WHY DECADES-LONG CHRONOBIOLOGICALLY INTERPRETED BLOOD PRESSURE AND HEART RATE MONITORING (C-ABPM) COPERIODISMS TOWARD A CHRONOUSPHERE?*

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Support: U.S. National Institutes of Health (GM-13981) (FH),
University of Minnesota Supercomputing Institute (GC, FH)

Several decades-long series of vascular (systolic [S] and diastolic [D] blood pressure [BP] and heart rate [HR]) and other psychophysiological variables, including core temperature and the endocrines (steroidal metabolite excretion), exhibit a broad spectrum of periods, τ, some shared with τs of similar length in terrestrial, interplanetary and solar variables. Several transdisciplinary coperiodisms have been mapped, and some components of about 7 days (circaseptans) and longer-than a year (transyears; trans = beyond) have been found to persist but are damped in the absence of a corresponding (congruent) environmental frequency, in whose presence they are amplified. Coperiodisms in 39 years of terrorism investigated by this approach and in major earthquakes of the past 100 years provide insight into the dynamics involved. Antecedents of quakes, some by rodent activity monitoring, others by human BP and HR surveillance, await future scrutiny for their degree of generality. Identifying these periodisms by lifelong around-the-clock **c**hronobiologically interpreted **a**utomatic **BP** and HR **m**onitoring (C-ABPM) contributes to a chronousphere, to avoid strokes and understand human-made and even natural cataclysms. The change from a spotcheck-based medicine to one that does not fly blind between visits to a care provider is the immediate reward from C-ABPM for severe disease prevention & as basic information complementing the monitoring of space weather.

Key words: chronobiological interpretation, monitoring of cardiovascular system, transdisciplinary coperiodisms, biosphere, ноцsphere chronousphere.

Definitions/concepts. Overlapping CIs (95% confidence intervals) of the τs constitute the criterion of congruence (vs. acongruence) classifying sets of τs that, if not identical, are very close to each other in length, introducing objectivity where subjectivity prevailed in dealing with the many non-stationary cycles, aeolian in space as in time, notably in the infradian domain, that characterize our psychophysiology, epidemiology and many

* Submitted by invitation to a celebration of the 50th anniversary of the Medical Faculty of the People's Friendship University of Russia, Moscow, Russia, September 28, 2011.

other human affairs, leading to a societal (as well as toward novel aspects of environmental) medicine. We designate as "coperiodism" the finding of congruent periods. (We recommend the omission of the hyphen between "co" and "periodism", as we did in proposing "circadian", without clarifying the self-explanatory "circa" and "dian".) We find selective coperiodism among cycles in solar wind speed and various geomagnetic indices on the one hand and between these variables and biospheric time series on the other hand.

Background. Vladimir Ivanovich Vernadsky, the biogeochemist and radiogeologist, coined the concept of the noösphere*, the sphere of human thought or mind (Gk noös), suggesting that as the biosphere steadily evolves, it transforms the earth biochemically. In his broad perspective, sets of coperiodisms connect the biosphere with cycles not only in the hydrosphere but also the lithosphere, the atmosphere and the ionosphere and may eventually complement the electromagnetic spectrum in a transdisciplinary chronousphere, a term portmanteau'd from the Gk chronos = time, Attic Gk nous = mind, and Gk sphairos = globe, as well as sphere (nous from Attic Greek was used instead of noös to save a syllable by portmanteauing).

Method. By modern technology, i.a., computers and satellites, we survey, quantify and investigate variables gauging individual and societal human health and other affairs. Monitored BP and HR, like other variables, yield by analysis parameters such as the τ and the MESOR, M, a midline-estimating statistic of rhythm, a better average. At each τ, one obtains further the amplitude, A, a measure of extent of predictable change within one cycle and the acrophase, ϕ, a measure of the timing of overall high values recurring in each cycle. In the case of BP and HR, the pulse pressure, PP, and the standard deviation of HR also provide valuable information. All endpoints should preferably be based on a minimal half-hourly 7-day or longer record (1, 2). Circadian and about 7-day (circaseptan) parameters, i.a., quantify loads so that undue strain is recognized and, as far as possible, eliminated. They also provide harbinger information for the prevention of severe

* Robert Sonkowsky, Professor of Classics and Theater emeritus at the University of Minnesota, explains that the difference between nous and noos in ancient (classical) Greek can be viewed as merely a spelling difference; in Antiquity, the two words would have been pronounced alike. Both "ou" and "oö" were a long o, not a diphthong and not o + glottal stop + o. The two, however, when adopted into various modern languages, are each subjected to the conventions of the adopting languages. Thus, when Dr. George Vernadsky puts a diacritical mark of 2 dots over the second o of "noös" in English, he is telling us that he pronounces the word "no + glottal stop + os", as we would do in "noösphere". In terms of spelling in Antiquity, Socrates (had he written anything) or Plato of Athens, in turn, as likely speakers of Attic Greek, might have written "nous" and pronounced it, as would Aristotle of Stageira, as a long o. In portmanteauing, into modern English adapted spelling and pronunciation, in using "nous", a syllable is saved, with "chronousphere" rather than "chrononoosphere". More importantly, the addition of "chronos", insofar as it implies eventually the mapping of transdisciplinary time structures (in the litho-, hydro-, atmo-, iono-, helio-, cosmo-, bio- and nou-sphere) has already added novel information on links among some of these global entities (spheres) as glimpses into coperiodisms in the light of the biospheric consequences of changes in amplitude, including disappearance and/or (re)appearance of a corresponding environmental (co)period.

personal and possibly of human-made societal disasters and natural cataclysms. C-ABPM detects harbingers of strokes (brain attacks) so that they may be eliminated, sometimes by no more than a change in the timing of hypotensive medication. As a dividend from preventive cardiology, the same data may serve for understanding man-made disasters such as crime, terrorism and war. We may even find their antecedents and seek warnings of earthquakes by C-ABPM.

Illustrative examples. When we apply a set of computer programs to time series from human or other animal or plant monitoring, e.g., of systolic (S) or diastolic (D) BP and HR of an elderly hypotensively treated man (FH), we find peaks in the broad spectrum from 10 to 0.3 years, with differences among the 3 variables investigated, which happen to share an about (~) 10-year τ, with the environmental counterpart in the solar wind speed (SWS) (1—3). When we look for corresponding environmental frequencies in the circaseptan window of data on the circulation of blood from another elderly hypotensively treated man (GSK), we again find that congruence (the overlying or overlapping of CIs of s) is selective; thus the CIs of SBP and DBP, but not of HR, overlap with a component slightly longer than 7 days. By contrast, HR, but not BP, overlaps the CI of τ of a major component in solar wind speed of ~6.78 days, and the CIs of 3 geomagnetic indices, the equatorial Dst and the planetary Kp (and Ap) (3).

Table 1 shows coperiodisms in the spectral region from 3 to 0.3 years of a clinically healthy man (RBS) (1, 2). All these geomagnetic and interplanetary magnetic cycles are aeolian in time (nonstationary, in an inferential statistical sense) and in space, appearing, disappearing or changing at least in intensity and drifting in phase and frequency as well as from one geographic location to another (1, 2).

Sir Edward Appleton put it best:

First, the earth is round, not flat; hence solar radiations impinge unequally in different regions. Second, the earth rotates and interesting solar functions may occur at any time; hence observers are needed at different terrestrial longitudes so that no effects are missed. Third, the earth is a large magnet in its own right, so that electrical particles from the sun are constrained to travel in curved tracks that may even have effects on the side of the earth's atmosphere further from the sun (at night). Magnetic qualities are very different in different locations, and hence they modify solar effects with unequal intensity at different terrestrial latitudes. (Appleton EV. Foreword. In: Stetson HT. Sunspots in action. New York: Ronald Press Co.; 1947. p. iii—vi.)

With qualification as to the aeolian nature in space as well as time of coperiodisms, congruences are found between Wolf sunspot numbers as such (WN) or with odd WN cycles coded negative, to approximate the Hale sunspot bipolarity cycle (SBC) for SBP, DBP and HR in 38 years of 5—6 self-measurements/day on the average of RBS (1, 2). Table 1 shows the percentage of congruence between solar wind speed (SWS) and geomagnetism (aa) overall in the first column and in the region of τs between 1.7 and 0.3 years in particular in the second column, both below 30% (1, 2). In the remaining column, the congruences between a human mental function, namely the estimation of 1 minute and interplanetary or earth magnetism range from 33 to 84%.

Table 1

Congruent* periods of interplanetary and geo-magnetism (columns [c] 1 & 2), the stimation of 1-minute (c 3) by a healthy man over 3.5 decades, his mood (c 4), vigor (c 5), systolic (c 6) and diastolic (c 7) blood pressure (BP) and heart rate (c 8)

Variable: solar wind speed	geomagnetism (antipodal index, aa)	1-min time estimation (1MTE)	mood estimation	vigor estimation	systolic BP	diastolic BP	heart rate
Period (years) (CI: 95% confidence interval)							
15.6(15.2, 16.0)							
	10.85(10.78, 10.92)						
9.54(9.38, 9.70)							
		8.71(8.52, 8.90)					
	5.31(4.38, 5.35)						
		4.11(4.06, 4.16)					
3.56(3.52, 3.60)							
		2.81(2.76, 2.84)					
			2.34(2.28, 2.42)		**2.35(2.30, 2.40)**	**2.46(2.42, 2.51)**	
2.17(2.15, 2.19)					**2.19(2.15, 2.24)**		
				2.09(2.05, 2.14)	**2.04(2.01, 2.07)**	**2.03(1.99, 2.08)**	
	1.92(1.89, 1.95)*	1.98(1.94, 2.01)*	**1.91(1.87, 1.95)**				**1.86(1.81, 1.90)**
		1.85(1.82, 1.88)*			**1.80(1.77, 1.83)**	**1.79(1.77, 1.83)**	
1.69(1.67, 1.72)*	**1.71(1.69, 1.74)***	**1.71(1.68, 1.74)***	**1.74(1.71, 1.77)**	**1.71(1.68, 1.74)**	**1.68(1.65, 1.71)**	**1.70(1.67, 1.83)**	
			1.64(1.61, 1.66)				
1.60(1.58, 1.62)*							
1.52(1.51, 1.54)*		**1.54(1.51, 1.56)***	**1.51(1.48, 1.53)**				
1.39(1.37, 1.41)*	**1.39(1.37, 1.41)***		**1.38(1.36, 1.40)**		**1.39(1.37, 1.42)**		**1.39(1.37, 1.41)**
1.32(1.31, 1.34)*					1.31(1.29, 1.33)		
1.24(1.23, 1.26)*		1.26(1.25, 1.27)*	1.22(1.20, 1.24)	1.23(1.21, 1.25)	**1.25(1.23, 1.26)**		**1.25(1.23, 1.27)**
							1.19(1.18, 1.20)
		1.16(1.15, 1.18)*					
1.06(1.05, 1.07)*	**1.06(1.04, 1.07)**	**1.06(1.05, 1.07)***					
			1.02(1.01, 1.03)	1.03(1.02, 1.04)			
					1.00(0.99, 1.01)	**1.01(1.00, 1.02)**	
	0.99(0.98, 1.01)*	**0.99(0.98, 1.01)***	**0.99(0.98, 1.00)**	0.98(0.97, 0.99)			**0.99(0.98, 1.00)**
						0.95(0.94, 0.96)	**0.96(0.95, 0.97)**
0.91(0.90, 0.92)*							**0.91(0.90, 0.92)**
0.83(0.82, 0.84)*		**0.82(0.81, 0.83)***		**0.82(0.81, 0.83)**			
				0.80(0.79, 0.81)	**0.80(0.79, 0.81)**		
				0.78(0.77, 0.79)		**0.79(0.78, 0.80)**	
					0.75(0.74, 0.76)		
0.72(0.71, 0.73)*	**0.72(0.71, 0.73)***	**0.713(0.708, 0.719)**					
	0.599(0.598, 0.600)						
0.559(0.557, 0.561)		0.561(0.558, 0.564)					
	0.548(0.547, 0.549)						
0.524(0.522, 0.526)							
0.500(0.499, 0.501)	0.500(0.499, 0.501)						
	0.437(0.436, 0.438)	0.440(0.438, 0.442)					
0.485(0.483, 0.487)							
0.425(0.423, 0.427)							
0.409(0.407, 0.411)							
0.355(0.354, 0.356)							
	0.341(0.340, 0.342)	0.339(0.338, 0.340)					

*Based on weekly; otherwise on daily measurements. Congruence defined by overlying or overlapping 95% confidence intervals, given in( ). A transyear of **1.34** years, with CI(**1.31, 1.37**), of terrorism worldwide is congruent with these environmental τs and time courses show similarities that are resolved with hypothesis testing and estimation of the uncertainty of the acrophase in Figure 2. When more data on terrorism are analyzed, the transyear period is of 1.28 (1.26—1.29) year length overlapping with a period of 1.26 year in 1-minute estimation and solar wind speed.

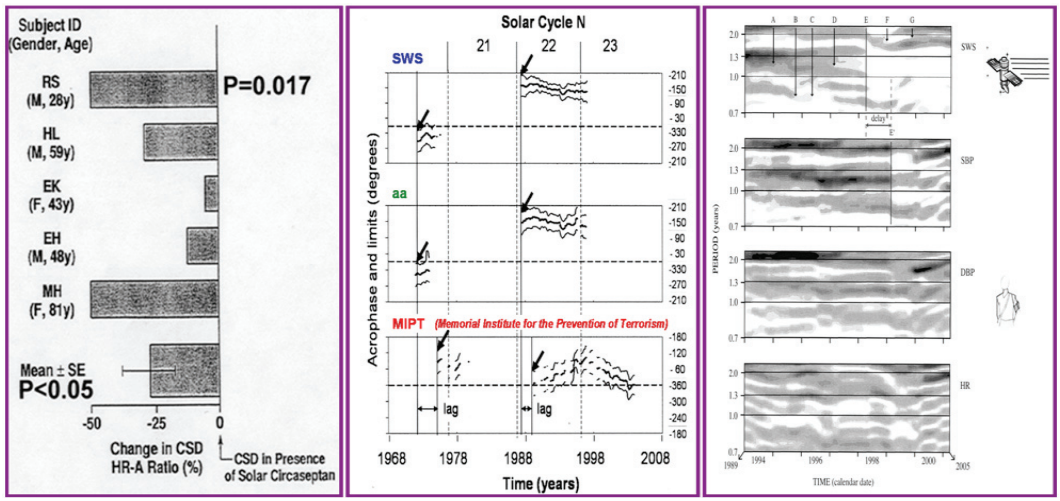

Figure 1. (left) A lesser prominence of an ~7-day (circaseptan) spectral component in the HR of 5 men is found when the sunspot area loses its circaseptan. Implied, but not shown, is the persistence in the biosphere of an ~7-day component that can be driven(amplified) by a reciprocal component in solar activity(1).

(middle) Congruence in both time and frequency is found for the ~1.3-year component of terrorism with respect to both SWS and aa. Peaks of best fitting cosine curves(ϕs) and parts of chronomic serial sections show a statistically significant ~1.3-year far-transyear in both SWS(top) and in the antipodal geomagnetic index aa(middle), followed on each of two occasions with a lag by a statistically significant ~1.3-year component in terrorism, which by far outlasts the apparently triggering putative heliogeomagnetic drivers(ϕs are plotted only when the zero-amplitude of the ~1.3-year cosine curve was rejected at $P < 0.05$; dots bracketing the ϕs indicate the CIs of ϕs in each interval). Noteworthy further, but not shown, is that a transyear replaces the calendar year in the spectrum of a 39-year series of terrorist acts, suggesting the importance of transyears in military-political affairs, with the same finding of a transyear, as a replacement of the seasons, in the popularity of a U.S. president(not shown). These and/or other non-photic signatures pervade human affairs, including military and political activity, economics and health. The scope of transyears has been greatly extended by Miroslav Mikulecky, emeritus head and professor of internal medicine and professor of statistics at Comenius University in Bratislava, Slovakia. Transyear and cis-half-year patterns are pertinent to sudden cardiac death, a condition wherein magnetic storms may be protective rather than noxious.

(right) There is partial resonance of the ~1.3-year component in the SBP of FH with SWS(middle). Non-stationary intermittent frequencies are seen to characterize SWS(top row). These, like those in SBP(second row), are dubbed Aeolian, the use of the term implying, as in the case of winds, marked variations geographically as well as nonstationarily in time on the one hand and that interval as well as point estimates of the τs are to be provided, at least **glo**bally, as a first approach to nonstationarity and whenever possible, time-varyingly (lo**cal**ly in time and space or glocally in time in wavelets or spectrograms). SWS, like SBP, changes in frequency, smoothly [A] or abruptly [B, C, D], bifurcating [D, F] and rejoining [G], and varies in amplitude [B], up to disappearing [C, E] and reappearing.

An abrupt change in SWS is followed in SBP with a lag by changes such as the narrowing(disappearance of part) of a broad band and the damping of the remaining part of the ~1.3-year(1.22 to 1.38-year) far-transyear component in SBP, previously congruent with a counterpart in SWS and by the disappearance of part of a cis-year. This finding suggests that some of FH's cis- and transyear components were driven by the SW. Note also that part of a far-transyear band disappeared with a lag of about a far-transyear following the disappearance(subtraction) of the same components from the SWS spectrum. The lag in the disappearance from SBP of a cis-year component of ~0.66 year is the same(not shorter) as that for the transyear, suggesting the possibility that it represents a harmonic of a non-sinusoidal far-transyear. Specifically, after the broad band disappears in the SWS (at E), parts of the same broad band in SBP also disappear, with a lag(delay) at E', while other parts, albeit damped, persist. This persistence of a narrower damped band in the spectral domain suggests prior driving of a component with partial endogenicity, i.e., an evolutionary acquisition of biotic transyear oscillations that may reflect solar dynamics for the past billions of years. Post hoc ergo propter hoc reasoning can never be ruled out. N = 2,418 daily averages of BP and HR data; total N = 55,000, from automatic around-the-clock monitoring for nearly 16 years, mostly at 30-min intervals, with interruptions. Gliding spectra computed with an interval of 8 years have a resolution low in time but high in frequency. The increment is 1 month and trial τs range from 2.5 to 0.4 year(s), with a harmonic increment of 0.05. Darker shading corresponds to larger amplitudes. © Halberg.

Figure 1 reveals, for a few τs, a likely causal relation insofar as the removal and/or replacement of an environmental τ is associated with corresponding biospheric change. On the left, in 5 individuals and overall, an about 7-day(circaseptan) component is damped (the circaseptan-to-circadian amplitude ratio is smaller) yet persists when the sunspot area does not have a circaseptan(1). In the middle of Figure 1, where we display the acrophases with their CIs of a 1.3-year cosine curve fitted to the data when the zero-amplitude assumption is rejected with statistical significance, we find for this far-transyear, in 39 years of terrorist activity, that following the appearance of the 1.3 year in the

SWS (top row) and concomitantly in geomagnetism(aa, second row), the same component appears after a lag in terrorism (bottom row); notably in solar cycle 22, the 1.3-year persists for a long time, in the absence of an environmental counterpart (3).

In Figure 1 (right), the loss of an ~1.3-year in SWS is followed, again after a lag, by a damping and narrowing of the 1.3-year band, but not by its loss. Subtraction and/or addition document that the periods are genetically coded since they are found in the biosphere when they are not detected in the environment and are thus also driven by the cosmos, which amplifies them.

The results in Table 1 are summarized in Figure 2 (top). The relation of interplanetary and terrestrial magnetism(first column) is the standard for comparison with the association of the cosmos with human psychophysiology. Note that interplanetary and terrestrial magnetism are barely statistically significantly associated at the 5% level, although originally they were regarded as identical(4), another aeolian fact. The second column shows the same statistically significant association of SBP with SWS, as does mood with either SWS or aa, as shown in the last 2 columns. The lower limit of the CI for the odds ratio of the association of mood with aa is above the point estimate of the association of aa and SWS (1, 2). It seems likely, by the criteria of coperiodisms, that for the cases examined thus far, organisms are more sensitive cosmometers than physical magnetometers.

Figure 2(bottom) shows for two Vascular Variability Anomalies(VVAs) the risk of a Cerebral Ischemic Event(CIE) within 6 years. As generally known, a high BP, one of the VVAs, is associated with a fourfold increase in risk of a CIE as compared with normotensive individuals(left column). High BP can be more reliably assessed by Chronobiologically-interpreted Ambulatory BP Monitoring (C-ABPM) than by guidelines in current practice. The risk of a CIE is even greater in the presence of a circadian overswing, dubbed CHAT, short for Circadian Hyper-Amplitude-Tension, that can occur with or without an elevation of the BP mean. Figure 2 indicates that the risk of a CIE was increased sixfold with systolic CHAT(middle) and eightfold with diastolic CHAT (right). This is the major immediate reason for the many millions of people who receive treatment for high blood pressure to do C-ABPM; it has been extensively discussed in a long series of consensus meetings (5, 6).

We now turn from personal disasters such as strokes, to natural cataclysms, like earthquakes. Figure 3(upper right quadrant) shows the results of Dr. Yoshihiko Watanabe's C-ABPM on himself and on 12 other patients who were unaware of any danger of the Sendai earthquake and tsunami (7, 8). A shaded column on the day of the quake is the reference day on the left upper graph in this section; in the graph on the right, a vertical arrow indicates the time of the quake and serves as reference for days after vs. before the quake. A clear increase in SBP is seen for 3 or 2 days before the earthquake, not found in controls below. It remains to be seen whether there is some degree of generality to this finding. In the top left section, Dr. Zhengrong Wang happened to monitor rodents during a span bracketing the Chengdu earthquake (9). Again, his surveillance showed changes preceding the quake. The lower left section summarizes the last 331 major earthquakes, revealing about 50-year cycles, among others, also found not only in tsunamis (not shown) but also in many human affairs ranging from natality to crime and war, as shown in Figure 3 (lower right section).

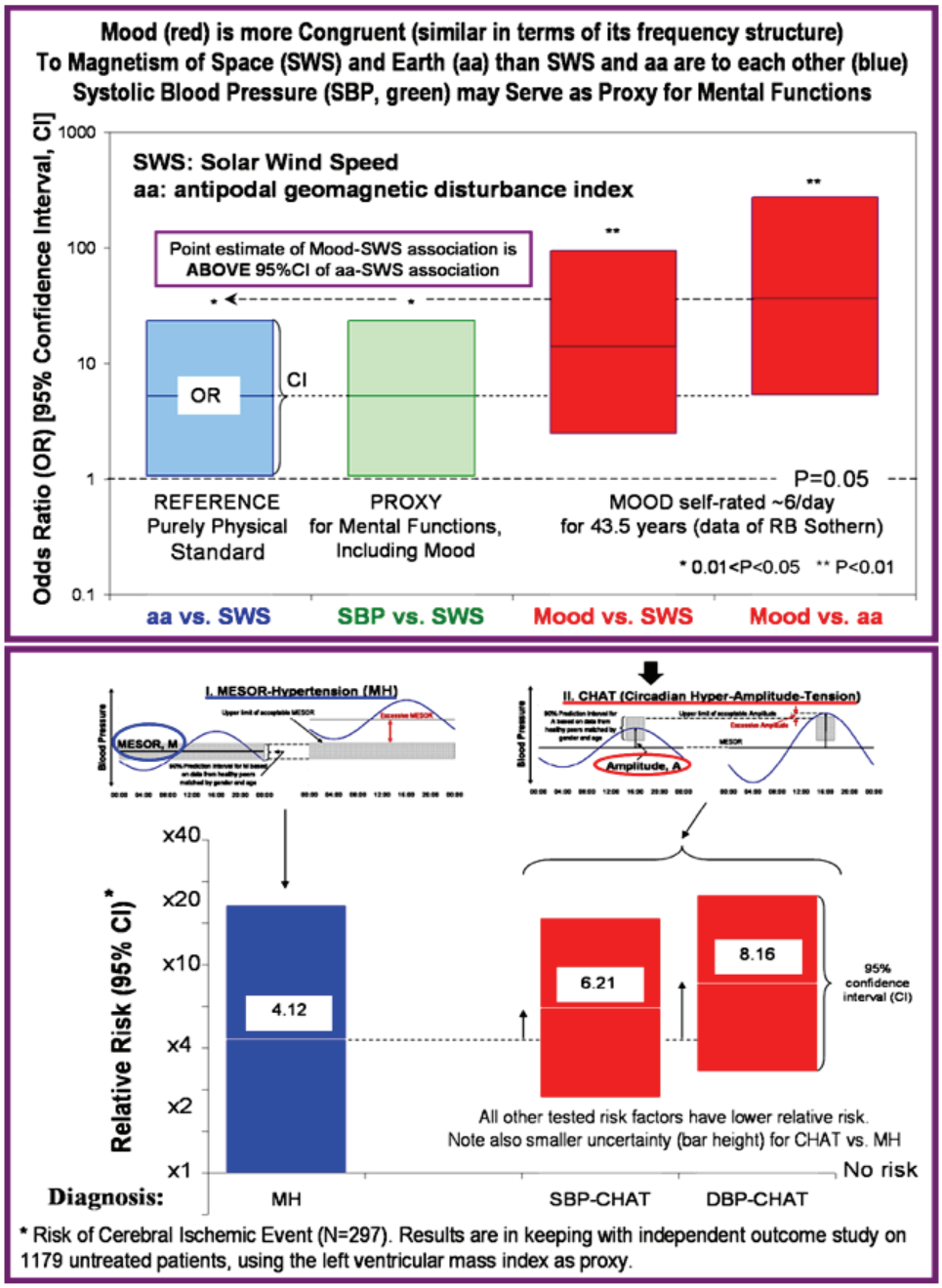

Figure 2. Top: The human mind(mood) is a more sensitive cosmometer than a magnetometer by odds ratios for the criterion of coperiodisms based on congruences(shared periods; for detail see Table 1): the point estimate of the well-accepted association of interplanetary and terrestrial magnetism is below the 95% confidence interval of the odds ratio for an association of mood with the antipodal geomagnetic index aa. Note that the odds ratio of the association of systolic blood pressure with solar wind speed(SWS) makes it a proxy for mood.

Bottom: The cosmos may also be tested for any effects upon Vascular Variability Anomalies, VVAs, new diagnoses made by C-ABPM deserving investigation as of value in their own right for severe cerebrovascular disease prevention, with the dividends in Figures 1 and 3. © Halberg.

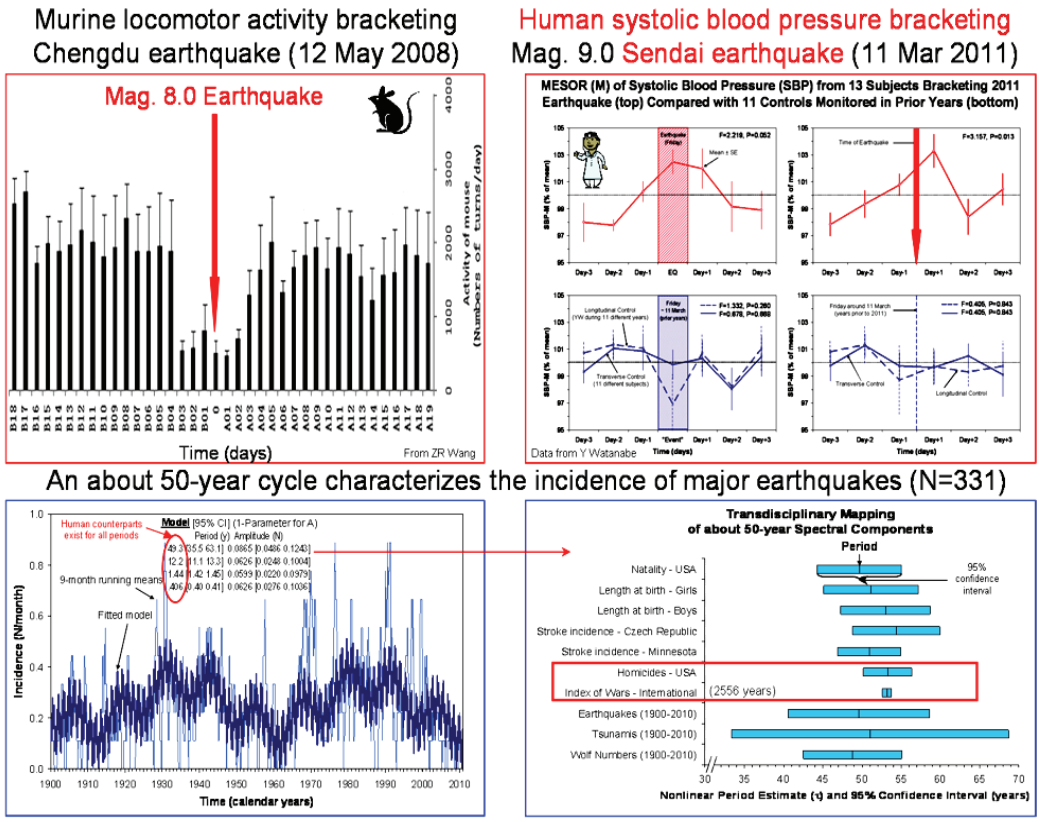

Figure 3. C-ABPM and other biospheric monitoring for the understanding of underlying mechanisms and possible improvement of the prediction and evasion from (tsunamis, not shown, and/or) earthquakes. © Halberg

Coperiodisms are, of course, hints, but remain to be validated by a subtraction and/or addition approach implemented by the cosmos, as shown in Figure 1. The challenge remains to attempt to learn more about what the cosmos does to us and to our earthly habitat, so that we do not fly blind. Current concerns about space weather interfering with communication systems are dwarfed by other largely invisible effects of our environment, as Alexander Leonidovich Chizhevsky knew too well. Intra- and inter-organismic communication underlying many human affairs from stroke over war, perhaps to earthquakes, all remain to be investigated by C-ABPM.

In the middle of World War II, Vladimir Ivanovich Vernadsky (as translated by Dr. George Vernadsky [10]) wrote: “We are entering the noösphere ... at a stormy time, in the epoch of a destructive world war. But the important fact is that our democratic ideals are in tune ... with the law of nature, and with the noösphere. Therefore we may face the future with confidence. It is in our hands. We will not let it go.” Coperiodism, checked by subtraction and addition of an environmental τ, is a step toward Vernadsky’s goal. We are in a spotcheck-based medicine, flying blind, in an era of computers, when the pressure is routinely measured in some car tires. Why not do the same for those who drive the cars, as one of us (SMC) has started in Moscow, another (GSK) is now monitor-

ing himself in St. Petersburg, and as some others (FH, GC and YW) have done for a quarter-century, with RBS (to whom all authors are greatly indebted) holding the record for well over 4 decades?

REFERENCES

[1] *Cornélissen G., Grambsch P., Sothern R.B., Katinas G., Otsuka K., Halberg F.* Congruent biospheric and solar-terrestrial cycles // J Appl Biomed 2011; 9: 63-102. DOI 10.2478/v10136-009-0023-7.

[2] *Halberg F., Cornélissen G., Grambsch P., McCraty R., Beaty L., Siegelova J., Homolka P., Hillman D.C., Finley J., Thomas F., Kino T., Revilla M., Schwartzkopff O.* Personalized chronobiologic cybercare; other chronomics' progress by transdisciplinary cycles' congruences: Season's Appreciations 2009. J Appl Biomed 2011; 9: 1-34. DOI 10.2478/v10136-009-0022-8.

[3] *Halberg F., Cornélissen G., Sothern R.B., Katinas G.S., Schwartzkopff O., Otsuka K.* Cycles tipping the scale between death and survival(= "life"). Invited presentation, Nishinomiya-Yukawa International & Interdisciplinary Symposium 2007, What is Life? The Next 100 Years of Yukawa's Dream, Yukawa Institute for Theoretical Physics, Kyoto University, October 15—20, 2007. Progress of Theoretical Physics 2008; Suppl. 173: 153—181.

[4] *Sabine E.* On periodical laws discoverable in the mean effects of the larger magnetic disturbances. No. II. Phil Trans Roy Soc Lond 1852; 142: 103—124. "... it is certainly a most striking coincidence, that the period, and the epochs of minima and maxima, which M. SCHWABE has assigned to the variation of the solar spots, are absolutely identical with those which have here been assigned to the magnetic variations", see p. 121.

[5] *Halberg F., Cornelissen G., Otsuka K., Siegelova J., Fiser B., Dusek J., Homolka P., Sanchez de la Pena S., Singh R.B.* BIOCOS project. Extended consensus on need and means to detect vascular variability disorders(VVDs) and vascular variability syndromes(VVSs). Geronto-Geriatrics: Int J Gerontology-Chronome Geriatrics 2008; 11(14): 119—146, AND Leibniz-Online Nr. 5, 2009 (http://www2.hu-berlin.de/leibniz-so zietaet/journal/archiv_5_09.html). 35 pp.

[6] *Halberg F., Cornélissen G., Otsuka K., Katinas G.S., Schwartzkopff O., Halpin C., Mikulecky M., Revilla M., Siegelova J., Homolka P., Dusek J., Fiser B., Singh R.B.* Chronomics* (*the study of time structures, chronomes) detects altered vascular variabilities constituting risks greater than hypertension: with an illustrative case report. In: Mitro P., Pella D., Rybar R., Valocik G., editors. Proceedings, 2nd Congress on Cardiovascular Diseases, Kosice, Slovakia, 25—27 April 2002. Bologna: Monduzzi Editore; 2002. p. 223—258.

[7] *Watanabe Y., Halberg F., Otsuka K., Cornelissen G.* Physiological changes in relation to the 2011 East Japan earthquake. World Forum "Natural Cataclysms and Global Problems of the Modern Civilization", 19—21 September, 2011, Istanbul, Turkey. London: SWB; 2011. p. 113—114.

[8] *Watanabe Y., Halberg F., Otsuka K., Cornélissen G.* Physiology and earthquakes, focusing on that in 2011 in Sendai, Japan. Proceedings, World Forum "Natural Cataclysms and Global Problems of the Modern Civilization", 19—21 September, 2011, Istanbul, Turkey, in press.

[9] *Li Y., Liu Y., Jiang Z., Guan J., Yi G., Cheng S., Yang B., Fu T., Wang Z.* Behavioral change related to Wenchuan devastating earthquake in mice. Bioelectromagnetics 2009; 30: 613—620.

[10] *Vernadsky VI*(Vernadsky G trans). The biosphere and the noösphere. Originally published in American Scientist 1945; 33: 8; reprinted(without footnotes) in Executive Intelligence Review 2005 (Feb 18): 30—33. http://www.larouchepub.com/other/2005/site_packages/vernadsky/3207bios_and_noos.html

ПОЧЕМУ ДАННЫЕ МНОГОЛЕТНЕГО ХРОНОБИОЛОГИЧЕСКОГО МОНИТОРИНГА РИТМОВ СЕРДЕЧНО-СОСУДИСТОЙ СИСТЕМЫ ЯВЛЯЮТСЯ ЧАСТЬЮ ХРОНОСФЕРЫ?

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На протяжении нескольких десятилетий было проведено хронобиологическое мониторирование сердечно-сосудистых, психофизиологических, эндокринных и других показателей, включая температуру ядра. Полученные показатели обладают широким спектром периодов, некоторые из которых имеют аналогичные показатели с земными, межпланетарными и солнечными ритмами. Было проведено картирование циркасептальных, цирканнуальных ритмов изучаемых параметров. Установлено, что имеется определенная степень синхронизации ритмов, которая затухает при отсутствии или уменьшении активности окружающей среды и возрастает с активацией этой среды. Аналогичная направленность показателей была выявлена для периодичности ритмов террористических атак и крупных землетрясений.

Синхронизация(кепериодизм) циклов биосферы с циклами гидросферы, атмосферы, ионосферы и т.д. обосновывает создание междисциплинарного термина хроносфера («хронос» — время, «сфера» — земной шар).

Изучение хроносферы позволяет избежать последствий природных катаклизмов, а хронобиологическое мониторирование сердечно-сосудистой системы является значительно более эффективным способом предупреждения заболеваний по сравнению с обычной системой медицинского наблюдения.

Ключевые слова: хронобиологическая интерпретация, мониторинг показателей сердечно-сосудистой системы, трансдисциплинарный кепериодизм, биосфера, ноосфера, хроносфера.