EXPLORING CORRELATIONS BETWEEN LOCAL EMOTIONAL AND GLOBAL EMOTIONAL EVENTS AND THE BEHAVIOR OF A RANDOM NUMBER GENERATOR.

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Abstract

During the period from May 11, 1995 to May 21, 1995 disturbing events, like apparent anomalous movements of objects were reported at the home of a family in Druten (The Netherlands)[1]. A few days after the phenomena started, a hardware random number generator connected to a computer was installed on the premises. As measures for the non-randomness of the RNG, two coherence variables, one representing first order non randomness and one representing 8-bit patterned forms of non randomness, were used.
Comparison of epochs during which disturbances occurred and control epochs showed a decrease in first order RNG coherence (sum of z^2 scores was: 78.4 with df=107; $p < 0.05$ two tailed; in the control periods sum of z^2 was 4724 with df= 4771, n.s.) while the more general RNG coherence measure did not show an effect

- On Wednesday May 24, 1995, when the field RNG was still running at the home, the major European sports event, the European soccer cup final, was played between a Dutch and an Italian team. During the 90 minutes of the match, the RNG showed a significant increase in first order non-randomness (sum of z^2 scores = 343.6 , df=297, $p < 0.05$ one tailed) while during the preceding control period the RNG showed its normal behavior (sum of z^2 scores = 284, df=297,n.s.). The global coherence measure testing all possible 8 bit patterns decreased non significantly during the match.
- Two minutes before the end of the match, the only goal was scored by the Dutch team. Comparison of the 10 minutes before the goal and the 4 minutes after the goal suggests that after the goal the RNG shows a decrease in global coherence (mean chi^2 before = 258.4, mean chi^2 after = 245.2, t = -1.94, df = 54, $p<0.058$ two tailed) but no first order coherence effects were observed.
- The results are discussed in the light of similar recent experiments, with special emphasis on the weak conceptual framework and the weak methodological aspects, especially the risk of over-analyses is inherent in this

[1] *Short description of the Druten RSPK case* (for an elaborate report see Gerding et al, 1996)
From thursday May 11th, till monday May 22nd, several anomalous, so called Poltergeist, events were observed around a 15 year old son in a turkish family in the small town of Druten, The Netherlands. The majority of the phenomena concerned 'throwing' of little stones, sand, or soil. Some of the events resulted in considerable damage. Also the displacement of larger household objects was claimed. The phenomena were observed by several independent witnesses, amongst them 4 policeman, who visited the premises on Sunday, May 14. One of the policeman refused to return to the house. Two of them were the target for sand-events, in one case it was claimed that the boy was inside the hermetically closed policecar. A few times the stones were warm and twice a stone which fell according to the sound with large velocity was immediately at rest. Many phenomena followed directly upon spiritual services (praying).
On monday May 15, two researchers visited the family and returned on wednesday 17 may bringing an RNG with wich a few PK tests were run and when the reseachers left the RNG was installed to continously run in field mode. The results of the PK tests were marginal (see Gerding et al, 1996) but the present paper deals only with the results of the field RNG.
Although the phenomena effectively ceased after May 22 the field RNG stayed there till beyond may 24. On that evening the family watched the big final soccer game between a dutch and an italian team. The match was won by the dutch team by one goal which ocurred two minuted before the end of the match. This resulted in an euphoric mass eruption in the towns of the Netherlands.

type of field work at this stage.

Introduction

Random Number Generators (RNG) have been used widely to investigate the alleged phenomenon of Psychokinesis (PK) or 'Mind over Matter'. These experiments typically try to establish a correlation between a mental state and the subsequent behavior of the RNG. The mental state is generally an *intention* to produce one of the random outcomes more often than it would occur by chance if the RNG is left alone (e.g. Bierman & Houtkooper, 1972; for a review see Radin & Nelson, 1989). For instance the subject *intends* to produce more odd than even numbers in a random number generator which produces random 8 bit numbers. The much debated question explored in these experiments is whether a mental state can be causal to a material state (Bierman, in preparation).

Recent experiments (Radin, 1995; Nelson, 1995) have suggested that there may be correlations between RNG behavior and episodes where some form of collective feeling is experienced WITHOUT any INTENTION on the part of the experiencers. They labelled these experiments as Field RNG experiments because the RNG which is 'influenced' is situated in the field rather than in the laboratory. The major methodological problems associated with this new paradigm are:
1) how to operationalize the *episode* as well as the appropriate control period, and
2) how to operationalize the dependent measure by which the non random behavior of the RNG is characterised given that there is neither an explicit given goal to 'influence' the device in one or another direction nor a strictly defined time frame during which this influence is supposed to happen.

In Radin's and in Nelson's field RNG experiments it is unclear if the driving factor behind these apparent anomalous correlations is a shared *emotion*, a shared *attention* or a specific *state of consciousness* that may transcend ordinary time and space constraints. In the present paper we present data which may shed a light on this question by exploring correlations of RNG behavior with events during a so-called Poltergeist case and with a major sports event. The Poltergeist events are well localised in space and time and only a few persons are directly involved. The soccer game offers a sustained

shared attention and the goal event is precisely localised in time and is accompanied by strong emotions.

In the field of Parapsychology, there have been numerous well-documented reports of so-called Poltergeist or Recurrent Spontaneous PK events (Roll, 1977). Because these events occur in the field one is generally dependent on testimony. The few attempts to capture the phenomena on video were unsuccessful. If a better supported database of these phenomena could be established, then this would strongly favour an 'influence' model of Psychokinesis rather than the 'selection' model that has been put forward by May et al to account for RNG experiments in the laboratory.(May et al, 1995). In this model it has been suggested that apparent psychokinetic phenomena should not be interpreted as 'our mind influencing Nature's (e.g. RNG's) normal behavior' but rather the moment that we decide to look at her is chosen such that we happen to select an epoch during which Nature just happens to show extreme behavior.
If we can establish correlations between anomalous RNG behavior and reported anomalous disturbances of a Poltergeist type, this would give independent support for the genuine character of these Poltergeist phenomena.

Dependent variables

As argued above, the choice of the dependent variables is rather arbitrary, given that no explicit goal to 'influence' the RNG is given. Therefore we choose the simplest direction independent measure as the primary variable of interest. In order to explore if more complex patterns ocurred in the RNG, we took as a second measure the most global direction independent one.

First order RNG coherence

First order RNG coherence occurs when either an excess number of '1' or an excess number of '0' bits are produced. For each epoch of 18 seconds during which 8192 bytes are sampled from the RNG a z-score of the deviation from chance expectation (which is an equal number of '1' and '0') is calculated. Because we are dealing with situations where no explicit intention exists to influence the RNG into one or another direction we use z^2 scores which are independent of the direction of the first order deviations. The sum of the z^2 (Σz^2) scores over a number of epochs is chi^2 distributed. For instance for 100 epochs we expect a sum of z^2 of 100.

General RNG coherence

General RNG coherence occurs when specific patterns in the bit stream are produced more often than can be expected according to chance. For instance, alteration of subsequent bits or bursts of 2 or more consecutive '1' bits, etc., etc. Since no single specific pattern is expected to be 'induced' on *a priori* grounds one has to use a general test that captures a large number of patterns. In the present analyses, we restrict ourselves to 8 bit patterns by calculating the distribution of the 256 possible byte patterns. For each epoch, a chi^2 for the distribution is calculated (df = 255). We will refer to this measure as the global_chi^2 in order to avoid confusion with the measure used for first order non randomness. A value of global_chi^2 larger than 300 indicates that one or more specific patterns occurred more often than could be expected according to chance.

It should be remarked that first order and the general coherence measures are not quite independent. However the first-order coherence measure is more sensitive because the general coherence measure is very general and deviant frequencies of only one pattern will go by unnoticed if all other 255 patterns occur according to chance.

Experimental and control periods

Experimental periods are the periods during which some extraordinary external state occurs. These states may refer to anomalous disturbances or to collectively experienced emotions and/or attention. In the present paper the collectively experienced emotions and shared attention refer to the impact of the disturbing Poltergeist events on the family members on the one side and to the mass emotions induced by a major sports event on the other side. Control periods are periods of the same or larger length as closely as possible in time to the experimental periods. Precise operationalizations are given in the results section.

Hypotheses

Due to the exploratory nature of this new paradigm the only explicit hypothesis was that

> The coherence in the (field) RNG will increase during the experimental periods while the RNG will operate randomly during matched control periods.

The RNG

The random number generator consists of two independent random bit stream generators which are exclusively OR-ed to produce random bytes. The bit stream generators derive their randomness from the noise on the electron current through a Zener diode. The design and general tests on the randomicity of the device have been extensively described elsewhere (PRL report, 1984).

The RNG generated 8192 bytes during every epoch of 18 seconds These data were supplied through the serial port to a computer which stored summary data in files. The software not only continuously sampled the RNG but also logged keyboard-events by which family members indicated when a so-called Poltergeist disturbance occurred. Each time an event was indicated, the computer, while continuing the sampling, displayed an event-number on the screen which was then used by the family as a marker in the logbook that they kept of the happenings in the house.

Results

The Poltergeist case

There were in total 108 events reported and entered into the computer during the period from May 17th to May 22nd. An example of an event record is given in Figure 1. It can be seen that events tend to cluster . According to the oral reports, the most affected period was the one following collective prayer.

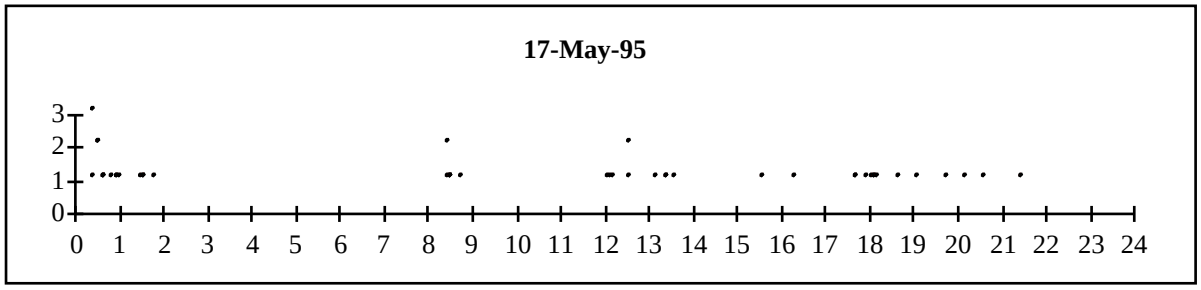

Figure 1, Event plot of the reported disturbances on May 17.

According to the main outside witness in the case, the events were generally registered on the computer within 30 seconds. Therefore we selected as experimental epochs the epochs which were on the average between 36 and 18 seconds before the key-press which indicated the occurrence of an event. For the control period, the full day of May 28th was taken which was about a week after the last disturbance was reported.

The 108 experimental epochs showed a significantly low variance in first order non randomness as indicated by the Σz^2 values of 78.4 where a value of 108 is expected. The corresponding z-value is -2.07 ($p < 0.05$) and calculated using the approximation (Guilford & Fruchter, 1973, p.517)

$z = \mathrm{sqrt}(2*\mathrm{chi}^2) - \mathrm{sqrt}(2*df-1)$

where $\mathrm{chi}^2 = \Sigma z^2$ and df is the degrees of freedom, in this case the number of epochs-1.

The 4772 control epochs did not show any first order non randomness. The Σz^2 was 4724 which corresponds to a z-value of 0.47 (n.s.).

There was virtually no difference between the mean global measures for RNG coherence during the experimental (mean global_chi^2 = 254.93, N =

108) and the control periods (mean global_chi^2 = 254.77, N = 4772).

The soccer match

The soccer game was played on May 24 1995, a time when no Poltergeist events were reported. The match lasted 90 minutes from 20:30 till 21:15 and from 21:30 till 22:15. All members of the family who had experienced the Poltergeist events watched the match on television. The 90 minutes of the soccer game (298 epochs) are considered to be the experimental period. The 90 minutes before the game were taken as the control period.

In Figure 2, the behavior of the RNG is plotted against time. The vertical axis gives the Σz^2. If the RNG is operating normally the Σz^2 increases continuously with on the average 1 per epoch. In order to keep the graph within limits, therefore, 1 is subtracted from this sum for each new epoch. Thus, a horizontal line represents normal behavior and an increase represents first order coherence. In a similar way, the cumulative global coherence is displayed by subtracting the expected score of 255 from the sum for each epoch.

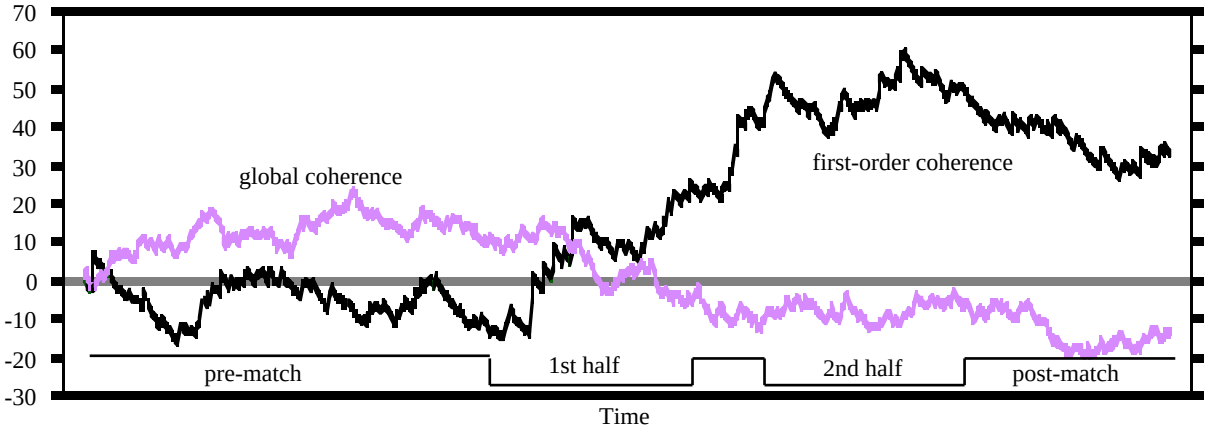

Figure 2. Cumulative first order and global RNG coherence preceding, during and after the match. Horizontal axis corresponds to 240 minutes. Vertical axis are 'normalised' . The cumulative scores are corrected for their normal trend (see text). The marker line indicates the pre-match, first half, intermission, second half, and post-match periods.

As can be seen in Figure 2 the RNG showed normal behavior before the match but first order non random behavior developed during the match i.e. in some of the 18 second epochs significantly more '1' bits were produced

while in others more '0' bits were produced. Each 18-sec epoch was characterised by a z-score corresponding to the difference between generated '1' and '0' bits. The Σz^2 during the match was 343.6 (df=297, $p < 0.05$ one tailed) while the Σz^2 for the 90 minutes before the match (.i.e. the control period) was quite normal (284, df=297, n.s.).
As can be seen from the figure, the largest contribution to the effect comes from the first half of the match. The intermission was not considered to be a part of the match in the analyses but it can be seen that just before the start of the second half, still during the intermission, a strong increase in variance occurred.

The global RNG is plotted in Figure 2 in a 'normalised' way in order to get comparable data for first and global non randomness in one plot. The normalisation is obtained by dividing the cumulative score by the standard deviation of the epoch coherence measures. As can be seen, the global RNG coherence measure decreased during the match, but the difference between the experimental epochs and the control epochs is not significant. The mean global_chi^2 during the match was 254.3 (N= 298), while the mean value for the control epochs was 255.9 (N=298).

Winning Goal
Two minutes before the official end of the game, the Dutch team scored the only and winning goal. In order to explore possible 'effects' on the RNG, we choose as the experimental period the four minutes following this goal. The reason for this choice is that the official timing may have been delayed a bit due to a slightly longer intermission but this delay was certainly not longer than two minutes. The collective euphoria in the Netherlands due to the event certainly was sustained over a longer period than four minutes.
For the control period, ten minutes preceding the goal was taken because as we have seen the RNG showed some deviant behavior during the whole match. In order to find out coherence effects on top of already disturbed coherence it is necessary to take the disturbed value as the base line.

In Figure 3 the cumulative global and first order coherence measures are plotted against time, together with a marker indicating the approximate moment of the goal event. The global measure shows a negative trend immediately after the goal (mean global_chi^2 before = 258.4, mean global_chi^2 after = 245.2, t = -1.94, df = 54, $p<0.058$ two tailed), while the first order measure shows a negative trend throughout the control and experimental periods (Σz^2 before is 38.8 with df=42 and Σz^2 after is 9.4

with df=12).

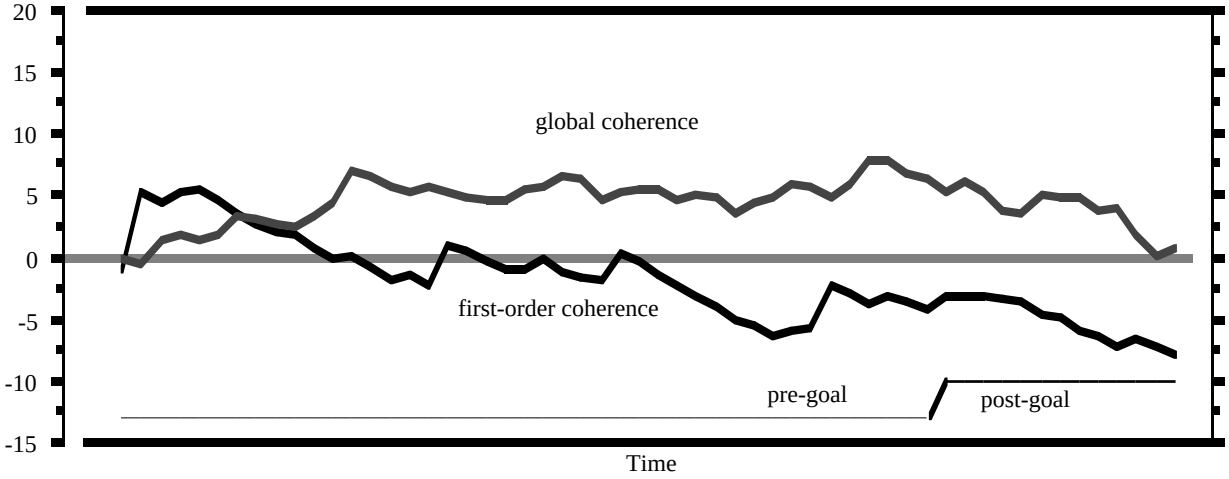

Figure 3: Cumulative coherence scores preceding and after the goal. The total horizontal axis is equivalent to 14 minutes. The cumulative scores are corrected for the normal trend (see text).

Discussion

Over-analysis

Before discussing the results, it should be stressed that there are multiple ways to operationalize:

a) the dependent variables,
b) the experimental periods,
c) the control periods

This is inherent at this stage of development for this new paradigm, but it should make the reader wary when it comes to discussing levels of significance.

For instance, for a preliminary analysis done on the Poltergeist data the 10 epochs (180 seconds) preceding the key-press was taken as experimental period. This was based on an assumption that each event was registered within 3 minutes. However when the witness report indicated that the key was pressed within 30 seconds of each event the number of epochs in the experimental was reduced to 2.

It is very difficult to determine in hindsight if this reduction was a purely rational one or whether is was also supported by the very meagre result found when 10 epochs were used.

In any case, when there was a marginal significant result ($z = 1.8$) with two experimental epochs, the decision to explore only one experimental epoch

was certainly driven by this fact.

Also the choice of the control periods can have an effect as is clear from Figure 3. If we had decided to take a shorter control period, the average chi^2 value would have been smaller and therefore the t-test would not have reached significance.

It seems impossible to correct for all these possibilities by BonFerroni adjustments, especially if the data have been inspected graphically before starting the formal analysis. Humans are able to detect subtle patterns and use them without being explicitly aware that these patterns may influence their decisions. Therefore, all results at this stage of the development of this paradigm should be seen as purely exploratory.

More random than random?

In the Poltergeist RNG data, an unexpected correlation was found between the reported external disturbances and the 'coherence' of the RNG. Unexpected because, rather than an increase in coherence of the RNG as we hypothesised, we found a decrease. If we assume that we have a real effect one might speculate why the apparent Poltergeist phenomena that were observed by the family members did not affect the RNG in the way that seems most logical namely by increasing the non randomness (coherence) of the RNG. The implicit model at the basis of this logic is that the movements of the Poltergeist objects is caused by some form energy that could also effect the RNG and result in some RNG bias.

However, given the present result, a very tentative speculation might be that the movements occurring in Poltergeist cases are caused by local decrease of entropy, e.g. the air molecules around the objects are moving in a coherent rather than a random way, where the decrease in entropy around the Poltergeist objects is *compensated* by an increase of entropy in the RNG, although the latter does not make much sense because it would indicate a too well random behavior of the RNG.

However if we assume that we are just dealing with a chance finding and that there are no correlations whatsoever, then it appears that the Poltergeist phenomena may be different from the events reported in the papers by Radin (Radin, 1995) and by Nelson (Nelson, 1995). Of course, we *assumed* that the reported external phenomena were of a genuine nature. It could be that this is not the case.

It should also be remarked that the state of consciousness of the people

involved may be different from the states described in other field-RNG research. In most other research the events are not precisely located in space time like the purported Poltergeist events. Rather, there is a sustained state of shared attention and shared (generally positive) emotions. This difference may also 'explain' why the peak emotional event of the scoring of the goal was not reflected in the RNG data, while the sustained tension of the match did seem to have an effect.

In the Poltergeist case, there may have been sustained but negative emotions. For instance, the two policeman who were present for several hours during the events experienced sustained fear and a kind of defensive attention. Also the number of the people involved during the events generally was around three. This is another difference between the Poltergeist case and the events described elsewhere and in the soccer game described in this paper.

Collective field or individual PK

Although there was a significant effect of 'coherence' in the RNG during the soccer game the effect size is impressively small. It is much smaller than found in laboratory RNG research, most notably in RNG research on pre-recorded random bit data (Schmidt & Stapp, 1994). The effect size in the present field RNG study for a single random bit sample is about 0.0004. For Radin (Radin, 1995) the effect sizes the were around 0.002. For Nelson the effect sizes are a bit more difficult to estimate because the number of bits that were taken into account for a given effect is not explicitly given. However they too hover around the figure of 0.002.

The proposition that some form of a collective field consciousness is responsible for these effects seems a bit premature, given the extreme weakness of the effects. Rather one would expect stronger effects of collective fields than those found with individual subjects.

The alternative explanation for the data is that we have an experimenter induced PK effect on pre-recorded random data, just like the effects found by Schmidt et al. Indeed the effect sizes found by the respective experimenters of the field RNG studies, Radin, Nelson and Bierman seem to reflect for the effect sizes they previously found in laboratory RNG experiments.

The interpretation of the current data as an experimenter effect removes a troublesome conceptual problem that arises with an interpretation in terms

of collective fields, namely the selectivity of the effect. Especially in Nelson's experiments the RNG was situated close to the place where the collective experience was supposed to happen. Much in the same way as we brought in the RNG in the home where the Poltergeist events were reported. But why would there be a correlation between the behavior of the RNG and some collective field next-door and not with the collective field two blocks away?
If it is the experimenter, his expectations and his hopes, play the key role then this selectivity problem is removed. On the other hand, if the experimenter plays a key role we have to ask why in the present study for the same experimenter there was a predicted effect in the soccer game data but a completely unexpected effect in the Poltergeist data.

Theoretical relevance?
Although the preliminary conclusion that we may deal here with the same phenomenon as found in the laboratory may be disappointing for those who feel that the concept of a collective field consciousness is a promising one this does not imply that field-RNG work does not have an added value over the lab work. This is because the field RNG work may shed light on the theoretical discussion if psychokinetic phenomena may be reducible to 'just' precognition as is put forward by May et al (May, 1995).
According to this Decision Augmentation theory (DAT) the experimenter selects the time frame during which the RNG will display the 'coherent' behavior out of many possible time frames. In other words, the experimenter just foresees the proper moment to start the experiment.
For instance in the soccer game the reasoning would be that I could have selected out of about some 20 possible soccer games and just picked the one by using my precognitive abilities that would display the increase in RNG coherence . Thus there was no 'influence' on nature, not by me and certainly not by a collective field of Consciousness according to this DAT. It should be stressed that this position in not refutable because in any experiment there are decisions made which imply some selection. However in order to select out of 20 games I would have had to wait another 20 years since the soccer final is only once a year. Also it was merely luck that this event coincided with the Poltergeist in Druten. In fact this is the whole point, in order to show the implausibility of DAT one has decrease the number of decisions one can make that bear a consequence on the selection of the time frame. For instance by leaving this decision to 'field' circumstances. This does not falsify the DAT, but if next year the same increase in RNG coherence is found during that soccer final DAT becomes less and less a viable

explanation.

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