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The two faces of time

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Speaking of a 'lack of time', do we mean the same 'thing' as the variable '*t*' in a graph of some time-dependent development? The following article tries to show that both concepts are extreme examples of the two sides, or faces, of the single phenomenon of time, as common and trivial as it is mysterious. Scientific, numerical time is considered first, followed by the time of the common human experience, the time in the present. It is on the basis of this curious ability to 'keep in presence' various events that follow one another, that the scientific concept of linear time has been established and, with it, the possibility to measure the time for scientific and practical purposes.

'As long as nobody asks me, I do know what time is – but to a direct question I do not have any answer.' This famous quotation of Augustine expresses the basic difficulty in dealing with such a common and banal everyday phenomenon as time. Throughout the whole day, the whole year and our whole life we swim in the medium of time – and in modern societies we struggle more and more with the lack of it. 'Time is what we lack when there is too much happening', a German sociologist said recently. Let us take these wise words as a sort of warning: there is little hope that a perfect definition of time could be found, that fits all of its various manifestations. Thus, we shall not try to crack the riddle of time by a direct attack, but we shall aim at a much more modest goal. We will try to show that our manifold experiences of time, both in science and in daily life, can be ordered into two categories: time appears either as linear and numerical, or as time with the present. John MacTaggart called them the B-series and A-series of time, respectively. In each of them, some properties or features of time will be apparent, whereas others will disappear. Nevertheless, we should resist the opposite temptation as well, namely to mark them by indexes and to speak about 'time-1' and 'time-2' as a Popperian philosopher would do. This would be too cheap a solution, in fact rather a defeat. Instead, we shall first present these two 'faces' of time in the good expectation that they are mere faces of something like 'time', and then confirm our hypothesis of the 'unity' of time by hinting at the possible connections between both of its faces.

Let us start with the measurable or 'scientific' face of time, although it is, as I hope to show, neither historically older, nor logically or phenomenologically more fundamental. Even if it is decidedly of very recent origin, it is the one we are better prepared to think and to speak about. Not only in science and history, but also in the whole of modern life are we continuously confronted with time as a number, as a scalar value representable as a point on a line, usually

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on a coordinate axis. Not only in mechanics or technology, where time is measured, but also even in daily life, we expect the answer to the question 'What time is it?' to be a number. However, this is a very modern usage, because our ancestors – only some two or three centuries back – would have been puzzled by the question itself. It seems that in most European languages, 'time' once usually meant 'weather', 'season' (as in the French *beau temps*) or even 'tide' (*gezeiten* in German) – the ever changing framework of human lives. Whenever people needed to divide the day, to designate more precisely its different moments, they spoke about early morning or late afternoon, about nightfall and noon. Something similar can be said about the date, nowadays usually a group of three numbers, one of which is frequently expressed by a curious conventional and traditional name of a 'month'. Several centuries ago, the course of the year was divided by particular 'holy' days, by feasts and festivals, by their drawing near and passing away.

The habit of expressing time by numbers is connected first with the military watches of antiquity, and the famous Aristotelian definition identifies the time with the number (or count) of regular movements. One can guess that it was mainly the movement of the Sun, the alternation of day and night, which he had originally in mind. Augustine reasoned whether this natural regular movement could be replaced by an artificial one, e.g. by the revolutions of a potters wheel, as a measure of time. A major breakthrough in the human organization of time occurred when medieval scientists and craftsmen replaced the natural movement of the Sun by an ingenious mechanical device, a precursor of the pendulum, whose movements could be mechanically counted by a series of cog-wheels. The first users of mechanical clocks in the late Middle Ages were probably monks. These extremely expensive devices, probably the first metallic machines, were usually fitted with a bell to awake the monks to the regular day and night prayers. The English word 'clock' comes from the Latin word for the bell and the word 'hour' meant, originally, these common prayers; among them, the ninth gave the name to our 'noon'.

Since the fourteenth century, mechanical clocks spread rapidly into the busy towns and became objects of public prestige. Only a century later, craftsmen were able to build the first portable watches, pocket models of the Universe. As the first Renaissance scientists needed to measure short time intervals with some precision, Galileo came up with the idea of the pendulum. Nevertheless, if we are to believe his somewhat dubious experimental reports, he first measured the velocity of free fall by counting his own heartbeats, as no better device was available to him. With public transport and television, public time as a number became a necessity, although, until the introduction of artificial light, it was not very practical. At 6 pm there could be bright sunshine as well as complete darkness, depending on the season. This numerical form of time is simple and exact, common to all and objective – although perhaps a little colourless and artificial, and this is why, on the dials of our watches, we clearly prefer 'hands' with their more expressive message. By the way, the traditional form of the dial is the last reminder of its former symbolic function of modelling the Universe with a hand representing the sun and the transmission rates of the cog-wheels giving the Ptolemean proportions of the planetary orbits.

Once time began to be measured (and not only indicated as with sundials), that is to say, expressed as a number, the road was open to the next step: to project time on a line, onto a coordinate axis. This new possibility was first glimpsed by Galileo and Descartes, although

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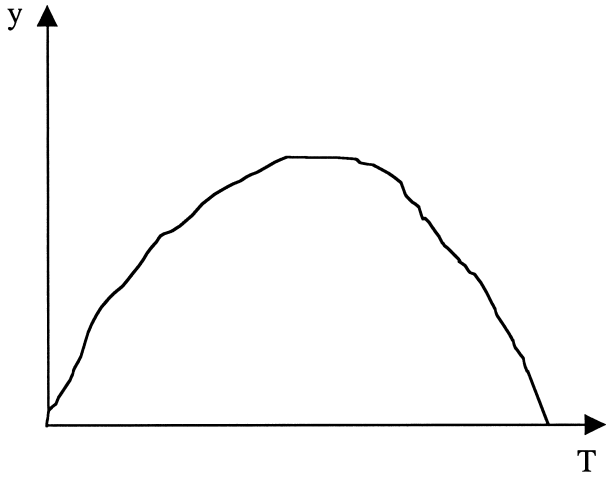


Figure 1.

it was not fully realized until the great Platonist, Newton. For him, time was a mark of human limitation. Man lives in the present only, in a tiny fraction of eternity. Only in this limited present, acting as a crevice or slot, can man see, feel and act, whereas the whole vast eternity is accessible in its full extent only to God himself. Thus, the whole reality is the eternal one and the discovery of the eternal truth about this permanent world, where the present plays no role at all, is one of the greatest achievements of science. This forgotten Platonic inheritance can be seen on any graph, say, in mechanics (Figure 1). The curve that describes a vertical height against the independent variable '*t*' presents the whole time course at one glance: its parabolic shape does not depend on true time and is identical at any time. A teacher, drawing it on the blackboard, tacitly presupposes that the thrown stone will not meet any other body on its path – a rather bold hypothesis, indeed, as in reality stones are rarely thrown into the air for no reason and with no aim.

The Platonism underlying this sort of mechanical prediction can be illustrated by a comparison with another time graph, describing, for example, the exchange rate of the Czech crown (Figure 2). Its shape alone shows without any doubt that we are dealing with a different matter. There will be a much less regular curve to the left, which is actually a mere series of discrete points corresponding to the known or measured values of the past – and a much simpler dotted line to the right, expressing no more than a tendency, the economists estimate for the future. Why is this part of the line dotted? To show that, pertaining to the future, it is just a forecast and thus by no means certain. Scientifically, it is a hypothesis – just the sort of thing Newton did not like. On the other hand, it is a true reflection of the human experience of the future, which can be conjectured and approximated, but never exactly known.

At this juncture we are approaching the borderline between the two faces of time. With the graph of the economist (or of a demographer, sociologist, physician etc) reality or experience has broken in and destroyed the beautiful, comfortable and reliable linear time. By this intrusion, the straight and homogenous line of time breaks down into a left-hand and right-hand part, the first backed by experience, and the second being no more than a dim and

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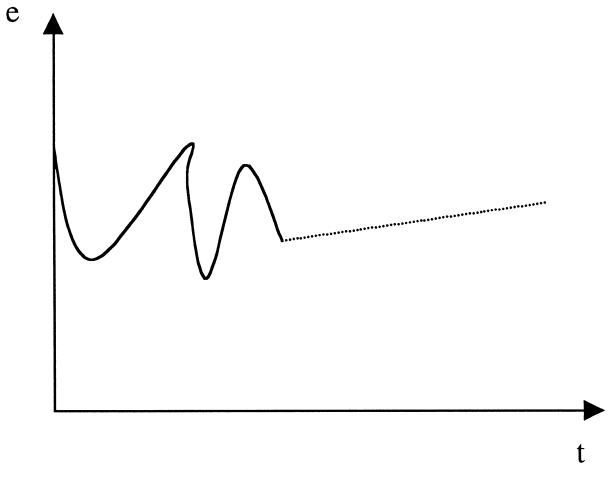


Figure 2.

doubtful assessment or expectation, and in fact rather a tendency than a line. Between these two realms of very different nature there is a mysterious frontier, the point of the 'present'. This very paradoxical state of things was first seen by Aristotle. In the fourth book of his 'Physics', he reasons that there are obviously three parts of time: the past, the present and the future. Of them, the past is not any more, the future is not yet – and the present, being a mere point, a frontier, has no possible existence at all. Hence his cautious conclusion is that time apparently has no being.

With all due respect to Aristotle, it should be remarked that a very similar concept of time has been familiar to almost every language from time immemorial. Indeed, many languages discern various tenses, tightly connected with the temporal relation between the actual present of the speaker and the contents of the message. This connection is so obvious that, in most languages, time and tense are designated by the same word. True, the meaning of the tenses is not only temporal. The present tense is used to speak about topics that may actually be present or intemporal, and are thus somehow beyond doubt and often verifiable. On the other hand, the future does not designate only things to come, but is often used to express a basic uncertainty, a mere expectation of what is said. Linguistic tenses bear a rather clear testimony of the age-old human experience with temporality, a 'fingerprint' (Nietzsche) or 'sediment' (Cassirer) of human thinking as a whole.

However, whether time is or is not truly existent, we cannot evade its basic riddle, now concentrated around the knot of the present. It is this mysterious 'point' or frontier where we miserable mortals are doomed to live and which we are unable to quit. On the other hand, it is so completely absent from the physicists' view of time, that a serious suspicion could arise that it is of our own invention, that the whole present is merely a subjective feeling of ours with no support in reality. In which reality? Obviously, in the eternal world of all the great and smaller Platonists. As to the experienced reality of ours, it is, on the contrary, exclusively there; that is, just in the present.

At this point of our investigation we are thus compelled to turn our attention to the other

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face of time, to the time of our immediate experience. As no experience is possible anywhere else but in the present, we have to start there. Our presence seen 'from within', from the only position which is directly accessible to us, offers a very different picture. The presence – from Latin 'prae-sum' – means all that we are confronted with, that we have before our eyes, that – as the German '*Gegen-wart*' says – we are actually watching, or – as the Czech word '*p-ítomnost*' suggests – all that we are attending to, concerned with or simply assisting at. In other words, it is the necessary and unavoidable counterpart of our conscious being. Nothing more nor less. At first glance, there is nothing 'timely' involved: my very presence at the moment of writing this article contains this obsolete computer of mine and its keyboard, the desk, the bookshelves over there and the fresh green trees behind the window. However, in this rather calm and silent scenery, a violent struggle is ensuing – the effort to write something worth reading, to paste letter to letter, word to word and phrase to phrase under the vigilant guidance of some 'idea'.

My immediate present, as I directly experience it, is by no means a point. It is an enormous bunch of thousands of impressions, perceptions and feelings, ordered in space and time, and kept together by my effort, by my attention. This surprising picture of our present was first perceived by Augustine. He analyses it using the example of speech. If I am to recite a poem (or, alas, to read a lecture), I have to have it 'present' in my mind as a whole, to be able to articulate it syllable after syllable and stroke after stroke. My listeners have to collect these utterances of mine, to hold and to gather them as they sound to them, to keep them together until their sense is caught. If we are both able and willing to play the game, the miracle of speech communication can happen – and after a while, the poem passes from my mind to yours until, at the end of the performance, it can be identically present in all of them.

All this, though happening step by step, is nevertheless present. If not, no communication could take place, no message could be sent and/or received. Something very similar goes on when we watch a movie, and you know well those absent-minded and preoccupied people who in the most dramatic moment start to enquire what the bearded gentleman with glasses is doing there or why the heroine is weeping. The same wonder of attentive presence renders possible such things as a violin concert, a game of chess or a simple chat. With a forgetful person who asks every two minutes whether it is time for lunch, even the simplest conversation is impossible.

Let us have a brief look at the internal structure of this present. Around the hot centre of what is just happening, there is a sort of trace or queue of what has happened (including, for example, the previous history of the bearded gentleman with the glasses), and a certain expectation of what should follow. Without this expectation the common phenomenon of surprise would be completely incomprehensible. Next door, let us say, somebody is playing the piano, a very well-known tune. As he is not very adept, he keeps making the same mistake again and again. In five minutes, you are going crazy. Why? Because the poor piano pupil is repeatedly frustrating your expectations. The same principle applies to dramatic turns in a criminal movie: a dark deserted street, threatening sound effects – and all of a sudden… Such a surprise can make a big impression on a man or woman, but none at all on a being without tacit expectations, without this sort of an enlarged 'spacious present', as William James put it.

Thus, my actual present contains, to speak with Augustine, a present past, a present present

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and a present future. Husserl calls them retention, presentation and protention, all together forming the 'courtyard of time' (*Zeithof*). The 'present past', however, should not be mistaken for past as such: whereas the role of the bearded gentleman has to be permanently present and clear to a movie spectator, the contents of my conversation with my wife yesterday are available to me – at the best – only after a special effort to remember. They are kept 'in the memory', as computer people often put it. They are in the bookshelf, not at hand on the table of my mind. The same is true about the future: the immediate expectation as to what may happen next has little to do with my plans for the future.

To a scientifically minded man, the question might arise about the 'length' of this required presence – and a hundred years ago this was indeed measured. The result was rather deceptive: for the sheer performance of somehow articulated speech, several seconds might suffice. But a man who repeats the same joke after half an hour is a poor partner even for a street encounter or for a pub chat. Man simply has to be able to extend his attentive presence to the whole performance in which he is participating. On a lazy Sunday afternoon or waiting for the bus, we can relax our attention to the extreme of drowsiness. On the other hand, there are extreme, heroic feats of attention, doing a prolonged surgical operation or listening at a Wagnerian festival, but for common mortals society sets merciful limits to what can be required from us. Thus, the maximum length of a theatre play, a movie, a school class, football game, of a religious service – and of a lecture – is not to exceed one hour. After this time, we have the right to pause to assemble the elapsed presence, to save it or whatever of it is worth saving in the memory – and to prepare for the next.

As everyone can check by his or her own experience, one's life is not a straight and homogenous line of 'time', but a series of discrete 'presents', filled up with various occupations and more or less remembered for the future. During the prolonged exercise of life, man gradually gathers a certain feeling of continuity, a hazy idea of 'my life'. From the very focus of the present this life extends into the remote past, our own experience being usually prolonged by the narratives of our parents and teachers – and, on the other side, there are distant expectations and plans, extending far into the future. Thus, the concept of 'my life' is shaped more clearly – including its limits. These limits of birth and death are not accessible to our direct experience, nevertheless we are well aware of them. And as our life goes on towards the limit of death, as we grow older, we feel that 'time is the stuff life is made of'. Having 'no time' is an everyday experience of modern life for those of us who are unable to fit into the limited space of life (materialized for example by a diary) all the interesting and intriguing things we have heard about or we have touched upon.

Out of this basis of human temporality and of the ability to 'keep in mind', to remember and to recollect, the majority of truly human phenomena grows, i.e. the ability to promise and keep (or break) promises, which is, according to Nietzsche, the most outstanding feature of humans, the mysterious phenomenon of moral conscience and, on the other hand, the ability and habit to gather experience, to remember and tell stories, which is the common root of literature and history as well as of science. And even deeper, this is the first prerequisite for all human culture in the broadest possible sense, including habits, beliefs, traditions – and particularly language and speech.

This very common ability to 'keep in the present' permits us to view, at a single glance, things that are actually there, side by side with those that ceased to be and that are yet to come.

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This ability is, perhaps on a different level, similar to our capability to see the rapidly changing series of single pictures on a film strip as a smooth movement that cannot be explained by a sort of simple inertia. It is, at the same time, the only available legitimization for the physicist's habit of depicting time as a continuous line. Otherwise, the physicist would have to suppose, as Newton did, that it is the ever present mind of God, the famous '*sensorium Dei*', which collects all fleeting individual facts, states and happenings and connects them together into continuous movements or stories.

Once this basic continuity of time or its 'flow' has been constituted, the next task emerges, which is to establish some reference points and some measure or unit. We need them not so much in the individual life as such, but rather to coordinate and synchronize our joint common activities. Even in the most trivial case of running a race, the 'spacious' nature of our present requires that 'inside' the common present of the runners a point-like signal, a shot, needs to be fired to synchronize their start efficiently. On the other hand, lived time is actually not as smooth as the physicist believes. It is modulated by bodily rhythms, by the heartbeat, by the breathing and by the rhythm of walking, and it is regularly interrupted by periods of darkness and of sleep. The alternation of day and night offered man the first common measure of time and a convenient means of its more or less uniform division. The course of the year, the alternation of summer and winter, so all-important for both hunters and farmers, could have been subdivided by the visible changes of the moon, the usual basis of all primitive calendars. Only the early empires and imperial towns with their elaborate systems of taxation required a more precise and regular solar calendar – a much trickier technical problem, to be reliably handled only by professionals.

Man cannot help but see his surroundings as if organized 'around him': something in front of him and behind, something to the left and to the right, something near and something more distant. Even a highly civilized man has a certain difficulty in identifying the surroundings of his immediate experience with a certain point on an (objective) map. A very similar perspective or horizon can be observed in temporal relations. On the one hand, we cannot help but count 'the time' from now, from the present, speaking about tomorrow and yesterday or promising to be back in five minutes. This is the commonly perceived, daily face of time, called 'A-series' by McTaggart or 'time with the present' by Einstein. However, for the sake of coordination or synchronization of human activities, our ancestors introduced a different, objective, scale of time-measuring, starting with an important event – the first Olympiad or the foundation of Rome – which was common for all.

The technique of time-measuring since the late medieval period has been developed to unprecedented perfection. From the 18th century on, mechanical clocks outperformed the regularity of the movement of the Earth, and currently we can measure time with the precision of ten to the power minus twelve seconds. Actually, the measure of time is probably the most precise measure available. Linear measured time supplanted the more 'natural' methods of orienting oneself in the course of the day and of life, but primitive time-reckoning remains in common use. It is not easy to imagine that the words 'now' or 'today' could be generally replaced by (ever-changing) numbers, or that a race could be started by asking the runners to get started exactly at 15:00. On the other hand, except for such simple occasions of everyday life, numerical time is constantly invading new areas, allowing for, and enforcing, increasingly precise planning. Renaissance watches with one single hand would be of little use today, and

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even the seconds hand is no longer simply ornamental. The introduction of the common 'epoch' and calendar, of Greenwich Mean Time and of generalized time zones was among the first signs of what is now commonly called 'globalization'. And the ever-present linear time, as Chesterton once put it, has gradually tied us all up with 'the heaviest of all chains – the watch chain'.

About the Author

Jan Sokol, born in 1936 in Prague, teaches philosophy at the Charles University in Prague. After a study of mathematics and a long period in software development, he studied cultural anthropology and philosophy. As a former dissident, he was elected MP in 1990 and in 1998 he served for a short period as Minister of Education. He has published several books on computer software, on philosophical anthropology and phenomenology (*Time and Rhythm*, 1996) and numerous translations.

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