

THE BIOLOGICAL PHYSICIST

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This issue of THE BIOLOGICAL PHYSICIST brings you the minutes from the March 2006 DBP Business Meeting, some special announcements, the first job ads of the fall faculty hiring season, and an editorial essay from yours truly, discussing what Enlightenment philosopher Pierre Bayle (1647-1706) can teach us about the nonlinear dynamics of seizure prediction.

Stay tuned for the next issue, which will feature an interview with Drs. Kamal Shukla and Denise Caldwell of the National Science Foundation about funding opportunities in biological physics.

■ SB

Pierre Bayle & Seizure Prediction

*When beggars die, there are no comets seen;
The heavens themselves blaze forth
the death of princes.*

Shakespeare, *Julius Caesar*

A terrible comet appeared over the skies of Europe in December of 1680. Even though the dawn of the Enlightenment was already breaking over the horizon, people were terrified. One eyewitness wrote that “from this little star stretched out such a wonderfully long tail that even an intellectual man was overcome with trembling; one’s hair stood on end as this uncommon, terrible and indescribable tail came into view.”¹ Despite the general panic, some scholars were astonished at the superstitious terror they saw even in the largest capitals of Europe. No one, perhaps, was more amazed – and irritated – than the philosopher Pierre Bayle.

Pierre Bayle’s works on religious toleration paved the way for the next generation of Enlightenment philosophers – Voltaire, Diderot, d’Holbach, Fontenelle. Among his many other works, Bayle published a wildly popular *Historical and Critical Dictionary*, which became a crucial inspiration for Diderot’s *Encyclopedia*. Though Bayle concentrated on biographical articles about historical figures and scholars rather than taking the more expansive approach of Diderot, who included articles on the sciences, the arts, and mechanical crafts in his *Encyclopedia*, Bayle’s *Dictionary* allowed him to cover an immense range of philosophical ideas. An article on Hieronymus Rorarius, Pope Clement VII’s nuncio to the court of Ferdinand of Hungary, for example, led to a discussion of whether animals have souls, and a review of various philosophers’ opinions on the subject.

¹ Pierre Bayle, *Various Thoughts on the Occasion of a Comet*, trans. Robert C. Bartlett. State University of New York Press, Albany NY, 2000, page xxv. (This source will be referred to below as *Comet*.)

Bayle also originated a subtle system of footnotes upon footnotes, later adopted with brio by Diderot. Far from being pedantic, these annotations, sometimes longer than the articles themselves, were delightfully subversive. Elaborate cross-references allowed Bayle² to suggest ideas that, more overtly stated, might have led to disaster for both book and author, despite the comparative safety of his refuge in Rotterdam.

But, about that comet. As it blazed across European skies, Bayle, a Protestant, was in the process of fleeing to Rotterdam from France, where Louis XIV had just repealed the Edict of

² While not related to the scientific issues discussed below, the Editor cannot refrain from mentioning another brilliant one of Bayle’s works – one that, sadly, is still relevant today – his *Philosophical Commentary*. In this brilliant argument for religious toleration, Bayle considers a biblical parable in which a father, hosting a wedding feast, is disappointed by the small number of guests, and orders his servants to go out into the hedgerows and drum up some company, saying “*Compel them to come in, that my house may be full.*” St. Augustine later took this statement as a proof that Jesus had endorsed the violent forcing of conscience – hence the burning of heretics. Bayle argued brilliantly that it was impossible that this could have been the true intention of the biblical phrase. His work^α stands as one of the earliest modern philosophical assertions of freedom of conscience.

^αBayle was impelled to write the *Philosophical Commentary* by a family tragedy – the arrest and death of his brother, Jacob. Jacob, still living in France, was arrested by the authorities, as a proxy for Bayle himself, whose book *General Criticism of M. Maimbourg’s History of Calvinism* had enraged the establishment. Unable to seize Bayle, who was safely in Rotterdam, they arrested his brother – who died in prison under horrible conditions shortly afterwards. Bayle, overwhelmed with anger and guilt, channeled his grief into a magnificent work on conscience and toleration. How much safer we are today[†], living in a world where[∞] no one would dream of arresting us for our ideas!

[†]Are we?

[∞]At least in some countries.

Nantes, thus removing the last few protections that non-Catholics had in the country. As he fled, Bayle carried with him the manuscript of *Pensées Diverses Sur la Comète (Various Thoughts on the Occasion of a Comet)*, which he published several years later. In this book, Bayle presents an argument, as beautiful and clear as the most elegantly crafted “discussion section” of a journal article, that comets cannot be presages of doom, and are simply part of the natural world.

Bayle’s argument is dazzlingly lucid, like a drink of cool water after days stranded in a desert. He also writes with a delightfully wry tongue-in-cheek humor, dividing his book into sections with titles such as “*Third Reason [Against the Presages of Comets]: That Astrology, Which is the Foundation of the Particular Predictions Relating to Comets, Is the Most Ridiculous Thing in the World*”.

Bayle’s physical arguments, based on Cartesian physics, follow step by step, in the manner we should all emulate in writing up our experimental results. Why, he argues, should comets be able to produce physical effects on the earth? “Here, Monsieur”, he writes,

“are some reasons drawn from philosophy. One can say, to begin with, that it is very uncertain whether bodies so far from the earth as [comets] can convey to it any matter capable of great action. For if it is the universal sentiment of the philosophers...that the atmosphere of the earth – that is, the space through which are spread the exhalations and vapors the entire earth emits – comes to an end in the middle region of the air at an elevation of three or four leagues at most, *why will one believe that the atmosphere of comets extends several million leagues?* One could not say precisely why planets and comets can produce qualities as far as the earth, capable of causing notable changes there, *while the earth cannot produce any even to a distance of thirty leagues.*”³

Bayle next considers whether comets “convey something other than light” to the earth, concluding that the primary emanation of comets, “in their capacity as opaque bodies”, is simply light reflected from the sun. He then inquires whether this light may “detach any atoms” from the comets, and “bring them to our world” along with the reflected light. He refutes this by another analogy with the earth: “It suffices for me to say that the

atoms that the sun’s light causes to rise from the earth, and from the waters, follow the reflected light only to a very small distance *and that one must reason in the same way concerning those the sun causes to rise from other bodies.*”⁴

Having concluded that actual atoms of the comet are unlikely to reach the earth, and therefore cannot have any physical effect on the earth, he considers whether the reflected light itself may cause certain effects on the earth. “This does not seem so”, he writes,

“*since it is certain that this light no longer exists when the effects one attributes to comets are produced* and that, in addition, the influence of this light is very weak in regard to us, since no lamp lit in the midst of a field illuminates and heats the surrounding air any more than does a comet. Thus, as it would be ridiculous to attribute to the light from this lamp the force to produce great changes in the sphere of its activity, apart from illumination, it is ridiculous also to attribute to the light of comets the force to alter our elements and to trouble public tranquility. Not to mention that, *the light of comets being only that of the sun extremely weakened, it is absurd to attribute to it effects that the sun itself cannot bring about*, as it would be to imagine that a candle lit in the middle of a square would heat all the inhabitants of a large city, when a good fire lit in the bedroom of each cannot protect them from the cold.”⁵

Finally, Bayle considers the possibility that the “exhalations” of comets (meaning atoms “detached” from the comets, rather than light) might actually reach the earth. “Even if they should reach Earth”, he argues, “[they] would not produce anything there....Everyone knows that in order for a liquid to produce any considerable effect, it is not sufficient that it be permeated by certain spirits; it must possess a certain dosage of them.” (So much for homeopathy!) Likewise, he argues, a region of the earth must receive some minimum “dosage” of “the atoms that the comet sows here and there” in order to have some effect. These atoms are so sparse, and so randomly distributed, that their effect must “amount to nothing for each part of our world.”⁶

Finally, Bayle offers a “Refutation of Those Who...Would Like to Maintain that the Influences

³ *Comet*, p. 24. Italics mine.

⁴ *Comet*, p. 25. Italics mine.

⁵ *Comet*, p. 25. Italics mine.

⁶ *Comet*, p. 27.

[of Comets] are not Corpuscles,” declaring that his arguments made “on the basis of the idea of atoms and corpuscles...should have the same force against those influences that would consist in pure qualities distinct from matter.”⁷

Having covered all scientific bases, Bayle now moves toward a discussion of the historical⁸ and religious⁹ aspects of the presages supposedly offered by comets, refuting them as elegantly as he refuted the arguments for a physical influence of comets on the earth.¹⁰

Aside from being a beautiful example of a diamond-sharp mind at work, which is a delight to any scientist, does all this have any relevance for biological physics? Actually, yes – because a critical problem in contemporary biological physics involves the problem of *whether one thing, observed at a given moment, is an augury of something observed later*: the problem of seizure prediction.

The idea that seizures can be predicted may have originated with patients themselves, in the “auras” experienced before an ictal (seizure) event. More recently, various mathematical measures have been applied to electroencephalogram (EEG) recordings in an attempt to detect changes in nonlinear quantities such as the largest Lyapunov exponent¹¹,

⁷ *Comet*, p. 28.

⁸ Among his historical arguments, Bayle reviews the massively contradictory claims for good and bad fortune predicted by comets – victory in one battle predicted by a comet, defeat by another, vast delays between the appearance of a comet and its purported effect, etc.

⁹ Bayle argues that God cannot have created comets as presages, since comets, when seen in “pagan” lands, would promote increased fear among the populace there as much as in “Christian” lands, and thus would increase the worship of, and sacrifice to, “pagan deities”. How could God, Bayle asks, do something that would turn people away from worship of himself?

¹⁰ Bayle’s discussion becomes a brilliant treatise on political philosophy and the psychology of superstition. His *Comet* also holds the distinction of being the first modern work to propose that “a decent society of atheists is possible in principle”.

¹¹ Iasemides *et al.*, *IEEE Trans. Biomed. Engr.* **50**:616, 2003; though see Lai *et al.*, *Physical Review Letters* **91**(6):068102, 2003 and Lai *et al.*, *Chaos* **4**(3):630-641,

Kolmogorov entropy¹² or changes in synchrony¹³, presaging the onset of the seizure. The data suggesting that this may be possible is tantalizing, and the clinical importance of achieving rigorous predictive measures is obvious – seizure prediction could be combined with implantable devices to prevent seizure onset, either by the application of drugs or electrical stimuli. At the very least, predictive measures could enable the patient to ensure that he or she is in a safe environment, so as to avoid injury.

Tantalizing as the idea may be, seizure prediction has not yet reached the stage where it could withstand an attack by Pierre Bayle. The distance that remains to be traveled before it could withstand such analysis points a pathway for the next decade(s) of research.

Current studies of seizure prediction offer presages anywhere from a few minutes¹⁴ to nearly four hours before the event.¹⁵ Another group found

“localized quantitative EEG changes identifying prolonged bursts of complex epileptiform discharges that became more prevalent 7 hr before seizures and highly localized subclinical seizure-like activity that became more frequent 2 hr prior to seizure onset.”¹⁶

Other studies have found no evidence at all of seizure predictability.¹⁷ Several groups have recently published comparisons of various methods, and the results, and conclusions, have been mixed.¹⁸ Debate rages over whether

2004 for an argument that Lyapunov exponents are unable to predict seizures.

¹² Van Drongelen *et al.*, *Pediatr. Neurol.* **29**(3):207-313.

¹³ Altenburg *et al.*, *Clinical Neurophysiology* **114**:50-55, 2003, and many other references cited below.

¹⁴ Martinerie *et al.*, *Nature Medicine* **4**(10):1173-1176, 1998; Navarro *et al.*, *Brain* **125**:640-655, 2001.

¹⁵ Le Van Quyen *et al.*, *Clinical Neurophysiology* **116**:559-568, 2005; Mormann *et al.*, *Epilepsy Research* **53**:173-185, 2003.

¹⁶ Litt *et al.*, *Neuron* **30**(1):51-54, 2001.

¹⁷ Aschenbrenner-Scheibe *et al.*, *Brain* **126**(Pt 12):2616-2626, 2003; Jouny *et al.*, *Clinical Neurophysiology* **116**:552:558, 2005.

¹⁸ Jerger *et al.*, *Journal of Clinical Neurophysiology* **18**(3):259-268, 2001; Schelter *et al.*, *Chaos* **16**:013108, 2006; Mormann *et al.*, *Current Opinion in Neurobiology* **19**(2):1870193, 2006.

synchronization increases or decreases prior to seizures; while much evidence suggests a drop in synchronization during the pre-ictal period¹⁹, other studies have observed both increases and decreases in synchrony preceding a seizure²⁰. Still other studies find a “loss of complexity” which “could reflect the hypothesized continuous increase in synchronization between pathologically discharging neurons...”²¹

Thus, it remains far from clear whether seizures can actually be predicted, and if so, what the optimal predictive measures are. As Mormann, Elger and Lehnertz point out, “Prediction algorithms must be proven to perform better than a random predictor before prospective clinical trials involving seizure intervention techniques in patients can be justified.”²² If we are still searching for algorithms that perform better than random predictors, we have a long way to go.

Variability among the predictive capabilities of various detection algorithms is to be expected. But in some cases, even a single algorithm provides a wide range of “anticipation times”. Even within a single patient, anticipation times can range from possibly as short as eight minutes to as long as 143 minutes; “predictive measures” are observed on the opposite side of the brain from that of ictal onset, in patients with focal seizures.²³

So can the exhalations of a comet have an effect here on earth? What is needed, in both the case Bayle examined, and in our current prediction dilemma, is a *plausible mechanism*. Bayle demolished as implausible all the mechanisms by which comets might foretell the death (or birth, or martial victory, etc.) of kings. Do changes in nonlinear measures foretell seizures any more accurately? We hope so: prediction would be

fascinating from a dynamical point of view, and terribly important clinically.

But we are still waiting for mechanisms. *How* is a drop in synchrony on *one* side of the brain related (causally or otherwise) to a seizure which occurs *two hours later*, and *on the other side* – any more than such a drop in synchrony might be related (again, causally or otherwise) to the patient, say, thinking of an onion omelette two hours later? The next gigantic step in the problem of seizure prediction must be the proposal of such plausible mechanisms. And, with apologies for switching from Pierre Bayle to Karl Popper, these mechanisms must be *testable*.

Finally, the problem of seizure prediction is particularly salient now, in the wake of several striking papers that suggest that some types of seizures may be fundamentally, *dynamically*, unpredictable. Lopes da Silva, Suffczynski and their colleagues have studied models of epileptic activity which exhibit multistability. “[I]n addition to a normal steady state, [these models] also have an abnormal one characterized by widespread synchronous activity, and...the transition between these two states may occur abruptly.”²⁴ In other words, transitions between a normal state and a seizure state might be simply a noise-induced transition from one basin of attraction into another.

So, are we seeking to predict the unpredictable? More likely, some seizures follow the da Silva / Suffczynski model, while others result from the slow change of some dynamical parameter, and thus, in principle, might be predicted. The difficulty, of course, is to provide statistically significant proof of correlation between the comet and the effects of its exhalations. [▲]

■ SB

¹⁹ Mormann *et al.*, *Epilepsy Research* **53**:173-185, 2003; Mormann *et al.*, *Physical Review E* **67**:021912, 2003.

²⁰ Le Van Quyen *et al.*, *Clinical Neurophysiology* **116**:559-568, 2005.

²¹ Lehnertz and Elger, *Physical Review Letters* **80**(22):5019-5022, 1998; see also Elger and Lehnertz, *European Journal of Neuroscience* **10**(2):786-789, 1998.

²² Mormann *et al.*, *Current Opinion in Neurobiology* **19**(2): 1870193, 2006.

²³ Mormann *et al.*, *Epilepsy Research* **53**:173-185, 2003.

²⁴ Lopes da Silva *et al.*, *Epilepsia* **44**(Suppl.12):72-83, 2003. See also Lopes da Silvia *et al.*, *IEEE Trans. Biomed. Engr.* **50**(5):540-548, 2003; Suffczynski *et al.*, *Neuroscience* **126**:467-484, 2004. Suffczynski *et al.*, *IEEE Trans. Biomed. Engr.* **53**(3):524-532, 2006.

[▲] And then the much harder task, that of proving causality by proposing and testing falsifiable mechanisms, can begin in earnest.

DIVISION OF BIOLOGICAL PHYSICS 2006 BUSINESS MEETING: THE MINUTES

By Shirley Chan

Baltimore Convention Center, MD, March 14, 2006, 5:35 pm.

Catered refreshments are served before Business Meeting begins. 56 attendees sign in.

Peter Jung, DBP Chair, presides, and welcomes everyone.

Jung introduces and congratulates Alfred Redfield of Brandeis University, the recipient of 2006 Biological Physics Prize. He thanks the Prize Committee for the selection job. Redfield has been cited as the first person to work on high resolution NMR on proteins.

Redfield acknowledges the acceptance of this prize on behalf of all those who did the pioneering research of this field. It is mentioned that there will be a scientific session on Wednesday at 11:15 am on this topic.

Jung introduces Kamal Shukla, NSF Program Director for Molecular & Cellular Biophysics, to talk about funding opportunities for biophysicists at the NSF.

Shukla says that NSF has 4 Divisions of particular relevance for biological physics: (1) Chemistry in the Directorate for Mathematics and Physical Sciences (MPS), (2) Materials

Research in MPS, (3) Physics in MPS, and (4) Molecular & Cellular Biosciences (MCB) in the Directorate for Biological Sciences (BIO). Shukla says that nowadays, everyone wants to do biology. The question is whether physicists can do it well. One major funding rule is that a Principal Investigator (PI) can't submit the same proposal to NIH and to NSF.

There are 2 programs relevant to biological physics in Physics Division, Biological Physics, and Education and Interdisciplinary Research. In most grant submissions, analytical & experimental tools of physics are often applied to problems in the living world. New experimental approaches can be very broad. Molecular biophysics in MCB supports research, for example, on structural studies.

It is important to find the right program to apply to for funding. First, a PI should look for the goals of program from the announcements. The regular programs are classified as unsolicited. The researcher should then find out the eligibility requirements, and any other special requirements, and the deadlines or target dates. Shukla says that his advice is that a researcher first ask the program directors for the right program to submit to. Get guidance right at the beginning.

Submitting a proposal: a good proposal must have a good idea and must be well expressed, with a clear indication of methods and with backup plans. It should provide sufficient methodology. Justify the experimental systems and provide supporting data.

Don't forget about broader impacts. Education and outreach possibilities are important. Write accurately and concisely to help reading by reviewers easier.

One of the most often asked questions, Shukla says, is how much funding one should ask for. One should ask oneself what is need needed for the work – be realistic.

Why do proposals fail to get funding? The answer often is the lack of new or original ideas. If there is a lack of funding, one should not give up. The funding level often could change in new cycles. Shukla then offers to answer any questions from the audience.

Bob Austin of Princeton says he submitted a proposal to NSF in 1993, with innovative ideas how micro-nanotechnologies could be applied to biology. The proposal was rejected and ridiculed as far-out impossible ideas. But now nanobiology is one of the hottest research topics. His experiences show that the NSF does not like to fund proposals with real original ideas. What will NSF do in the future?

Shukla remembers the incident, commenting that some reviewers can be very conservative. Risky proposals can get rejected. The NSF needs community support to deal with new ideas.

Shukla says that NSF program directors make every effort to support risky proposals. However, given the conservative nature of the review system and very limited funds, it is not always possible to support many of the well

deserving proposals. It is always good a idea to call NSF program directors and discuss with them your exciting ideas.

Bruce Taggart of NSF says that projects for pure research are very difficult to fund because innovations are now wanted. NSF is looking to hire program directors who can make a positive impact. There is much growth in biological physics. The NSF needs to start new programs.

Hans Frauenfelder of Los Alamos points out one problem. The cultures between biology and physics are very different. He has panel review reports that one half rated the proposal to be good, and the other half, bad. It's hard for a proposal to please everyone. The NSF needs to find some solutions for the conflicts, perhaps not to send a proposal to both groups for review.

Shukla says that dialogues between different fields are needed. The NSF strives to maintain a broad view. He mentions that one physicist declared to him that a panel was *too* broad.

Aihua Xie of Oklahoma State points out that the number of women in physics is increasing rapidly, and asks whether the NSF has any program to accommodate this gender increase.

W. Lance Haworth, Acting Division Director of the NSF Division of Materials Research, says the NSF has addressed this problem in budgeting, and will have more funding for women, but the amount is not known yet. The NSF will try to focus on this area. On the other hand, NSF's inventory of the total amount of grants shows 18% in biological areas. Therefore, the budget will grow.

Shukla points out that biophysics belongs to more than one program within NSF. The NSF tries to foster growth in this area. It has funded many physicists, but even more

chemists. Basically, MCB has funded not only physicists, but also chemists and biologists.

End of Shukla's presentation.

Jung presents the certificates and pins to 9 APS Fellows sponsored by DBP and elected in 2005 (in alphabetical order): Eshel Ben-Jacob, Taekjip Ha, Gerhard Hummer (absent), Michael Mackey (absent), Jaroslav Majewski (absent), Udayan Mohanty, Steve Schiff, Tamar Schlick (absent), Nancy Thompson.

Jung thanks all DBP members for their efforts in nominating their colleagues for the honors.

DBP financial report by Shirley Chan, Secretary-Treasurer: (Copies of the financial report were distributed at the Business Meeting, and follow the Minutes in this published version.)

Chan reports that the total income in 2005 was \$19,212.05 and the total expenditures were \$21,811.41. The net loss was \$2,599.36 due to an unexpected \$5K payment to the Biophysical Society in order to continue APS membership in the Bridging the Sciences Initiative, in order to pay a Congressional lobbyist for 2005. This request was made by Ken Dill (BPS Committee's Co-chair) and was approved at the 2005 DBP Executive Committee Meeting, Los Angeles.

All investment income has been distributed as student travel grants, \$3700 for 16 students (2 foreign @\$300, 14 domestic @\$100-250) in 2005 and \$3400 for 14 students (3 foreign @\$300-400, 11 domestic @\$200-250) in 2006. Most other line items have been at normal levels. The cost of today's refreshments is estimated to be \$600.

As for the Biological Physics Prize Fund, there is enough to cover the prize money (\$5K) for Prof. Redfield, but there is an insufficient

amount (~\$700) to cover his travel expenses. His expenses will instead be charged to the DBP operating fund. New money must be raised to replenish the Prize Fund before the next award cycle.

Jung reports DBP's major activities in 2005-6.

(1) Workshop: Opportunities in Biological Physics, a 1-day meeting held before the 2006 March Meeting, with 8 speakers and 190 participants. The primary organizers were Clare Yu, Dean Astumian, Shirley Chan, Ken Cole (APS Staff). DBP Executive Committee Members have voted to continue this event in March 2007.

(2) Program with a focus in nanobiology: Marilyn Gunner, the Program Chair, has scheduled many talks in the first 3 days of this week. She groups the talks under other topics in later 2 days. Jung asks for feedback and comments. The talks under the focus topics will get higher priority; DBP plans to continue this format in 2007.

(3) DBP Executive Committee has committed to contribute a symposium in 2007 Biophysical Society Meeting, and plans to ask BPS to contribute one symposium at 2007 March Meeting in Denver.

Comment from an attendee: Some of the meeting rooms are too small for some DBP sessions with hot topics. This issue ought to be addressed and improved in the future.

(4) Lobbying efforts:

(a) Sending APS-prepared letters to Senators and Congressional Members.

(b) Buses to transport DBP members to Washington, D.C., to meet with the Members of Congress on Wednesday and Thursday of the conference week.

(c) Bridging the Sciences Initiative, organized by the BPS in 2003. It recruited other societies

to join as a Coalition. Society membership is \$5K/year, to pay John Porter, formerly a Congressman, currently a lobbyist for his services. Originally it was intended to be a 2-year effort. APS paid all \$5K in 2003. APS & DBP each paid \$2.5K in 2004. In 2005, the APS was surprised to receive a 3rd year bill without a prior consultation and consent. The APS Executive Board decided not to pay. Ken Dill then pleaded the DBP to pay for all \$5K during the 2005 DBP Executive Committee Meeting in L.A. In the fall of 2005, Jung recruited other units to share the anticipated fee in 2006, at \$1K each. Now DBP, DFD, DCOMP, GSNP, and APS will contribute equally to the 2006 fee.

Austin points out that lobbying the Congress is a tricky business and asks how carefully the effort has been handled or monitored by the BPS and Ken Dill. Bob Eisenberg says that Mike Lubell of APS is on top of this issue, and knows what progress has been made. Frauenfelder warns that no payments should ever be given directly to any Congressional Members.

(5) 2006 election results for new Executive Committee Members: Vice Chair: James Glazier; 2 Members-at-Large: Réka Albert and Brian Salzberg. All three will start their serving terms after this March Meeting.

(6) Publication Branch: PRL has a new editor who asks for more submissions of research papers to PRL. Tom Duke is also on the editorial board. It needs one more editor. PRL/E ask for recommendations of new referees to increase its data bank.

Open Discussions from the Attendees:

Eugenie Mielczarek of George Mason announces that she has completed an article, "Resource Letter: Physical Frontiers in Biology", to be published soon in *Am J. Phys.*

It is a guide for grads, undergrads and high school teachers with references to books and review articles in this fast growing field. Please keep this article in physics teaching community.*

Marjorie Lundquist of Milwaukee says to have her poster in the hallway about electromagnetic effects on people, urging people to ask the Congress for money for research and the Government to investigate this problem.

Jung thanks Chan for getting DBP business done throughout the year.

Jung thanks Sonya Bahar for her great job as the editor of DBP newsletters.

Jung introduces Marilyn Gunner as the new Chair for DBP in 2006-7.

Jung adjourns the Meeting at 6:45 pm.

Recorded on 3/14/06 and submitted on 7/1/06 by Shirley Chan, Secretary-Treasurer, DBP.

* Editor's note: see announcement about the publication of this Resource Letter on page 21.

**APS Division of Biological Physics
2005 Financial Summary**

I. OPERATING FUND

	2004	2005	2006 EST.
INCOME			
Member Count on Jan. 1	1668	1682	1783
Dues (@ \$5)	\$8,340.00	\$8,410.00	\$8,915.00
March Meeting Share	\$7,995.00	\$7,403.00	\$7,000.00
Investment Income	\$3,466.64	\$3,399.05	\$3,085.00
Total Income	\$19,801.64	\$19,212.05	\$19,000.00
EXPENSES			
Dinner: Excom Mtg	\$1,097.30	\$1,395.12	\$1,500.00
Rental: Projector/Video	\$523.68	\$363.86	\$300.00
Lunch: Students	\$997.26	\$862.67	\$400.00
Reception: Business Mtg	\$0.00	\$0.00	\$600.00
Reg. Waiver: Speakers	\$2,100.00	\$2,590.00	\$2,600.00
Travel: Speakers	\$5,000.00	\$4,400.00	\$1,200.00
Travel: Students	\$2,600.00	\$3,700.00	\$3,400.00
Travel: Sorters & others	\$1,411.41	\$2,297.33	\$2,500.00
Lobbying Fee	\$2,500.00	\$5,000.00	\$1,500.00
Newsletter (printing)	\$0.00	\$592.00	\$1,000.00
Misc (postage, bank,....)	\$77.25	\$610.43	\$1,000.00
Total Expenses	\$16,306.90	\$21,811.41	\$16,000.00
Net Gain/Loss	\$3,494.74	-\$2,599.36	\$3,000.00
YR-END NET ASSETS	\$50,683.85	\$48,084.49	\$51,084.49

II. BIOLOGICAL PHYSICS PRIZE FUND

	2004	2005	2006 EST.
ASSETS			
Balance on 01/01	\$10,020.53	\$5,251.98	\$5,631.66
Contributions	\$250.00	\$0.00	\$0.00
Investment Income	\$417.01	\$379.68	\$68.34
TOTAL ASSETS	\$10,687.54	\$5,631.66	\$5,700.00
EXPENSES			
Prize for Recipient	\$5,000.00	\$0.00	\$5,000.00
Travel for Recipient	\$435.56	\$0.00	\$0.00
TOTAL EXPENSES	\$5,435.56	\$0.00	\$5,000.00
YR-END NET ASSETS	\$5,251.98	\$5,631.66	\$700.00

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Dynamical complexity detection in short-term physiological series using base-scale entropy

[Jin Li](#) and [Xinbao Ning](#)

Published 24 May 2006 (4 pages)
052902

Dielectric dispersion of erythrocyte ghosts

[Koji Asami](#)

Published 31 May 2006 (3 pages)
052903

SPECIAL DBP ANNOUNCEMENT

2006-2007 DBP Committee Appointments

(continued from April 2006 issue)

2006 DBP Nominating Committee

Chair: **Peter Jung**, DBP Past Chair (1-year term, expires March 2007)

Members:

Michael Mackey, APS-Appointee (1-year term, expires March 2007)

Ralf Bundschuh, (2-year term, expires March 2007)

Chao Tang, DBP MaL (2-year term, expires March 2007)

Deborah Fygenon (2-year term, expires March 2008)

Gerhard Hummer (2-year term, expires March 2008)

SPECIAL ANNOUNCEMENT

Publication of “Physical Frontiers in Biology” Resource Letter

Some time ago, Dr. Eugenie V. Mielczarek, of the Department of Physics at George Mason University, asked DBP members for suggestions for material to be included in a “resource letter” she was preparing for publication in the *American Journal of Physics*. We are pleased to announce that the resource letter was published in the May 2006 issue of *Am. J. Phys.*, Vol. 74(5): 375-381. It is available online at <http://aapt.org/ajp>.

FACULTY POSITION IN BIOLOGICAL PHYSICS

The Department of Physics & Atmospheric Science (<http://www.physics.dal.ca>), Dalhousie University, invites applications from outstanding candidates for a tenure-track faculty position, beginning July 1, 2007. The successful candidate will have a PhD, a strong background in physics, demonstrated research excellence in biological or medical physics, and the ability to teach effectively. Ideal candidates would demonstrate strong funding potential from CIHR, CFI, and NSERC. Our priority is excellence and all researchers in biological physics (**theory or experiment**) or medical physics are encouraged to apply and will be seriously considered.

Applicants should submit a current CV and statements of both proposed research directions and teaching interests, and should arrange for at least three letters of reference to be sent to us directly: Chair of the Search Committee; Department of Physics and Atmospheric Science; Dalhousie University; Halifax, Nova Scotia CANADA; B3H 3J5. The review process will begin **October 15, 2006** but applications will be accepted until the position is filled. For specific inquiries, email physics@dal.ca.

All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority.

Dalhousie University is an Employment Equity/Affirmative Action employer. The University encourages applications from qualified Aboriginal people, persons with a disability, racially visible persons and women.

Assistant or Associate Professor of Physics University of Missouri-St. Louis

The Department of Physics & Astronomy, UM-St. Louis, seeks applications for a tenured or tenure-track faculty appointment as Associate or Assistant Professor of Physics. The candidate must have a Ph.D. in physics or a closely related field. He/she will be expected to teach physics at the introductory and advanced levels and conduct an active research program in computational/theoretical physics, preferably in an area that overlaps with existing research programs in astrophysics, biophysics, or materials physics (<http://www.umsl.edu/~physics/>). The candidate will have the opportunity for collaboration with the campus' Center for Molecular Electronics (nanoscience) and Center for Neurodynamics (nonlinear dynamics in neural systems). Applicants should have a strong track record of research and scholarly activities and will be expected to direct research projects at the Ph.D., M.S., and undergraduate levels. Submit curriculum vitae, statement of teaching philosophy, research plan, and arrange for three letters of recommendation to be sent to: **Prof. Bruce Wilking, Chair, Dept. of Physics & Astronomy, University of Missouri-St. Louis, One University Blvd., St. Louis, MO 63121, FAX : (314) 516-6152, email: bwilking@umsl.edu**. Consideration of applications will begin **November 15, 2006** and continue until the position is filled.

The University of Missouri-St. Louis is an Affirmative Action, Equal Opportunity employer committed to excellence through diversity.