Mass emotions apparently affect nominally random quantum processes: interplanetary magnetic field polarity found critical, but how is causal path?

Hans W. Wendt

(Alexander von Humboldt Geomedicine, Macalester College & Halberg Chronobiology Center, University of Minnesota).

Chronobiology Technical Report, 12/15/2002, revised 5/15/2008. 2 Figures.

Abstract

The published data of the Nelson-Princeton Global Consciousness Project (GCP) from mid-1998 to early 2008 were analyzed for the role of near-Earth magnetic field polarity. The GCP system tracks the output of internationally placed electronic random number generators (RNG), as populations experience unexpected catastrophes and dangers (e.g. bombardments, earthquakes), or participate in planned, life-affirming or closure oriented actions (celebrations, meditation, other). In several GCP studies, collective events as noted were associated with RNG deviations from random output. It is argued that such results may depend on positive interplanetary magnetic field (IMF) polarity that coincides with emotionally significant conditions and/or entropy changes. In the present exploration, satellite based IMF polarity was matched with GCP defined world events. Relationships were found among the triad of RNG deviations, events and the number of times during the preceding solar rotation that Earth was located in runs of positive IMF sectors. Especially large effects occurred in the context of violence and sudden death. The outcome was replicated in principle across world regions, for different types of violence and several other classifications. Results for major disasters like earthquakes and significant accidents appeared broadly compatible but less significant and subject to alternative explanations. Systematic relationships were also found with life-affirming and planned settings, but were likewise less prominent. – In an examination of the daily interaction triads from six days before through six days after the violence events, the largest interactions of polarity with RNG deviations anticipated the dates of record by one to two days. By contrast, for planned, life-affirming or other newsworthy mass settings, peak relationships were not seen until about two days after events. Similarly distorted time disconnects were seen in breakdowns e.g. by season and in the rising and declining phases of Solar Cycle 23. Depending on additional assumptions, the paradoxical findings can be interpreted in different ways which In theory include retrocausal influence. The contradictions are not resolved with the data at hand.

Background

In the 1980s Nelson et al. initiated the Global Consciousness Project (GCP)

(Nelson et al.,1995, 2002 http://noosphere.princeton.edu). The Princeton based extensive effort tracks changes in quantum indeterminate processes in random number generators (RNG) as groups of people experience significant emotional situations. While the approach and execution are unique they also reflect earlier "mind-machine" studies with electronic devices by Beloff and Evans (1961) and Schmidt (1969).

The RNG software of the Global Consciousness Project, collapses the binary output into one-second packets of 200 bits which are continuously transmitted to a server at Princeton for processing and archiving. The environments and events of the participants have ranged from bombings and nature catastrophes to sports attendances, prayer meetings, celebrations and meditation. Data collection involved up to 70 RNGs placed with local hosts in over 50 countries and covering nearly all of Solar Cycle 23. All procedural specifics were posted, and machine activity could be accessed at the host sites and downstream. To date the collaboration have recorded over 200 events. Deviations from RNG randomness accompanied many events as expected, and their predicted direction was later confirmed for 63% ($p<0.00001$). At the same time, the Project reported null results along with several significantly counter to predictions. Attempts at replication elsewhere likewise led to some contradictory results or encountered anomalies other than those expected (Jahn et al., 2000). Benefiting from discussions with and material made available by M. and L. Mansurov(a) of the Moscow Ionosphere Institute, I hypothesized that certain near-Earth conditions could contribute to the overall phenomenon as well as account for the apparent discrepancies. This report specifically addresses the polarity of the interplanetary magnetic field (IMF) which is carried into space by the solar wind.

History and framework

Ideas anticipating contemporary understandings of the solar wind and indirectly the IMF have been attributed to observations of comets by ancient Chinese

astronomers, Johannes Kepler, Heinrich Olber and others. Ludwig Biermann (1951) is generally credited with contemporary systematic studies. They were followed by Parker (1958), Svalgaard and Wilcox (1975) and into the present (Bodewind et al., 2008). The magnetic field in question is of the order of several nanotesla (nT) near Earth and originates in the sun's lower corona at 2-3 solar radii. Its polarity depends on whether the outflow from the sun is above or below the current sheet separating the North and South magnetic regions. Because of certain asymmetries and/or warping of the sheet the polarities alternate in a broadly regular fashion, although less predictably at time scales below the ~27-day solar rotation. Sectors of varying widths are thus created and conventionally designated "towards the sun" or negative, and "away from the sun" or positive, respectively. Due to the sun's rotation they form Archimedean spirals as they sweep past the planets. From two to ~10 sectors per rotation (two to seven in the present material) have been identified, depending somewhat on solar cycle phase but mostly the criteria used. Classifications based on ground observatories, replicated by some of us, match satellite based ones to 80-85%.

Other polarities of potential interest involve the vertical (Z) dimension. Especially its South direction plays a frequently destabilizing role in biomedicine and psychophysiology. Its interaction with the X-Y dimension is not taken into account here, nor is the role of magnetohydrodynamic engines like Alfven waves. On the other hand, there are suggestions in the GCP data that either complex might independently contribute to the Princeton results.

IMF Polarity as a factor in medicine and behavior

Research on IMF polarity is generally concerned with plasma physics and solar-terrestrial relationships (cf. Crooker and Siscoe, 1986). On occasion the interest extends to other fields. Especially in such outreach, however, it is unclear whether any findings are due to the IMF status as such, to some proxy, or to a multicollinearity of variables. The few precedents of record do not clearly favor one particular model. On the other hand, the examples, prominently Russian, are informative in their own right. Thus Nikolaev et al. (1976; and extended by Wendt, 1979) reported more excitement in 75 psychiatric patients during IMF sector crossings. – Krokowski, Wendt, and Hildebrandt (1982) analyzed mastectomy protocols of about 400 patients in 42 German hospitals; tumor recurrences were diagnosed more frequently in post-menopausal patients when IMF polarity changed to negative (sic) prior to operation. By comparison, there

was more premenopausal recidivism when Earth was in a positive sector. -- Kornetov (1989) reported changes in psychotic symptoms, suicidal behavior and aggression coinciding with sector crossings. – Rhyabikh and Mansurova (1994) observed more rapid progression of mouse tumors following IMF transitions to positive. -- Grigoriev and Vladimirsky (2007) explored the Global Terrorism Knowledge Base (MIPT, 2005) of over 23,000 world-wide incidents between 1968 and 2005. Besides seasonal and geomagnetic influences traditionally investigated (Murphy and Persinger, undated) the authors counted more acts of violence upon Earth's entry into positive or "away" IMF sectors. Effect size and polarity criteria are not specified in the available material. – Sector passages have been found geoeffective over a range of scales. Accelerated bacterial growth points to microscopic effects (Achkasova et al., 1978). At the other end, major earthquakes tended to occur just before and after polarity change (Shatashvili et al., 2000); those authors actually considered transitions "the most powerful stimulating factor" in the release cascade. Other IMF polarity related conditions situations potentially impacting pathology include geomagnetic Pc 1 pulsations of 0.2–5.0 Hz and ~0.01-0.05 nT. They frequently increase during sector passages, and it has been speculated that their overlap with human heart rate might contribute to some arrythmias. Still uncertain as well is the role of Pc in stroke and infarction (Feinleib et al., 1975). The dearth of findings may relate to the fact that IMF polarity is rarely if ever considered in biomedical research.

Unlike experiments where participants attempted to consciously influence the machines, the populations in the GCP were unaware of RNGs, thus comparable to those in the examples cited.

There is evidence of "Entanglement" between physical entities at a distance (Zeilinger, 2005), whether or not the underlying mechanisms are superluminal, Bohmian or otherwise. Non-local effects may also apply to brain function and sensations (Hu and Wu, 2006). Radin (2006) and others therefore propose to include mental states in the paradigm. Another significant component is

suggested here to account for the Nelson et al. findings.

Conjecture

The phenomena are influenced by third variables as moderators or catalysts which possibly interact with entropy changes in the overall setting. The IMF sector rotation is a possible candidate. It exposes Earth to alternating polarities whose rate of change varies with characteristics of the solar wind. A suitable measure is the number of times per 27-day (Bartels) rotation that Earth is exposed to runs of positive polarity (outside variables sometimes clarify higher order relationships, cf. Wendt and Birdsey, 1989).

The entropy term is today used with a variety of meanings from physics to engineering to poetry (Lambert, 2007; Roederer, 2003). While merely shorthand in this account and undefined, the real issue is how the analyses mentioned in the above examples and the findings of the present study relate to the Second Law of Thermodynamics (Moddel, 2004). The question will be directly relevant further on .

Data Sources: Events

These are defined as posted by the GCP collaboration. A significant instance is identified through news sources, consensus of judges, and sometimes outsiders' input. Certain entries were eliminated on formal grounds (the Project's or mine). In particular they included event durations less than 30 min. which routinely occurred with the planned, Life etc. entries but never with Violence (23); events exceeding 24 hours or concatenated entries (14); periodic events like holidays (8); derived quantities such as ratios or variances (8); contradictory time reports, and some others. Since adjustments were made before analysis there is reasonable assurance that results are not biased by knowledge of outcomes and a "file drawer" effect. Moreover, the situation specific mental states like fear,

excitement, etc. of relevant populations are based on hundreds up to thousands of individuals, many at great distances from any RNG. Adding to their unpredictable nature, from 1998 to 2007 noteworthy events have ranged from three on one day to one in 86 days, averaging about one in 13 days. After completion of the present analysis, data on eight additional events were made available. Those had been classified as exploratory and were not part of the original list because of ambiguous predictions or other formal reasons. When compared with the posted ones the differences were within expected variability. Their inclusion would not have influenced the outcomes of interest but of course this was not pursued.

Data Sources: Interplanetary Magnetic Field Polarity. This was based on the respective geocentric coordinates sent by the Advanced Composition Explorer (ACE), http://omniweb.gsfc.nasa.gov/html/polarity/polarity_tab.html. The satellite orbits the Earth-Sun axis at the L1 Lagrange Point of Sun-Earth balance, a distance about four times that to the moon or ~1 % to the sun. With average solar wind speeds, data are available at Earth about an hour later. Since NASA listings tended to be late and because of systematic errors in reports from another government center the material processed and posted by a Japanese downlink at http://www2.nict.go.jp/y/y223/sept/ace/1day/ was occasionally substituted. As noted the main variable of initial interest was how often Earth (qua satellite) was located in positive or “away” sectors during the pre-event rotation. Since otherwise coherent “runs” are sometimes broken by missing data etc., up to two days of gaps were allowed with totals conservatively adjusted. GCP events have ranged from minutes to weeks. For this study 24-hour averages of the IMF were chosen as compromises. Since only half of Earth directly faces the solar wind at any time, should the analyses be restricted to RNGs in the corresponding (varying) locations? Conceivably the field’s geoeffectiveness of specific interest is similarly constrained since full reconnection of the stream behind Earth does not occur for many Earth diameters. Given the RNG site geography, at UT noon about two

thirds of the units are in a sunward zone, one third shaded. A partial test for different outcomes was inconclusive. The problem is temporarily disregarded, and as in Nelson et al's procedure the data refer to all operative RNGs irrespective of global location,

Results 1: Role of sector polarity during a pre-event 27-day rotation

The GCP researchers generally emphasized peaceful collective events like meditation, prayer and ceremonies. By comparison, violence, fatal accidents and nature disasters are more prominent in the present approach. Figure 1 depicts outcomes for four groups of interest, (a) violence, (b) earthquakes, tsunamis and floods, (c) accidents, and (d) life, mind, closure actions, respectively. *Violence* further comprises the sub-classes of targeted structures or (e.g. religious) groups in the Mideast; the same types of targets beyond the Mideast; suicide bombings or shootings; and attacks against individuals or assassinations. *Nature Disasters* and *Accidents* are as noted or self-explanatory. Finally, *Life, Mind, Closure Action* is a catch-all for activities and events that often were hard to classify or heterogeneous. They include references to meditation, prayer, healing, festivals, sensational happenings, political initiatives and others. Some GCP descriptions also assume familiarity with special sub-cultures and customs (e.g. in American sports or elections); even outside judges sometimes arrived at contradictory decisions.

The X axis in the plots depicts an event's IMF history during the exactly preceding 27 days, as the number (square root) of positive or "away" sector runs. The Y axis is the summed Z score deviation from nominal randomness of all operative RNGs and taken from the GCP lists.

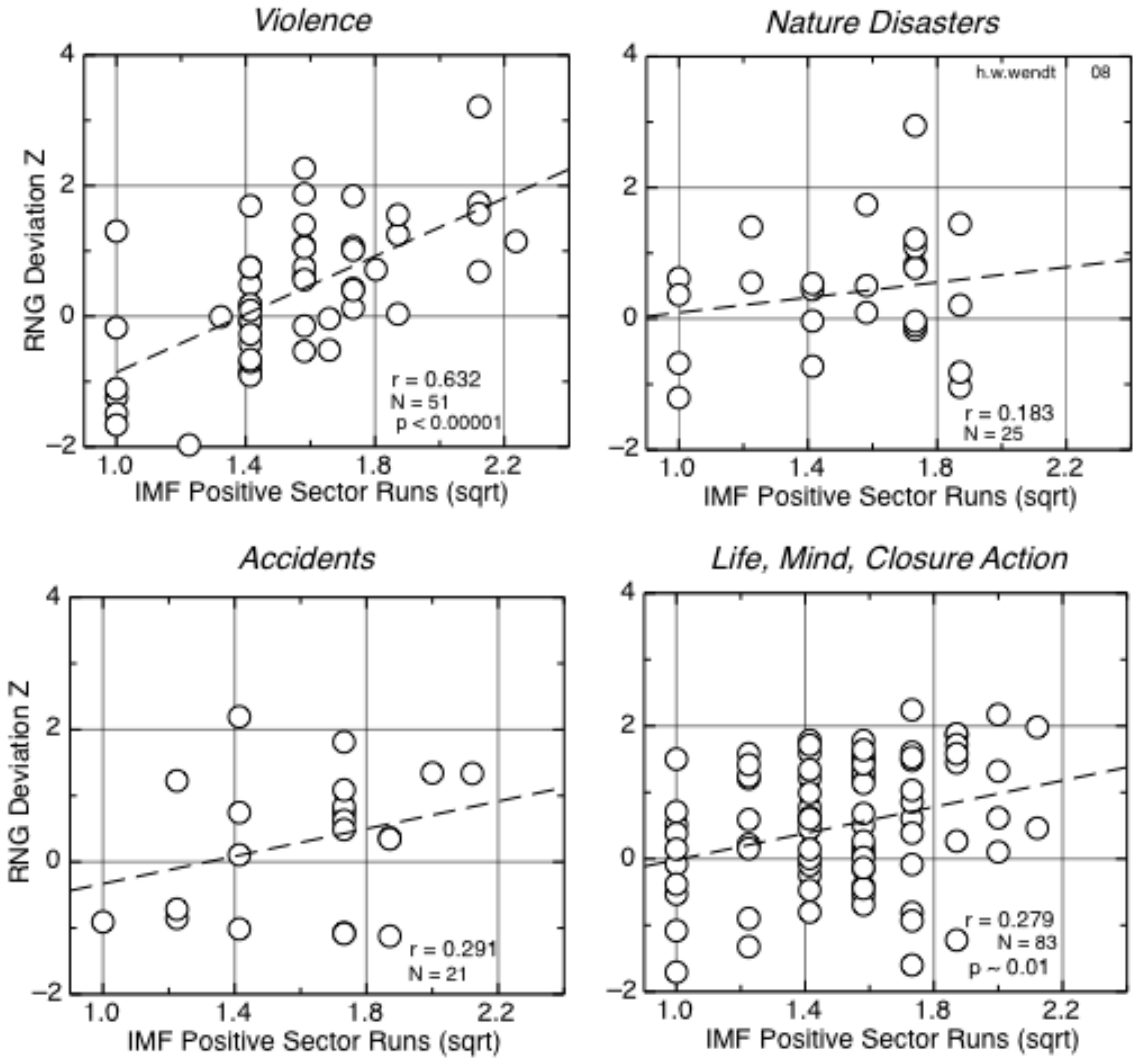

Figure 1. RNG deviation from randomness as a function of Earth's location in positive IMF sectors

RNG deviations from randomness clearly increase with the prior runs "away from Sun" in every category. Thus for the 51 recorded instances of *Violence* the association is ***r*** = 0.632 or 40% of shared variance, ***p*** ~10E-6 by two-tailed test. The sub-classes (not graphed) yield coefficients from ***r*** = 0.24 for targeted Mideast structures or groups, up to ***r*** = 0.91 for attacks against individuals and assassinations. For *Nature Disasters* (N = 25), ***r*** = 0.183; for *Accidents* (N = 21), ***r*** = 0.291. Regarding *Life, Mind, Closure action* (N = 83), ***r*** = 0.279, ***p*** ~ 0.01). Significance estimates for sub-groups of the larger categories would be problematic because of interdependencies.

Potential Artefacts

Experimenter effects are one of the concerns (Bierman and Houtkooper, 1981). In the present case, experimenter identity also codes decision-making level. In this analysis the identity of the experimenter appeared to be unimportant. In settings where the principal investigator decided on the inclusion of events the polarity count of interest correlated ***r*** = 0.63 with the RNG deviation. It was ***r*** = 0.62 where others made the judgment. Additional checks included season, solar cycle phase, local and UT time of event, and several others, yet none of the resulting differences were significant.

Other artifacts might result from influences on RNG activity from outside the GCP focus on mass experiences. To deal with one possibility, the ~3,400 Z deviation averages from Nelson et al's 15-min. and 24-hour listings over ten years were tested for known solar-terrestrial periodicities (G. Cornelissen and C. H. Wendt, 2007). Given the extensive control and calibration efforts by the Princeton investigators the overall spectrum resembled the expected white noise. On the other hand, suggestive peaks appeared at 126, 13.9, 7.3 and 3.8 days. Unless chance fluctuations, the slowest rhythm would be close to the low end of a frequency band sometimes found in hard solar flares (Rieger et al., 1984), the others possibly subharmonics of solar rotation. Interestingly, Shnoll et al. (2004) have long reported "cosmophysical" influences in supposedly random data from radioactive decay and other sources similar to the Princeton devices. They found that histogram shapes of data from various sources of this kind, besides other peculiarities, were dependent on Earth's direction of movement in space. The assumption of anisotropy or of an ether almost implied in such observations does not conform to customary interpretations of the original Michelson-Morley experiments, if not for the first time (DeMeo, 2002). In any case, the Shnoll approach might lead to a framework for the IMF / RNG findings beyond the near-Earth environment.

Note that the coefficients reported above among the four populations (ignoring their fairly small numbers) are noticeably different when the sector measures are limited to the 27-day periods specified. The picture changes when the survey covers time spans before and after events.

Results 2: Significance of sector polarity before and after events

In the Princeton Project the deviation Z scores were sometimes higher hours before as well as after an event (Nelson and Bancel, undated). Reporting problems, relative news interest or other mundane factors may have contributed to delays. The more provocative disconnects involve seemingly anticipatory IMF activity, since their timing should match the events. Several rationales are of theoretical interest here. For one, "reverse causation" may be limited to a few seconds and special conditions (e.g. Wang et al., 2002). For another, a case has been made for retro-effects in certain configurations of causative agents and receivers (Moddel, 2004). Neither option necessarily violates the Second Law of Thermodynamics. On the other hand, actual modifications of the Second Law beyond the quantum domain have engaged theory and experiment (Sheehan et al., 2006). The data base of the GCP permits some limited tests of the reach of such phenomena. For this purpose the material was divided into (a) violent, fatal and sudden; and (b) anticipated, constructive and closure oriented events. As frequently understood, (a) implies increases of entropy while many events in class (b) point to entropy reduction. In addition, the 13-day time span from six before to six days after an event was examined. Daily correlations were calculated between the Project's deviation Z and the IMF+ outcome for the 27 days preceding each event. The procedure yielded sets of correlograms of 13 coefficients ***r*** each. The X axis identifies the days by their distance from the event, and Y is again the correlation as an indicator of effect strength. For the largest of the four categories—Violence, and Life/Mind/Closure, respectively---the data were further divided by season (Fig. 2). The daily ***r*** are shown connected, forming 13-day strings. In place of seasonally averaged day to day

patterns, third order polynomials were added. The procedure reduces clutter and allows for broader comparisons. Disasters and Accidents were pictured in separate panels in Fig. 2.

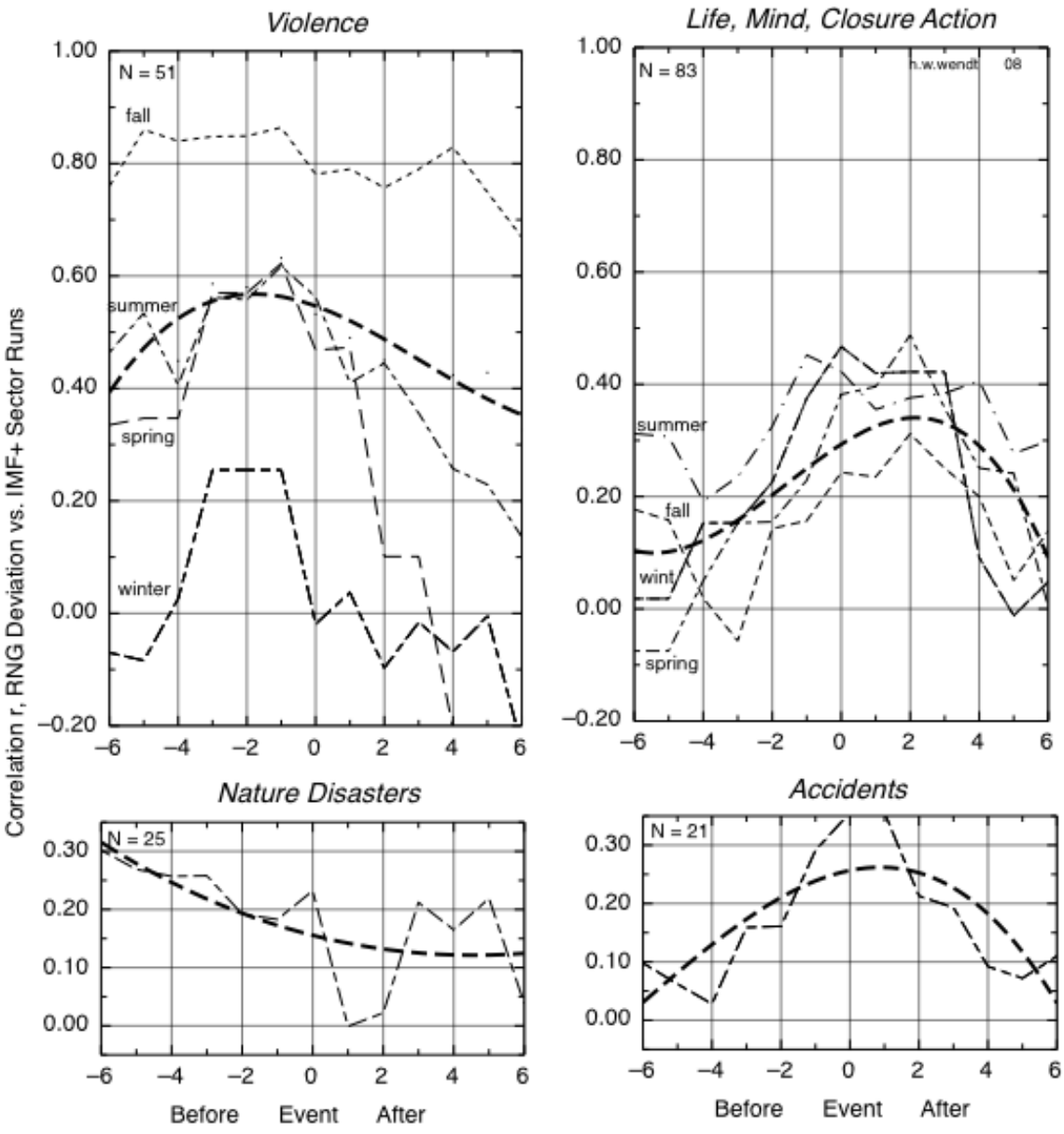

Figure 2. Correlation r, RNG deviation Z vs. IMF positive sector runs as a function of distance to event

Comparing the panels of the two large groups in particular: (1) The violence summary suggests (per its average and for three of four seasons) greater effect

strength as defined than the Life/Mind category. (2) Only the IMF interactions in the violence domain are affected by season. (3) The maximum interactions for violence with IMF polarity occur one to two days ***prior*** to the recorded events. In the opposite display the corresponding maxima ***lag*** their references by two or more days. These differentials are stable in all four seasons as well as across subdivisions defined by world regions. The respective advances (not shown) for violence range from 1.0 days (Africa-Asia) to 2.6 days before events (Americas and Europe).

Since the overall procedure above is based on overlapping 27-day IMF ranges (-2 to -28, -3 to -29 days, etc.) the results are not statistically independent, and a formal treatment of trend differences is not attempted here.

Disasters and accidents were graphed separately because they involve special problems. Earthquakes in particular often have geophysical and other precursors up to weeks ahead of time (Tributsch, 1982), and sometimes this is the case for floods. No comparable antecedents can usually be identified for violence. While the overall 13-day downward trend of the quake related coefficients resembles that of the violence ones, this may be coincidence. The accident classification has its own uncertainties. Their publicity can evoke empathy and concern but also may cause relief that the victims were strangers, or the news may be taken as sensation and entertainment. It is not obvious that the trend of ***r*** can be amalgamated with the one for the larger group shown above it. The tentative interpretations suggested are necessarily qualified by the limited numbers.

Interpretation

On their face the differences of timing (before vs. after events) seem to imply different quantum processes depending on the emotions and situations in which they are embedded. Such a conclusion is highly problematic, given common current understandings of quantum phenomena. More likely the different patterns

reflect incidental and secondary characteristics of the categories or situations. For example, there is the timing i.e. sudden vs. more gradual onset—however, accidents are likewise sudden and thus argue against it (disregarding their small numbers). Then there is death vs. life—again, put in question by the accidents since the GCP catalog lists only with numerous fatalities. Unlikely as well are time or location of the events although not all possibilities could be explored. Then again, news of violence and aggression may be disseminated differently than those about the mass meetings, celebrations, meditations and generally more benign events. Without a metric that can capture the respective differences the possibility is left open.

If the results shown in Figure 2 are taken at face value they are difficult to formalize within the same framework. Regarding the peak effects seen with Violence and time conventionally flowing from past to present, the most obvious conclusion is that past IMF polarity influences present RNG deviations. In the hypothetical alternative, future RNG deviations influence or retroactively cause the present IMF polarity—not probable even when retro effects are accepted. On the other hand, applying the same rationale to the Life / Mind etc. panel, present RNG deviations would influence or cause future IMF status—again highly improbable. Alternatively, a future IMF polarity status retroactively causes the RNG deviations found in the present—possible if retro effects are accepted. Any comprehensive interpretation, however, is incomplete or internally contradictory. For the Violence phenomenology, causality could theoretically manifest as usual. On the other hand, given the Life etc. settings and associated RNG results the time flow may be conventional but the causal direction appears to be from future to present. Assuming Moddel's (2004) reasoning is understood as intended the points made there apply to only half the current derivative GCP analysis. Such a specificity also seems to restrict attempts to operate on parts of the Second Law (Sheehan and Wright, 2006). Moreover, hypotheses can be too complex or speculative (Atmanspacher et al., 2002).

In sum, whether the largest RNG effects occur in the past or the future depends on the setting and (by the reasoning of Nelson et al.) on collective mental states. It is especially remarkable that the timing of the IMF involvement should depend on the setting and/or emotional state of the respective populations. Regarding only the violence domain, however, the apparent anticipation reminds of "presentiment" and related observations by Sheldrake (1995), Bierman and Radin (1997), and Spottiswoode and May (2003), respectively. It is unclear to what extent the Princeton results belong in the same theoretical domain. Among other things, the studies noted and some others found disconnects from seconds to hours: by comparison the current analysis suggests offsets ten to 100 times that long. It may be productive to apply an overall framework of time symmetry as considered by Bierman (2008), or to extend the reach of contemporary physics as by Puthoff et al. (1981). Whether or not parallels to "precognitive" phenomena are justified, some suggestive results have emerged in data made available by Ertel (2005, 2006). The tested individuals had to predict target characteristics prior to blind-reaching for them, and the accuracy tended to be higher when IMF polarity before had been positive.

Outlook

Overall, several manifestations of the connection between RNG activity and. IMF polarity appear replicable in principle, which in uncharted territory is as important as statistical significance (Utts, 1988). Such stability may or may not change the assessment by some for whom "…consciousness remains the last refuge of obscurantists" (Gell-Mann, 2001). Or they may just add to the catalog of "impossible physics" (Kaku, 2008). On the other hand, some of the findings raise questions about the direction of causation, and other questions remain. Thus it is unknown how the phenomena discussed play out in the other half of a 22-year magnetic (Hale) sequence such as Solar Cycle 22 or 24. The mechanisms by which IMF polarity interacts with the biosphere generally, with brain function and what we experience as consciousness in particular, are speculative. On the other

hand, neurophysical and quantum theories (Hameroff et al., 1996; Radin, 2006; Helfrich, 2007) may add options for further interpretation. Biochemical and biomagnetic mediation is inevitably implied (Ulmer, 2002). The nervous system at large may be involved, considering that the magnetic field of nerve impulses of ~0.1 nT approaches Pc 1 levels. Neurotransmitter imbalances initiated by ionization from space have been discussed. Since periodicity is ubiquitous in heliogeophysical phenomena (Halberg et al., 2001) it must be taken into account especially where analysis is done against such a background.

Corollaries of the modified GCP approach above seem worth following up for some phenomena currently lacking explanation, i.e. the well-known attenuation over time or periodic disappearance of telepathic and psychokinetic effects. The alternation of IMF polarities two or three times a month is suggestive here: about half of the tests of anomalous influences and transmissions will in the long run coincide with positive IMF polarity, and such phases might be reflected in enhanced psi results even while the actual dynamics remain to be clarified. Analogous approaches in biomedicine include healing, spontaneous remission, some experimental surgeries, transplants, and wherever a critical path is of quantum nature. Further 'out of the box' one might speculate about unconventional transformation of energy that have been difficult to replicate even where procedures seemingly followed the specified protocols.

References

Achkasova Y.N., Bobova V.P., Brizgunova N.I. et al. (1978). Sectoral structure of IMF and bacterial multiplication in laboratory experiment. *Solar Data* 1, 99-102.

Atmanspacher, H., Roemer, H., and Walach, H. (2002). Weak quantum theory: complementarity and entanglement in physics and beyond. *Foundations of Physics 32*, 379-406.

Beloff, J., & Evans L. (1961). A radioactivity test of psycho-kinesis. *Journal of the Society for Psychical Research*, 41, 41-46.

Berns, G.S., Chappelow, J., Cekic, M., et 3 al. (2006). Neurobiological substrates of dread. *Science, 312*, 754-*758*.

Bierman, D.J., & Houtkooper, J.M. (1981). The potential observer effect or the mystery of irreproducibility. *European Journal of Parapsychology*, *3*, 345-372.

Bierman, D.J., & Radin. D.I.,(1997). Anomalous anticipatory response on randomized future conditions. *Perceptual and Motor Skills*, *84*, 689-690.

Bierman, D.J. (2008) Personal communication.

Biermann, L. (1951). Kometenschweife und solare Korpuskularstrahlung. *Zeitschrift fuer Astrophysik*, *29*, 274-286.
Bodewind, D., Christian, D.J., et 8al. (2008). Cometary X-Ray emission: Using comets as natural solar wind probes. *CalTech ACE News* # 114, 3/19/2008.
Crooker, N.U., & Siscoe, G.L. (1986). The effects of the solar wind on the terrestrial environment. In *Physics of the Sun*, vol. 3 (P.A. Sturrock ed.) Dordrecht: Reidel, 1986).
DeMeo, J. (2002). Dayton Miller's ether-drift research: a fresh look. *Pulse of the Planet 5,* 140-130. OBRL Greenspring Center, Ashland, OR.
Ertel, S. (2005). Psi Test feats achieved alone at home: Do they disappear under lab control? *Australian Journal of Parapsychology 5*, 140-148.
Ertel, S. (2006). Experimental data, courtesy of the author.
Feinleib, M., Rogot, E., & Sturrock, P.A. (1975). Solar activity and mortality in the United States. *International Journal of Epidemiology 4*, 227-230.
Gell-Mann, M. (2001). Consciousness, reductionism and emergence. Some remarks. *Annals of the New York Academy of Sciences 1929*, 41-49.
Grigoriev, P.E. & Vladimirsky, B.M. (2007). Helio-geophysical effects on frequency of acts of terrorism. *Preprint Abstract, Crimean State Medical University, Simferopol, Ukraine*.
Halberg, F., Cornelissen, G., Otsuka, K.,et 3 al. (2001). Chronomics. *Biomedicine and Pharmacotherapy 55* (Supplement I), 153-190.
Hameroff, S.R., and Penrose, R. (1996). Conscious events as orchestrated spacetime selections. *Journal of Consciousness Studies 3*, 36-53.
Helfrich, W. (2007). Is the psychokinetic effect as found with binary random number generators suitable to account for mind-brain interaction? *Journal of Scientific Exploration 21*, 689-705.
Hu, H.P. & Wu, X.M. (2006). Nonlocal effects of chemical substances on the brain produced through quantum entanglement. *Progress in Physics, 3*, 20-26.
Jahn, R.G., Dunne, B.J., Nelson, R.D., Dobyns, Y.H., & Bradish, G.J. (1997). Correlations of random binary sequences with pre-stated operator intentions: A review of a 12-year program. *Journal of Scientific Exploration, 11*, 345-367.
Jahn, R., Dunne, B., Bradish, G., et 9 al.(2000). Mind/machine interaction consortium: PortREG replication experiments. *Journal of Scientific Exploration, 14*, 499-555.
Kaku, M. (2008). *Physics of the Impossible*. London: Allen Lane.
Kornetov, A.N. (1989). Geocosmic bonds in anomal human behavior. *Proceedings, International Congress of Biocosmic Relations, Crimea*.
Lambert, F.L. (2007). Configurational entropy revisited. *Journal of Chemical Education, 84*, 1548-1550.
May, E.C. (1996). The American Institutes for Research Review of the Department of Defense's STAR GATE Program. *Journal of Scientific Exploration, 10*, 89-107.
Memorial Institute for the Prevention of Terrorism (MIPT). (2005).*TKB data base 1968 to current.* www.tkb.org.
Moddel, G. (2004). Entropy and subtle interactions. *Journal of Scientific Exploration 18*, 293-306.
Murphy, T., with Persinger, M.A. Neurobiology of religious terrorism. www.shaktitechnolgy.com/terrorism.htm.
Nelson, R.D., Bradish, G.J., Dobyns, Y.H., et 2 al. (1995). Field REG applications in group situations. *Technical Note PEAR 95003,* Princeton Engineering Anomalies Research.
Nelson, R.D., Radin, D.I., Shoup, R., & Bancel, P.A. (2002). Correlations of continuous random data with major world events. *Foundations of Physics Letters, 15*, 1-13.
Nelson, R.D. & Bancel, P.A. (2006). Anomalous anticipatory responses in networked random data. In Frontiers of Time: Retrocausation – Experiment and Theory. *AIP Conference Proceedings* (D.P. Sheehan, ed.)

Nikolaev, J.S., Rudakov, J.J., Mansurov, S.M.,& Mansurova, L.G. (1976). Interplanetary magnetic field sector structure and disturbances of central nervous system activity. *Proceedings, 7th International Interdisciplinary Cycle Research Symposium, Bad Homburg, Germany*, 27 June -3 July, 1976. Also *Academy of Sciences of the USSR, Moscow*, Preprint N 17a, 1976.

Nikulov, A. & Sheehan, D. (2004). The Second Law mystique. *Entropy, 6*, 1-10.

Parker, E.N. (1958). Dynamics of the interplanetary gas and magnetic fields. *Astrophysical Journal, 128*, 664-676.

Puthoff, H.E., Targ, R., and May, E.C. (1981). Experimental psi research: implications for physics. In *The role of consciousness in the physical world* (R.G. Jahn, ed.). Boulder: Westview, 1981.

Radin, D.E. & Nelson, R.D. (1989). Evidence for consciousness-related anomalies in random physical systems. *Foundations of Physics,19*, 1499-1514.

Radin, D. (2006). *Entangled Minds*. New York: Paraview Publishers.

Rieger, E., Share, G.H., Forrest, D.J., et 3 al. (1984). A 154-day periodicity in the occurrence of hard solar flares? *Nature, 312*, 623-625.

Roederer, J.G. (2003). On the concept of information and its role in nature. *Entropy, 5*, 1-2.

Ryabykh, T.P. & Mansurova, L.G. (1994). Link between the sectoral structure of the interplanetary magnetic field and the haematological parameters in the control mice and in mice during a tumour process. *Proceedings, International Conference on Sun, Moon and Living Matter (M. Mikulecky, ed.),* Bratislava, 29 June–1 July, 1994, pp. 70-74.

Schmidt, H.(1969). Anomalous prediction of quantum processes by some human subjects. Seattle, WA: *The Boeing Company, Doc.* No. D1-82-0821.

Shatashvili, L.K., Sikharulidze, D.I., & Khazaradze, N.G. (2000). Dynamics of changes in the IMF sector structure in the vicinity of the Earth and the problem of earthquakes. *International Journal of Geomagnetism and Aeronomy, 1*, 1- 5.

Sheehan, D.P., and Wright, J.H. (2006). The Second Law and experiments with intrinsically biased resonant microcantilevers. *AAAS Pacific Division, Proceedings of the Annual Meeting 25*, June 18-22, San Diego, CA.

Sheldrake, A.R. (1995). *Seven experiments that could change the world*. New York: Riverhead.

Shnoll, S.E., Zenchenko, K.I., Berulis, I.I., et 3 al. (2004). Dependence of "macroscopic fluctuations" on cosmophysical factors. Spatial anisotropy. *Biophysics, 49*, 129-139.

Spottiswoode, S.J..P. & May, E.C. (2003). Skin conductance prestimulus response. *Journal of Scientific Exploration, 17*, 617-642.

Svalgaard, L. & Wilcox, J.M. (1975). Long-term evolution of solar sector structure. *Solar Physics, 41*, 461-475.

Tributsch, H. (1982). *When the snakes awake. Animals and earthquake prediction*. Cambridge, MA: MIT Press.

Ulmer, W. (2002). On the role of the interactions of ions with external magnetic fields in physiologic processes and their importance in chronobiology. *In Vivo, 16*, 31-36.

Utts, J.M. (1988). Successful replication versus statistical significance. *Journal of Parapsychology, 52,* 305-320.

Wang, G.M., Sevick, E.M., Mittag, E., et 2 al. (2002). Experimental demonstration of violations of the Second Law of Thermodynamics for small systems and short time scales. *Physical Review Letters, 89* (July 29), 050601.

Wendt, H.W. (1979). Interplanetary magnetic field sector polarity and neuropsychiatric adaptation: a reanalysis. *Journal of the Minnesota Academy of Science 45*, 20-23.

Wendt, H.W. & Birdsey, K.A. (1989). Urbanization parameters as moderators of the background radiation-leukemia connection. Pp. 115-121 in *Etiology of*

cancer in man (A.S. Levine, ed.), Dordrecht: Kluwer Academic.
Wilcox, J.M. & Ness, N.F. (1965). Quasi-stationary corotating structure in the interplanetary medium. *Journal of Geophysical Research, 70*, 5793-5805.
Zeilinger, A. (2005). Essential quantum entanglement. Pp. 257-267 in *The new physics for the twenty-first century* (G. Fraser, ed.), Cambridge: Univ. Press.

Address: Dr. H. W. Wendt, 2180 Lower Saint Dennis, St. Paul, MN 55116 U.S.A.
E-mail hans.wendt@comcast.net.

.

.