Consequently, no calendar has been or ever will be either continuous or linear if it tries to fit together all these motley pieces of data.

The main assumption of the present work is that due to the multifaceted nature of time each process and each of its levels is governed by temporal laws of its own. Integrating all of them into a single fabric by a single real number is impossible. Therefore, both age time and watch time should be treated in their complexity. For this purpose several definitions are introduced.

Generalized time is defined as a manner of marking the events or processes and a way of arranging, ordering or coordinating them.

To provide a one-to-one correspondence

between historical events and their marking, contemporary dates are substituted by a multidimensional hierarchic reckoning of time (so-called Time-codons) [1]. Depending on the particular problem, Time-codons might be based on 3 to 10 diverse quasi-cyclic celestial motions with different periodicities.

In order to study cultural developments, each event is marked by the birth of the person responsible for its initiation.

Watch-time of the environment synchronized with the zero-point age time of the enclosed subsystem is called its Theta-factor. For human beings, the Theta-Factor labels their moment of birth either by solar-lunar calendars or by relative positions of the 10 celestial bodies. People sharing the same Theta-factor are called "celestial twins."

In historical processes "slower times" were called by Bohm after the ancient Greek notion "aeons" [10]. Aeons provide the information about the cultural and political atmosphere, in which our personal and much faster times unfold. In modern calendars, aeons are limited by diurnal and annual cycles. From the year up and from the day down they do not provide any temporal information. Time-codon reckoning, using 10 quasi-cyclic clocks with various periods, allows one to widen these limits and to evaluate both – the faster personal times and the slower cultural aeons.

Modern counting of aging is arbitrary. It is reminiscent of T.S. Eliot's line "I have measured out my life with coffee spoons" [15]. It was shown that a more meaningful evaluation of life path might be obtained when age time is also treated in terms of

Time-codons [1]. The main difference between watch time and age time becomes the starting point, in relation to which the planetary positions should be regarded. In the case of age time, they should be measured in relation to the zero point of a personal lifespan. Then age time will be reckoned as the complex matrix. (In case of ten standard planetary motions this will be a ten-by-ten matrix).

Given such sets of definitions we shall show that under certain conditions the Theta-factor becomes a temporal code prescribing and reflecting development of highly-organized living systems.

3. Effect of Celestial Twins

In his *Autobiography*, Goethe has observed that "any person born ten years earlier or later would have been quite a different being, both as regards his own culture and his influence on others" [16]. It means that the *Zeitgeist* would be felt differently by those who were born in different historical periods. In other words, the Theta-factor of a human being who is able to express a new idea, is important: it signals a potential change in history and may reveal a significant development in the culture. If so, the reverse should be also true: those who are born simultaneously with one another might be exposed to more similarities in environmental atmosphere and they might influence their environment in more similar ways.

Indeed, the systematic studies of well-known celestial twins, which lasted more than 20 years, led to the discovery of a new phenomenon – the Effect of Celestial Twins. In one sentence, this effect

demonstrates that though each human being is unique, there is a fairly exact (or more precisely, isomorphic) matching between the biographical narratives of celestial twins. The preliminary stage of this research was to collect and to crosscheck the biographical data of about 15,000 historic personalities in order to get the most accurate list of celestial twins. Hundreds of pairs of celestial twins or even threesomes were detected, but in many cases their precise birthdays could not be confirmed. Unfortunately, up to the 19th century the historical dates were frequently recorded only partially. Considering the current state of chronology, for the purpose of the preliminary studies "celestial twins" were redefined as the people born within the interval of time shorter than 48 hours. From the Time-codon point of view they have almost identical positions for all the slower cycles, but may have slightly different positions for the faster lunar cycle. (The Moon is moving quickly, traveling approximately 13° daily). After rigorous rechecks of birthdates, more than a hundred pairs of celestial twins were confirmed. Their comparative life paths demonstrated impressive parallels between celestial twins alongside profound differences between the pairs with different Theta-factors.

The next step was to write comparative biographies of the well-known historical celestial twins, those whose biographic material allowed detailed comparison of their lives from birth to death. Most of them, such as C.G. Jung or Ernest Hemingway, King George VI or Oscar Wilde were believed to have an unprecedented life path. And yet.... Each

of them had at least one celestial twin who had the same unique life task, used the same methods to complete it and achieved the same results. Furthermore, in many cases it appears as if when one individual makes a discovery, his/her celestial twin consciously or unconsciously helps to spread and amplify it. To mention but four examples:

In science. In 1913 two pioneer works concerning isotopes were reported simultaneously: one was written by Frederick Soddy, another by Francis Aston. Nobody seems to recognize what an incredible coincidence it was that these Atomic Age pioneers and Nobel Prize winners were celestial twins.

In medicine. Though separated from birth by geography, religion and genes, Nobel Prize winners Emil Behring and Paul Ehrlich were honored as "the children's saviors." Their joint work has saved millions of children from diphtheria.

In music. Pablo Casals is considered the greatest cellist of the 20th century. His celestial twin, Lionel Tertis is recognized as the greatest viola-player of all time. Both lived more than 97 years and enjoyed playing chamber music together.

In feminism. In 1919, Nancy Astor became the first woman to sit in the House of Commons, replacing in this position her husband, Waldorf Astor, who was also her celestial twin.

To sum up, the effect of celestial twins challenges many long-held beliefs. It shows that the roles of genes, race, gender and cultural background are not as strong as is believed and that the Theta-factor is not less important for shaping identity than the genes or the early environment.

The fact that the celestial twins reared apart had a similar pre-birth family history, as well as a similar early environment, and a similar physique combined with similar major modes of expression, strongly suggests that Theta-factor denotes more than the qualities of a single personality. It was suggested that the Theta-factor denotes a phenomenon resembling Whitehead's "natural unit of historic fact" and might be used for constructing a cultural historical calendar.

4. The Hour of the Phoenix

The name of this model is taken from ancient mythology. As an immortal creature, the Phoenix was associated with time, symbolizing an endless flow of ever-changing life and the cycling nature of its changes.

The first step in constructing the Clock of the Phoenix is to mark major historical or cultural events as the dates of birth of the personalities, responsive for these developments. Afterwards, the numerous historical facts are reassigned to the Theta-factors of their initiators. The final step is to reconstitute history according to the rearranged chronology in terms of the long-term Neptune-Pluto cycles and their phases.

For example, from 1885 to 1899, Neptune and Pluto seemingly converged in the skies, a rare planetary conjunction, which takes place once every 493 years. A generation born during this Hour of the Phoenix witnessed the emergence of something unpredictably new and took part in a revolutionary transformation and becoming. One of the prominent poets of this generation, Anna Akhmatova, wrote

that "no other generation in history experienced such a fate, and perhaps, there was no other generation like it" [17]. Quantitative measurements confirm that the number of great poets born during this period was significantly greater than in all the previous and following periods. For example Table 1 reproduces a characteristic fragment from one of the tables obtained in this study [3].

Table 1, Russian Poets in Wikipedia

Birth Year	Number of poets
1930-1944	32
1915-1929	44
1900-1914	51
1885-1899	100
1870-1884	42
1855-1869	22
1840-1854	10

It was found that since the beginning of the written history such enormous spikes of creativity were observed cross culturally during each and every Hour of the Phoenix [3, 18].

Furthermore, each Hour of the Phoenix is a moment of a cosmic change, when the world completes its previous cycle and subsequently steps into a new epoch. It resembles both a full stop in time and a seminal point, establishing a time frame for an exploration of new paradigms.

The proposed model of the Clock of the Phoenix has been successfully applied to the chronological analysis of Judea and Greece, Rome and Portugal, to the survey of the European Renaissance and the Age of Discoveries, to the history of the national poetries and to the history of film and aviation.

The cross-cultural findings seem to reflect

the intrinsic characteristics of the generalized time rather than to be based on more culturally-relative concepts.

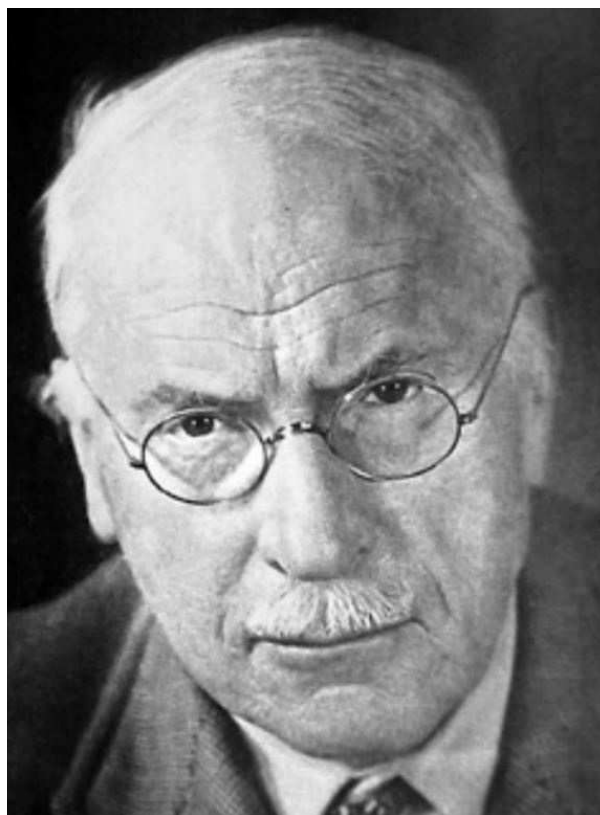
5. Conclusions

Life in its totality might be treated as a juxtaposition of various processes, described by their specific temporal increments. I hope that this study will contribute to the unification of science, life and creativity by introducing the new concept of generalized time and building the interface between mind and matter. ■

6. References

- [1] **E. Levin.** *Prostranstvo-vremya v Vysokorazvitych Biologicheskikh Sistemah*, Jerusalem, Health & Healing Ltd, 2012.
- [2] **E. Levin.** *Celestial Twins*. Tel-Aviv: Astrolog, 2014.
- [3] **E. Levin.** *Chasy Feniksa*, Jerusalem: Milky Way, 2013;

Carl Jung and Antonio Machado. From selected chapter, "*The Explorers of the Human Soul: C. G. Jung and A. Machado*". *Celestial Twins: The Code of Destiny*. Astrolog Publishing House, December 2014: 336 pp.



VISUALIZING TIME

A RECENT SURVEY OF ARTWORKS ABOUT TIME



CURATED BY **ANTONELLA SBRILLI**



Sara Morawetz, *61/60 (027)*, 2016. Performance devoted to the 'leap second' at Lick Observatory, Mount Hamilton, California. Action concurrent with the introduction of the 27th leap-second on December 31, 2016 at precisely 15:59:60 PST (23:59:60 UTC). COURTESY OF ARTIST.



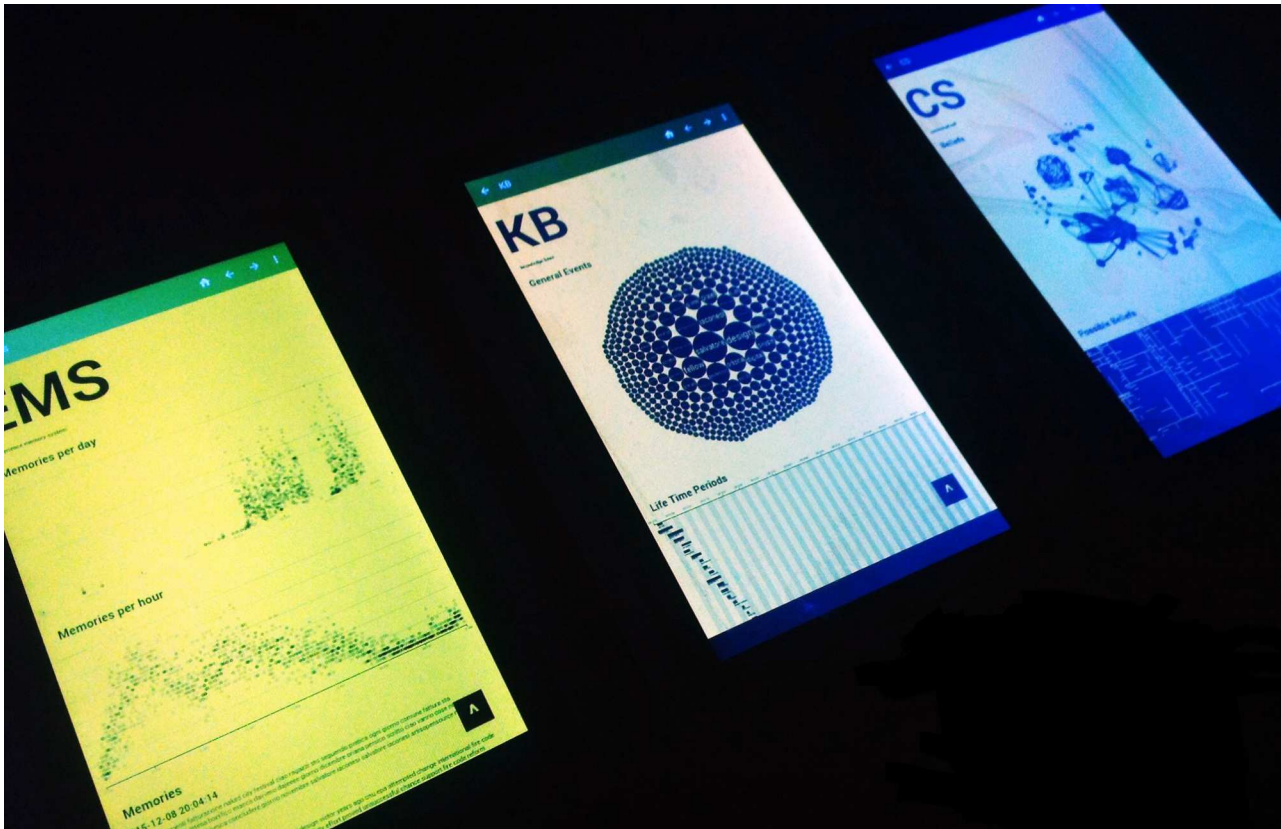
Olafur Eliasson, *The shape of disappearing time*, 2016. Brass, stainless steel mirror, stainless steel, paint (black), bulbs 214 x 321 x 214 cm. Installation view: Leeum, Samsung Museum of Art, Leeum, KR. COURTESY OF ARTIST; NEUGERRIEMSCHEIDER, BERLIN. PHOTO HYUNSOO KIM.
PREVIOUS TITLE PAGE: **Federico Pietrella**, *18, 19, 20, 21 Gennaio 2017*, 2017. Acrylic panel, ink, date stamps. 217x160 cm. COURTESY FONDAZIONE DEL MONTE, BOLOGNA.



Christian Marclay, *Lids and Straws (One Minute)*, 2016. Single-channel animation, silent continuous loop. Dimensions variable. COURTESY WHITE CUBE.



Marilyn Arsem, *Day 95: Black Sand, 100 Ways to Consider Time*, Nov. 9, 2015 – Feb. 19, 2016. 100 six-hour durational performances. Documentation: Artist sweeps cone of black sand from the table to the floor over six-hour duration. COURTESY MUSEUM OF FINE ARTS, BOSTON. PHOTO NICK PROCOPI



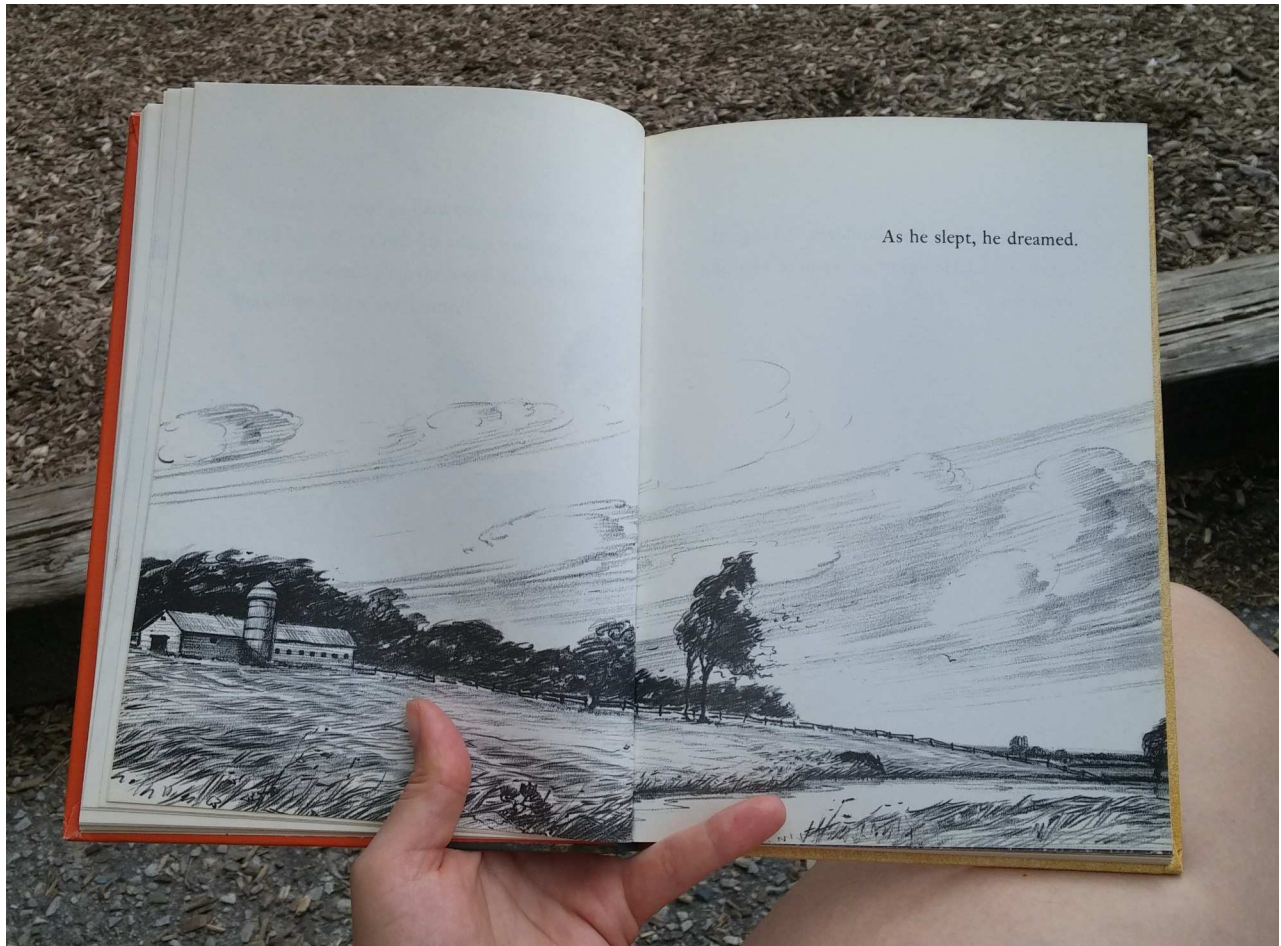
AOS (Art is Open Source) Ghost Writer, 2016. Algorithmic autobiography. Commission by Goethe Institute. COURTESY OF ARTISTS SALVATORE & ORLANA PERSICO



Claude Closky, 2017 Calendar, 2016. Duplex color digital printing on glossy coated paper 300 g. 8.6 x 5.4 cm. COURTESY BAZAAR COMPATIBLE PROGRAM, SHANGHAI.

FROM A LABYRINTH OF TIME

WRITTEN BY **JAN DULLEMOND**



SELECTED POEMS BY **JAN DULLEMOND, DANIEL CORRIE & ERIC KINCANON**
PHOTOGRAPHY BY **EMILY DICARLO & DANIEL CORRIE**

The date 11-20-2010 is not just an exact location in time. J.T. Fraser has been my temporal companion for thirty years. His temporal Umwelts have shaped my outlook on love, life, society and science ever since my Master's thesis on "Shakespeare and changing concepts of time in the Renaissance". Time has manifested itself in my poetry where it usually plays a leading part. So when, in 2013, I read that Fraser had died three years before, I knew I had a poem to write. To express Fraser's genius, I wanted to start from a common place for time, the date of his death. Ironically, one of the great thinkers about time was remembered on the Internet not with just one date, but two. Wherever I looked on the Internet, it seemed that Fraser had outdated time.

Fraser's concept of temporal Umwelts has provided me with the tools to distinguish the complex processes I had failed to understand since I had started my career as a psychiatric nurse. In psychiatry Fraser's theorem: tell me what you think about time, and I will tell you who you are, was true to the extreme. We can distinguish a complex of temporal processes in a single image when we see a patient listening to Bach and woodworking miniature coffins to present to other patients whom he scared to death, locked up in their delirium or delusions. Temporal processes on a psychiatric ward behaved as in a pressure cooker. Time could be experienced as accelerated or arrested, as chaos or as a fixed time-table in life, as fatal or determined. But most of all I perceived time as an adaptive element in man: I had the opportunity to observe how the experience of time and the

working out of time adapted to changing conditions, whether emotional or intellectual, social or personal, physical or neurological, life-style or medication. Too many levels of reality were involved to unravel the knots of psychiatric existence. Past, present and future were continuously in flux, and even biological clocks behaved like the Mad Hatter.

When I went to college in my late thirties, Shakespeare showed me, to my relief, that time was in fact a many-faceted phenomenon. He also showed that poetry can explore these facets and give them a new coherence. Understanding Time, however, is just the first step. Most unresolvable problems arise when we are not aware that our existence comprises different Umwelts, when we approach our conflicts and paradoxes from a single point of view, mainly nootemporal. Fraser's concept of time may provide us with the tools to unravel the complex problems of life, society and the human mind.

Before the conference in Edinburgh my only contact with the ISST had been Frederick Turner. I had sent him an e-mail to ask for the correct date of Fraser's death, even though he was a complete stranger. Fortunately he was of great help with the poem I can present you now. When I came to the ISST conference in Edinburgh, however, it was to find a focus to prepare a Ph.D. on Fraser's temporal Umwelts. What I found was both a warm welcome and an overwhelming shower of approaches and ideas of time.

I'm sorry to say that I have just given a paraphrase in which rhythm has inevitably been lost and meaning sometimes strained. Evidently, a translation by a native speaker would come closer to the original. ■

20-11-2010

Daidalos is dood. Al kan ik
niet zeggen dat ik hem heb gemist,

net als het heelal was ik zelfs
dat weekend al weer lang vergeten,

mijn werkelijkheid gaf geen teken
van noodzaak. Zijn dood lijkt tijdloos

en het leven voldoet nog steeds
aan alle functies, honger, dorst, slaap

en kou nemen af, nemen toe,
onvermijdelijk zolang het duurt.

Maar het labirint weet beter:
Julius Fraser is uitgewerkt.

Op fresco's in het labirint
vieren de goden feest, een plezier

voor de ronddwalende gasten,
ze zochten hun weg zolang het kon.

Nu stort het tijdelijk bouwwerk in,
het werk hield op, de aannemer

gaf de geest, de behoefte nam af,
het fundament is in verval.

Zijn bestemming is waarschijnlijk
de zekere chaos, in oorsprong

zijn goden ook niet al te slim.
Julius Fraser is uitgewerkt.

20-11-2010

Daidalos is dead. However, I
can't say I have missed him,

just as the universe I had even
forgotten that weekend long ago,

my reality hadn't shown any signs
of necessity. His death seems timeless

and life still fulfils all
its functions, hunger, thirst, sleep

and cold decrease, increase,
inevitably while it lasts.

But the labyrinth knows better:
Julius Fraser is worked out.

On frescos in the labyrinth
gods are having a feast, a pleasure

for roaming guests
trying to find their way while they could.

Now the temporary edifice is collapsing,
work stopped, its contractor

gave up the ghost, necessities dwindled,
foundations are in decay.

His destination is most likely
certain chaos, in origin

gods aren't too clever.
Julius Fraser is worked out

Vage kennissen bleven achter,
collega's en buren, vrienden,

kinderen en zijn geliefde
in gevecht met zijn afwezigheid,

dagen, weken, jaren van verzet,
verleden en toekomst trekken

zich terug op dit moment
van liefde in opdringende dood.

Vage kennissen, buren, collega's
zwichten het eerst voor de zucht,

het eeuwig verlangen naar rust,
Julius Fraser is uitgewerkt.

Het werk moet door. Leve Daidalos.
De eeuwigheid begint nog steeds

met onverschillig, starend licht.
Dat oerbeeld spat op blinde muren

uiteen in schitterend licht, wonder
voor de een, werk voor de ander

om zijn tijd ogen en plezier
te geven, op fresco's zien we ons

terug op ons feest, worden mythes
verwekt en krijgt het labrynt

de uitdijende vorm waarin
Julius Fraser is uitgewerkt.

Casual acquaintances are left,
colleagues and neighbours, friends

children and his loved one
in combat with his absence,

days, weeks, years of resistance,
past and future pulled

back to this moment
of love in intruding death.

Casual acquaintances, neighbours,
colleagues

first yielded to the current,

our ongoing craving for rest,
Julius Fraser is worked out.

Work has to go on. Long live Daidalos.
Eternity still begins

with indifferent, gazing light.
At blind walls that primal image

shatters into glittering light, miracle
for some, work for others

to provide his time with eyes and joy,
on frescos we see ourselves again

at the feast, myths are engendered
and the labyrinth receives

its expanding form in which
Julius Fraser is worked out

AUGUSTINE CHANTING

WRITTEN BY DANIEL CORRIE

...the drops of my time are too precious. ...

—Augustine

The wholeness stands. Its outlines
cloud and alter.

The shape remains. It lives into
reshaping.

A page recites the psalm, held whole
in silence.

Memory traces contours of the psalm's
shape.

Time chants the psalm. Each word
distills to presence.

Words follow one by one into the
chanting.

The psalm continues shaping through
reciting.

The saint is chanting, as the saint is
chanted.

The monarchs swarm, migrating from
the milkweed.

The waxwings flock, ascending from
the pine's crown.

The salmon rise through sunlight's
dappled currents.

Shoots break from seeds, emerging
into rainfall.

Each word unfolds. It opens into
voicing.

Each rides a moment rising, breaching,
spanning.

The crest of voicing climbs the wave of
presence.

The psalms of waves recite the voice
of oceans.





NOW

WRITTEN BY DANIEL CORRIE

The NASA camera's shutter
blinked, time and deep space
kept in the now of a page,
great blackness of night's
stars eddying into stars,
the small, indifferent spirals
swallowing themselves,
galaxies drifting away
from galaxies to farther night's
moment always closing
toward a moment's opening,
single moment of all place
emerging from all place
into a farther place that is all,
inflections and immensities
continuing, a lone pulsar
strobing, lost somewhere far
in the photograph, its throb
measuring each interval
reshaping to a newer interval,
night washing over a beach,
breakers combing hair to white
in moonlight's salty rinse,
where I feel myself rising
to stand in sand, faltering
shoreward, pulled and pushed
in wave-heave then wave-heave,
knowing my now as a feeling,
my years' memories swimming
through now's forgetfulness
of eons' moments swarming
more than all swarming stardust,
vivid pivot-point of presence
like the dolphin glimpsed
in its leap through arc of air,
like surf reaching to receding,
like a breath into a breath,
like an eye's eclipsing blink,
primordial newness always
vanishing through becoming
the ancient suddenness of now.



KEEPING TIME

WRITTEN BY ERIC KINCANON

As the lowliest grad student
I spent so many long nights
Tracking and mapping the stars.

Working to stay warm in winter
And awake in summer
I timed and recorded,
Measured and noted
'Til Apollo would chase me off to bed.

Half a lifetime later I see now
That it is Phaeton who pursues me.
And the guidance
I could have found among the stars
Is daily buried in his brilliance.

But I know
That the lights are still there.
Shining on, unseen,
Behind the chaos of his path.
Waiting for me to find them
And mark my motions again.

ISST COUNCIL MEETING MINUTES: OCTOBER 23, 2016

Attending: Raji Steineck, Dennis Costa, Emily DiCarlo, Robert Daniel, Carol Fischer, Jane Fraser, Paul Harris, Arkadiusz Misztal, Carlos Montemayor, Jo Parker, Lanei Rodemeyer, Daniela Tan, Walter Schweidler

Excused: Alistair Bowden

Minutes: Daniela Tan

Raji welcomes the new council, who also represents the new generation of ISST.

REPORTS:

1. *KronoScope* Report (Jo): Spring 2017 (KS 17:1) special issue *Time in Early Modern Japan*. There were nine submissions for the 2017/2 issue, and there should be enough essays for a solid conference issue. From issue 2018/1, the *KronoScope* editorial team determined a new editorial structure with one editor-in-chief and three-four editors who would alternate doing issues.

2. Study of Time Report (Robert): The volume is in the making; Deadline was extended until 31st October 2016. The vision for this volume is to co-create bridges or dialogues between the essays.

3. Finances (Lanei): The 2016 Conference was different than prior conferences, as Edinburgh collected everything (wire transfer), which resulted in massive income and payment. We are not going to follow that system in the future. This year the income is relatively low for a conference year, because the Edinburgh conference was expensive, but as we have foreseen to spend money on the ISST's 50th anniversary. We will aim at lower costs per diem at the next Conference. The Council is now well dispersed around the globe and we are thinking about virtual meetings, also including the idea of local nodes that meet virtually at least once per cycle.

4. Membership (Dennis): Many thanks to Carlos who was working with memberships for the past 2 years. Membership now is at 117 and extremely international. Still, we should recruit more proactively. Suggestions were made that we distribute our call for papers more widely, and that we might have a point person in charge of getting the call for papers out. The conference layout is also closely tied in with our strategies for winning new members. Guest presenters (Julian Barbour, David Sloane, David Mitchell, Katie Peterson) of the Edinburgh conference are offered a free ISST membership for a year.

5. Time's News report (Daniela): The 2016 issue was sent to 154 members; costs for Lay-out, printing, shipment and 40 extra copies to distribute at conferences by Bier'sche Verlagsanstalt were 522.56 Euro. *Time's news* will be published online in the future; in a 3-year transition time a paper copy will be sent to those members who prefer this. From the 2017 issue, Emily DiCarlo will be in charge.

6. Communications report (Emily): The public FB site serves for commercial uses to attract potential new members. The private FB site is for ISST members exclusively. We have 333 members on Twitter. If you need anything posted, it can be posted in the ISST closed group and to the Twitter 333 followers. Emily will send a communications plan to the Council.

7. Conference Survey (Daniela): 23 members have participated in the survey. The intellectual quality of the conference was rated as very good by most, and the inter- or transdisciplinarity of the conference was much appreciated. The need for a keynote speaker is rated positive by 60%, whereas 40% don't think that's necessary, also regarding the costs. The key-note speaker could be

an ISST member; or should be of the country where the conference is held (costs, tie with location). This year's key-note speakers had a very good response; Mitchell and David Sloane were highly regarded. The theme "Time's Urgency" was ranked as well chosen, combined with the wish for a sum up in the end of the conference; some thought the summing up that we had was rather vague. Conference organization was rated as very good and excellent: "Lanei did a wonderful job." Recurring technical issues and the poor acoustics were a setback. The quality of the venue was only satisfactory for most, and even unsatisfactory for some. Main reasons have been the sound system problems (and almost never a professional support person at hand) and the acoustics of the room, as well as the overcrowded cafeteria. Almost 80% found the length of the conference and the fact that there are no parallel sessions important. As a general feedback for future conferences is the wish for a balance of presentations from both natural sciences and arts.

2019 TRIENNIAL CONFERENCE:

Conference Manager: The 2016 Edinburgh Conference was managed by Lanei Rodemeyer, who agreed to take over these tasks for the next term (2018-2019) at the Interim Council Meeting in Edinburgh in July 2016.

Conference Site: Availability of facilities should be investigated. These locations have been discussed so far: Loyola Marymount University (Los Angeles), Dolomite Alps in Italy, Uschkaish (Portugal), Lochow Palace (Poland), Crakow, Merida (Mexico).

Timing: The 2019 Conference should be timed either in the beginning of June or the end of July 2019.

Structure of 2019 Conference: Consent is found in piloting panels by other time societies at the next conference. Half a day at the 2019 Conference will be reserved for this (2 panels = 2 societies). We could identify 1 or 2 societies that are particular to the theme and the conference site, and the Japanese Time society would be interested in organizing an interdisciplinary panel representing Japanese time societies. JSTS has a large membership from the sciences. Specific interim conferences should be used as occasions to interact with other time societies.

Conference Theme:

Currently discussed themes for the next Conference: Slow Time, Slowing Time, Measured, Time and Meaningfulness. Conversation will be continued via email and decision will be made during 2017.

RELATIONS WITH OTHER TIME SOCIETIES:

Longnow Foundation in San Francisco (Jo)

Philosophy of time network (Lanei)

Time Perspectives and Psychology (Carlos)

News of these time societies should be placed in the newsletter as an initial link. JSTS reports have been included in the last issue of Time's News and vice versa: they announce ISST news as well.

INTERIM CONFERENCES:

Emphatic Thumbs up to the proposal "The Anthropocene" (UK based conference, with members of Anthropocene working group) is such a good idea. Alistair could be asked to guest edit a special issue of *KronoScope*.

ASLE could be approached (Robert).

VARIA:

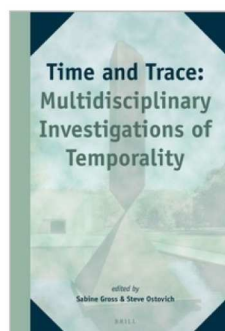
People prefer having the week-long conference; the structure of the conference should be discussed at the next Council meeting. Possibility to set aside a session just for a final discussion in the end of the conference to tie everything together, as people wished.

ARTIST PROJECT



Emily DiCarlo, *Set Together*, 2014. Photo detail from 24h globally collaborative performance that asked participants to document the setting sun on the longest day of the year in the northern hemisphere on June 21, 2014. Co-ordinated with The International Society for the Study of Time's conference at the Beijing Normal University. Nearly 100 individuals from more than 50 cities in 16 countries contributed to the project. All documentation is chronologically ordered to reflect the timezones in which the moments were captured. COURTESY OF ARTIST, TORONTO.





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Time and Trace: Multidisciplinary Investigations of Temporality

Sabine Gross, *University of Wisconsin-Madison*, Steve Ostovich, *Marquette University*

Time holds an enduring fascination for humans. *Time and Trace* investigates the human experience and awareness of time and time's impact on a wide range of cultural, psychological, and artistic phenomena, from reproductive politics and temporal logic to music and theater, from law to sustainability, from memory to the Vikings. The volume presents selected essays from the 15th triennial conference of the International Society for the Study of Time from the arts (literature, music, theater), history, law, philosophy, science (psychology, biology), and mathematics. Taken together, they pursue the trace of time into the past and future, tracing temporal processes and exploring the traces left by time in individual experience as well as culture and society.

Contributors are: Michael Crawford, Orit Hilewicz, Rosemary Huisman, John S. Kafka, Erica W. Magnus, Arkadiusz Misztal, Carlos Montemayor, Stephanie Nelson, Peter Øhrstrøm, Jo Alyson Parker, Thomas Ploug, Helen Sills, Lasse C. A. Sonne, Raji C. Steineck, and Frederick Turner.

READERSHIP:

Academic and lay readers interested in the human experience and the interdisciplinary study of time, including literary theorists, musicologists, philosophers, biologists, psychologists, sociologists, environmentalists, historians, and legal scholars.

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