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Prediction of historical and contemporary luminosity (UFO) reports by seismic variables within Western Europe

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Summary. Changes in tectonic strain within the earth's crust have been hypothesized to be the primary energetic source for most documented UFO (unidentified flying object) reports. Discriminant and multiple regression analyses indicated that seismic variables that correctly classified and predicted years that contained reports of spectacular spherical luminous phenomena during the 19th century, also correctly predicted major UFO episodes during the present century. The results indicate that phenomena once labelled as odd luminosities, mysterious airships and phantom airplanes in previous decades are associated with UFOs now.

The report of unusual, spherical lights in the night sky can be found in the mythology and literature of most cultures[2]. In western society, the descriptors of these odd displays have changed from time to time. During the 19th century, they were reported in scientific journals as 'odd luminosities' or 'peculiar meteors'. One typical report refers to an unknown luminous object that was observed for 10 min on 1 August, 1871 over Marseilles. According to the description, a magnificient red object appeared, moved slowly eastward, stopped, moved northward, became stationary, moved eastward again and then disappeared[3].

Recent analyses[4] suggest that events that were labelled as 'luminous displays' in previous centuries are usually called UFOs (unidentified flying objects), or some variant descriptor, now. This conclusion was based upon the accurate classification of contemporary UFO report years on the bases of discriminant functions generated from 19th century data. Variables selected for the functions were determined by the hypothesis that *most* UFO-like reports have been and still are associated with tectonic strain within the earth's crust[5]. Local, temporal patterns in the numbers of different intensity earthquakes[6,7,8] and the relative changes in these numbers from the previous year have been employed as inferences of tectonic strain[9].

If the hypothesis is correct, then a temporal relationship between luminous phenomena (LP) and earthquake patterns should be evident even by crude visual inspection. Figure 1 shows the total numbers of intensity IV, V plus VI, and VII or greater seismic events each year according to the Mayer-Rosa file for the period 1831 to 1980[10] within western Europe. Years in which a major LP occurred within this region between the years 1831 and 1920, the major data collection period of Charles Fort, are also indicated. Spherical Luminous Phenomena (SLP), such as the event reported over Marseilles, were differentiated from LP in general. Non-SLP involved reports such as the repeated displays of odd light flashes in the sky over several nights.

One visual pattern is also commensurate with statistical analyses. Spectacular LP tended to occur around the same year or clusters of years as increased numbers of VII or greater intensity quakes and/or the *relative* increase in the numbers of IV or V + VI quakes compared to the previous years. If this pattern were extrapolated to the years after Fort's collection, then there should have been a conspicuous increase in LP between 1945 and 1947; the numbers of VII or greater quakes that occurred during 1946 were actually *greater* than those years associated with the most spectacular LP of the 19th century. Similarly, the largest relative increase of $\leq$ VI quakes in 20 years occurred between 1947 and 1949 and an unprecedented increase in the numbers of these events occurred during the early 1950s. These dates marked the beginning of the modern UFO era.

One measure of the strength of any hypothesis is its capacity to accurately *predict* a phenomenon. If earthquakes (and implicitly tectonic strain) were involved with the occurrence of SLP, then a fundamental question follows: Can seismic patterns be used to predict SLP and their presumed contemporary equivalents: UFO reports? To answer this question, years that contained reports of LP between 1870 and 1910 within France, Belgium, Italy, Germany, Austria, and Switzerland were selected from the main data file[2] and verified with the original source[3]. Ten of those years contained SLP (reports that were obviously coincident with a seismic event were *not* included). Since they may have been subsets of a more general class of luminous events, the total numbers of years involving luminous phenomena (TLP) were also determined; they involved 16 of the 40 years. As a comparison of the contribution of earthquake patterns to luminous peculiarities that are now suspected to be involved with meteorological conditions, 10 years with the greatest numbers of documented ball lightning (BL) reports[11] were also determined. Historical LP were selected since they were not contaminated by contemporary labels and presumptions about UFOs and were less influenced by collection artifacts. SLP from the turn of the century tended to be spectacular events that were viewed by hundreds of witnesses and reported in scientific journals. In addition, the accurate prediction of contemporary UFO years by equations determined from the relationship between SLP and earthquakes that occurred decades before the term UFO appeared would support the persistent nature of these seismic-related phenomena. To avoid assumptions about ranking years with different numbers of LP reports, all years were allocated with a 1 (even if there had been more than 1 report) or a 0 (no reports) for each of the 3 measures: SLP, TLP, and BL.

The period 1870–1910 represented the most homogeneous portion of Charles Fort's collections. Before and after this interval, there was a clear change in the slope of the cumulative number of both LP and other unusual reports. In addition, bivariate correlations between $\leq$ V intensity quakes and years (sequence number) were > 0.50 if years before 1870, e.g., 1850 to 1905 were used for analyses, suggesting some artifact of changing instrumentation or surveillance. The sequence (serial) correlation for the 1870 to 1910 interval was not significant statistically ($r = 0.20$).

The numbers of V, VI, and VII or greater intensity earthquakes per year were sorted from the Mayer-Rosa file for the years 1820 to 1980[10]. Because of the excessive skewness values (> 1.00) encountered for the numbers of some quakes, square root values were computed for each intensity type. Percentage change in both the square roots of the numbers and the total numbers of each quake intensity with respect to the previous year were computed and truncated at 200%. In addition, the simple ratio of the change in earthquake numbers from the previous year was calculated for each of the 3 types of quake intensities. Measures of relative changes in earthquake numbers from the previous year have been considered to be one indicator of regional tectonic strain. They are also less influenced than absolute numbers of quakes by changing instrumentation and data coverage over decades[9]. All variables were lagged from 1 to 6 years and only these data were used in the subsequent analyses. They were performed using SPSS software on a DEC2020 system computer.

Multivariate analyses indicted that SLP occurred primarily during years that were preceded 3 years before by VII intensity quakes and 2 years before by increased numbers of V intensity quakes within the region during the period 1870 to 1910. The optimal combination of quake measures explained between 45% to 60% of the variance and allowed between 85% to 95% correct classification (discriminant analyses) of SLP years and non-SLP years. The stepwise addition of 7 rather than 5 variables into the equations or functions enhanced the explanation by another 10%. A similar pattern was

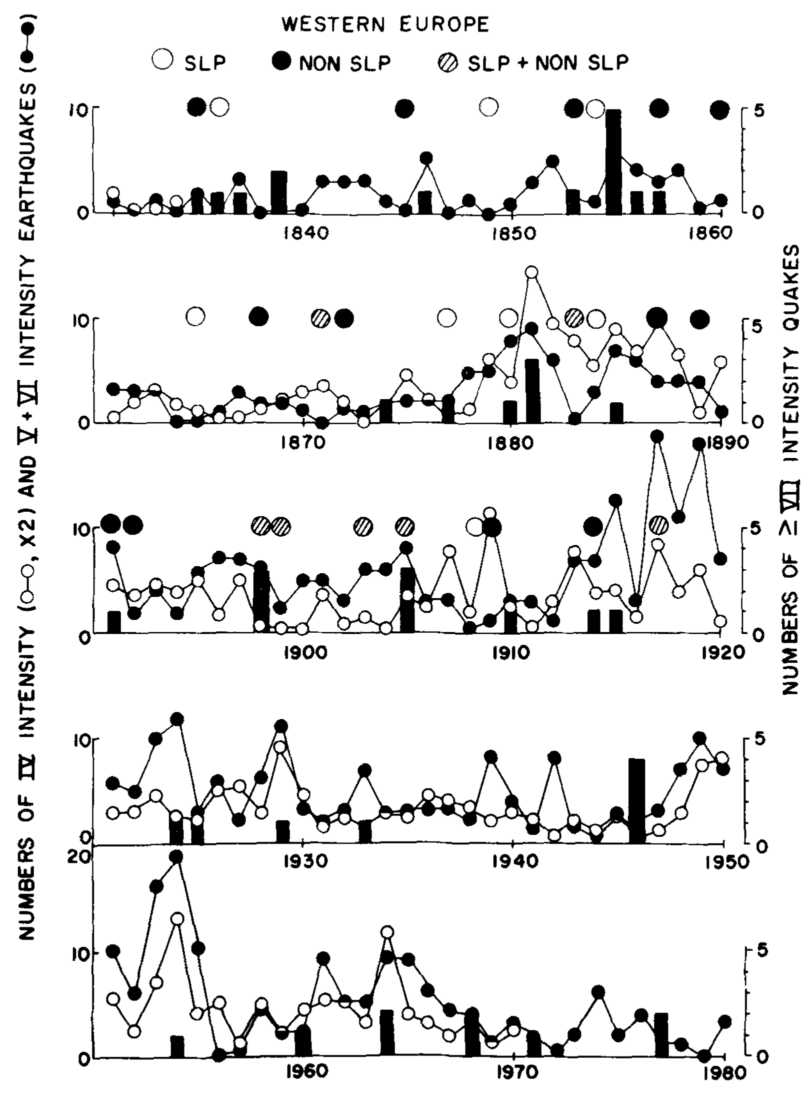

Figure 1. Numbers of IV intensity, V plus VI intensity and $\geq$ VII intensity (Mayer-Rosa data base) earthqakes per year within Western Europe between 1831 and 1980. Open circles indicate years in which spectacular spherical luminous phenomena (SLP) occurred, closed circles indicate years of luminous phenomena that were not SLP and hatched circles indicate years containing both SLP and non-SLP reports. The sample of LP ended in 1920.

noted for TLP except they were also discriminated by seismic variables that measured relative changes in numbers of earthquakes from the previous year. TLP tended to occur if there had been a decrease in VI intensity quakes the year before. These variables accommodated about 40–50% of the variance in TLP and allowed between 80–90% correct classification of TLP vs non-TLP years. On the other hand, no combination of seismic variables explained more than 20% of the variance for the years containing enhanced numbers of what is now considered 'ball lightning'.

Predicted scores for the likelihood of spectacular SLP and TLP years according to the equations specified in the table[12] are shown in figure 2. Multiple regression results are presented since the partial regression coefficients (B) and standard estimates of error (SEE) can be readily applied. (The correlations between discriminative and multiple regression values were > 0.99.) Both equations were statistically significant ($p < 0.001$) and did not display evidence of autocorrelation or multicollinearity (between variables within an equation). As can be seen in figure 2, there is a clear correspondence between predicted LP years and observed LP years. Analyses using only the 30-years period between 1870 and 1900 resulted in almost identical composition of variables and predictions, particularly for the years 1900 to 1920. However although the F ratios were more highly significant for each equation the Durbin-Watson tests for autocorrelation were outside of the accepted range of 2.00 ± 0.20.

There is also a clear correspondence (fig. 2) between predicted LP years and observed LP years even for intervals outside of the period from which the equations (and discriminant functions) were generated. If the criterion of one standard error of the estimate above the mean (scores > 0.56) is used for the indication of a spectacular SLP year, then such events should have occurred during 1915, 1917, 1919–1920, 1865, 1860, 1858, and 1854. Observed years occurred within the same year or within 1 year of the predicted values. The trend is even evident for years before 1850 when reports and documentation were much less frequent.

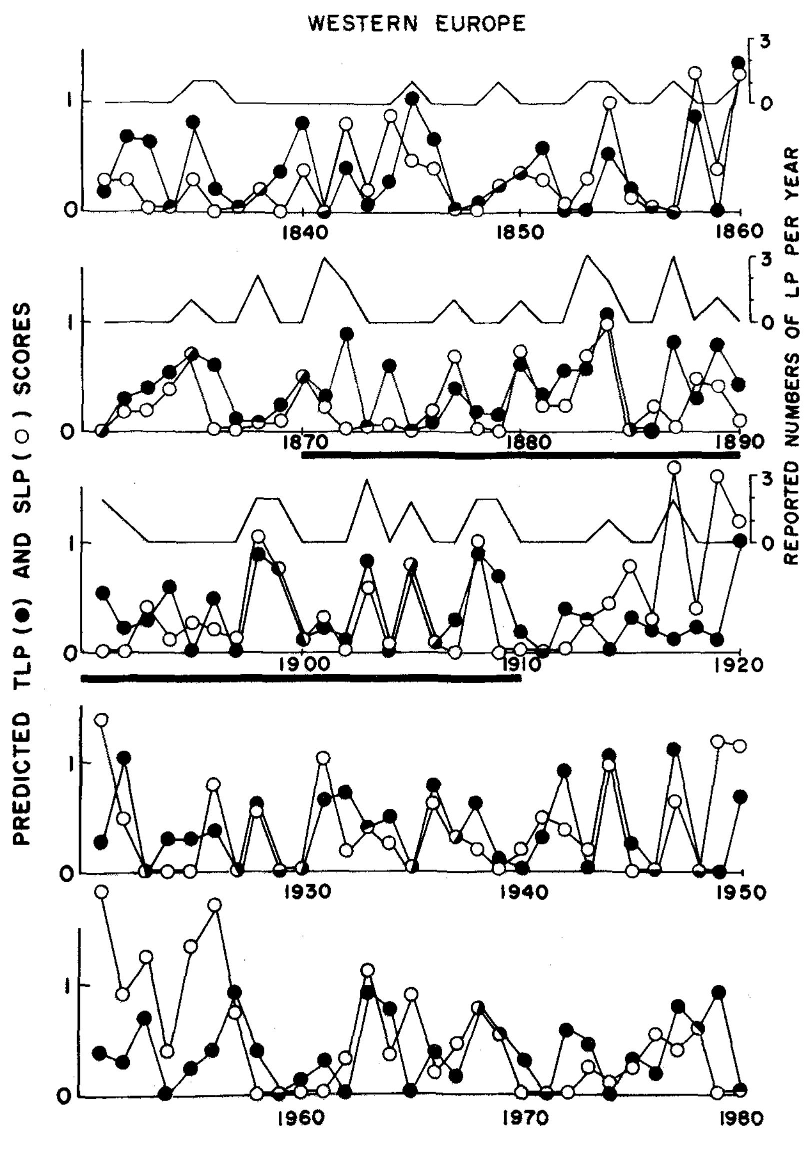

Figure 2. Predicted values for the likelihood of either spectacular luminous phenomena in general (TLPs) or SLP (spherical luminous phenomena) to have occurred each year for the period between 1831 and 1980 according to the equations in Table 1. Observed TLP are indicated as well as the total TLP per year according to the major data source for the years before 1921. The dark bar indicates the years from which the equations were generated.

If the criterion and the equations are applied to earthquake data patterns after the year 1920 (the end of Fort's major period), then 1921, 1926, 1931, 1936, and 1944 should have been SLP years. Whereas 1944 was associated with the famous 'foo-fighter' episodes, there were no obvious SLP references for the other years. Interestingly, Keel[13] indicates that 'clusters' of odd airplane and mysterious airship reports did occur during some of these years. The equations indicate that there should have been SLP during 1947, the year 'ghost rockets' were reported in the Alps. These predictions do not indicate there were no reports during other years; rather the predicted years should have been exceptional. Obviously, since a discrepancy of ±1 year between observed and predicted SLP years was evident within the time frame from which the equations were generated, variations of at least this range should occur occasionally within the contemporary predictions as well. For example, the SLP associated with the 1947 prediction probably began in the second half of 1946[13].

Even though this equation was derived from the relationship between SLP and earthquakes during the turn of the century, it predicts that an unprecedented series of SLP *should* have begun around 1949 and *should* have continued, almost without interruption on a yearly basis until 1957. This interval has been considered 'the classic period' of the modern UFO era and reaffirms a long-term relationship between SLP and earthquake activity within the region. Consequent SLP years should have included 1963, 1965, 1968, and perhaps 1977–1978. Bivariate correlations between predicted values and yearly UFO report measures from files that attenuated sampling artifacts[14] for this region between 1947 and 1979 demonstrated statistically significant coefficients that ranged from +0.60 to +0.70.

The expected SLP years were not artifacts of the seismic data selection. Neither the total numbers of various intensity earthquakes nor their square root transformation substantially changed the composition of the seismic variables that entered the equations (or functions). There was also little discrepancy between the use of the percentage change in the numbers of various intensity

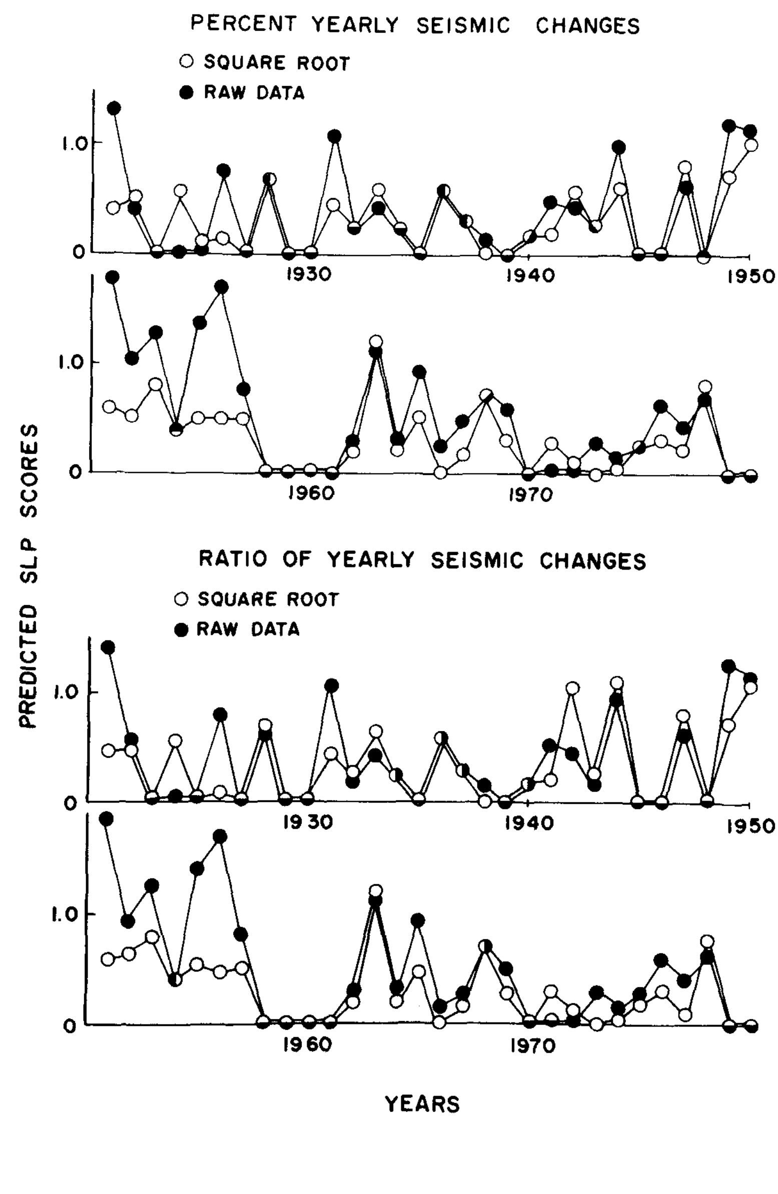

Figure 3. Comparisons of the predicted values for years in which SLP should have occurred between 1920 and 1980 according to a family of equations (generated for the years 1870 to 1910) that involved either the total numbers of various intensity quakes or their square root transformations and the percentage change in weak quakes (< VI) from the previous year or the actual ratio of the change in numbers of quakes from the previous year.

quakes with respect to the previous year and the simple absolute ratio of the change in numbers of earthquakes. As can be seen in Figure 3, there was a close correspondence between all of the predictions with the exception of the period between 1950 and 1957. However even the more conservative square root transformations predicted a persistent and unusual elevation of SLP during that period.

Figure 2 indictes that TLP closely followed the SLP pattern. This is interesting, since the equation from which these values were predicted was dominated by *change* in seismic activity. These measures have been used for inferences of alterations in tectonic strain within a region. Years in which there were clear discrepancies between SLP and TLP suggest the occurrence of other non-SLP. Whereas the years 1921, 1949, 1951, 1955, and 1956 should have been dominated by SLP, the years 1932, 1942, 1947, 1972, and 1979 should have contained more non-SLP. Yearly variations in the 'composition' of LP were evident in Fort's collection period and are well documented within contemporary UFO patterns[13,15]. Such alterations may not only reflect changing labels or interpretations but also other forms of LP.

Perhaps a greater correspondence between the years of SLP and optimal seismic measures between 1870 and 1910 for Western Europe would be evident if a larger data base, obtained by exhaustive analyses of the early scientific literature, was completed. Ranking of active SLP years rather than simple nominal (0,1) designations would allow the researcher access to the variability in range required for greater accuracy of prediction. However it is possible that no further explanation of variance can be obtained unless the total seismic patterns are included; they would include years during and after SLP. Temporal patterns of earthquake intensities may not reveal the changes in the rate of strain accumulation or the well-known waxing and waning of strain below fracture levels. These factors may be particularly important if predictions of SLP within increments of less than 1 year are attempted. For smaller increments of analysis, the use of fixed interval analyses (such as the procedure used in this study) may not be optimal if the latency between SLP and earthquake patterns oscillated around some mean value.

The present study indicates that UFO-like luminosities (SLP) are persistent phenomena but their occurrence may have been masked by different labels and descriptors. The relationship between seismic activity and luminous phenomena is consistent with the hypothesis that a significant portion of UFO-like reports may be measures of actual environmental events associated with solar-geophysical processes. Predicted values from the SLP equation correlated 0.91 with the values from an equation (not reported) that included seismic data from the same year as the SLP. This suggests that a substantial amount of the variance in earthquake patterns associated with SLP can be derived from antecedent seismic profiles.

From a theoretical perspective, the prediction of SLP by antecedent seismic variables in this study and the more persistent tendency for SLP and UFO reports to precede major releases of seismic energy in other studies appear to be contradictory. However even in some of these studies, a significant portion of the variance in UFO reports and SLP occurs after unusually large seismic events for that region[16]. This discrepancy could be accommodated if one assumes that an optimal *tectonic strain factor* is involved with the production of SLP. It may occur before the release of a large fracture or during the period of adjustment that follows. If the present hypothesis is correct, the relationship between UFO reports that are similar to SLP and regional tectonic strain will be conspicuous once a direct measure of this condition is developed.

SLP Seismic measure	B (SEB)	TLP Seismic measure	B (SEB)
≥ VII3	+ 0.17 (0.06)	%CHVI6	− 0.003 (0.0009)
V2	+ 0.12 (0.03)	%CHV1	− 0.004 (0.0009)
V6	− 0.09 (0.02)	%CHVI4	− 0.003 (0.001)
%CHVI6	− 0.002 (0.0008)	%CHV5	+ 0.002 (0.0009)
≥ VII2	− 0.18 (0.07)	≥ VII2	− 0.19 (0.07)
≥ VII5	+ 0.21 (0.08)	%CHVI3	+ 0.003 (0.001)
VI5	− 0.12 (0.05)	VI4	+ 0.16 (0.08)
Constant = 0.24		Constant = 0.33	
MR	0.77		0.73
ARS	0.50		0.44
SEE	0.31		0.36
X	0.25		0.38
D-W	2.01		2.16
F (df)	6.45 (7,32)		5.37 (7,32)
MIC	0.20		0.30

Equations for the prediction of SLP (spherical luminous phenomena) and TLP (total luminous phenomena) from lagged only seismic data. The variables are specified according to intensity (Roman numerals) or the percentage change in number of different intensity quakes from the previous year (%CH); the last (Arabic) number indicates the lag value for the variable. Various symbols indicate: B, partial regression coefficient; SEB, standard error of B; MR, multiple R value; ARS, adjusted r^2 value; M, mean of the number of LP years; SEE, standard error of the estimate for the equation; MIC, maximum intercorrelation between variables in an equation; D-W, Durbin-Watson test; F, F-value and df, degrees of freedom.

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The effect of nifedipine and verapamil on KCl-induced rhythmic contractions of guinea pig ureter in vitro

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Summary. Addition of KCl (40 mM) produced rhythmic contractions of guinea-pig ureters in vitro which were unaffected by phentolamine, atropine or tetrodotoxin.
KCl failed to elicit rhythmic contractions of ureters incubated in a Krebs solution with no added Ca^{++}; in these conditions the addition of $CaCl_2$ in concentrations of 1.5 mM, or higher, produced rhythmic contractions whose frequency, but not amplitude, was proportional to $CaCl_2$ concentration in the bathing medium.
EDTA reduced the frequency of KCl-induced rhythmic contractions without affecting their amplitude. Nifedipine and verapamil reduced both the frequency and the amplitude of KCl-induced rhythmic contraction; verapamil was more effective than nifedipine in reducing their amplitude.
Urethane reduced the amplitude without significantly affecting the frequency of KCl-induced rhythmic contractions. An increase in the extracellular Ca^{++} concentration reverted the suppressive effect of all drugs under study. These results suggest that an influx of Ca^{++} from the extracellular space is responsible for the initiation of KCl-induced rhythmic contractions and is involved in the mechanism(s) which regulates their frequency, but that a separate mechanism regulates their amplitude.

Introduction

In the past few years evidence has been provided indicating that the 2 major Ca^{++} entry blockers, nifedipine and verapimil[9,10] exert their effects through different modes of action at cardiac[8,23] and smooth muscle levels[11,13,24,37].
We reported recently that both nifedipine and verapamil reduce the frequency of spontaneous contractions of rat urinary bladder in vivo and that, unlike verapamil, nifedipine only slightly reduced their amplitude[30]. Further studies indicated that spontaneous contractions observed in these experimental conditions are likely to be attributable to a micturition reflex[32,33]. Therefore it appeared worthwhile to determine whether or not differences existed in the smooth muscle relaxant properties of nifedipine and verapamil on isolated smooth muscle from the urinary tract. In this study we report the effects of nifedipine and verapamil on the frequency and amplitude of KCl-induced contractions of guinea pig ureter, a preparation known to exhibit a rhythmic contractile activity[14] when exposed to appropriate K^+ concentrations.
In addition similar experiments were carried out using urethane, a general anesthetic which has been proposed to affect smooth muscle contractility by a mechanism(s) similar to that of organic Ca^{++} blockers[3,30,31,34].

Methods

Male albino guinea pigs, weighing 240–300 g were killed by a blow on the back of the head and exsanguinated. A 2 cm long segment of the right ureter, excluding the region directly connected to the pelvis[14] was removed, desheathed and suspended, under a resting tension of 0.5 g, in a 5 ml organ bath (heated at 37°C) containing Krebs solution of the following composition (mM): NaCl 119, KCl 4.7, $MgSO_4$ 1.5, KH_2PO_4 1.2, $CaCl_2$, $NaHCO_3$ 25 and glucose 11, which was bubbled with a