News, continued

classical. Thus the team simply blasted Bob's detector with a laser while intercepting Alice's data and then sending Bob a classical bit. Since the detectors always register a 0 or a 1, they can't tell the difference between a classical and a quantum bit. In other words, while Eve can't *copy* a qubit sent by Alice she can *measure* it. This destroys the qubit, but since the end result will necessarily be a 0 or a 1, Eve can then simply send a *classical* 0 or 1 along to Bob whose detector can't tell the difference.

The group tested the hack on two commercially available systems – one from ID Quantique of Geneva and one from MagiQ Technologies of Boston – and it successfully worked on both. The results were shared with company officials before publishing the work so that appropriate patches could be made available. Group member Vadim Makarov was quick to point out that quantum cryptography is still the most secure cryptographic system in existence. The research appeared in *Nature Photonics*.

Guess what your neighbor is thinking

Entanglement (and thus nonlocality) is, arguably, at the heart of almost everything in quantum information. The no-signaling theorem, however, prevents us from exploiting this to transmit information faster than the speed of light, hence (supposedly) preserving causality. So now imagine N people arranged in a circle. Each player receives a bit (a 0 or a 1) to start off with. Then each player guesses what bit their neighbor on their right received and emits the matching bit. The distribution of possible input bits is known at the start but, otherwise, there is no communication among the players. Winning the game amounts to having the highest number of correct guesses after a certain number of rounds. Clearly signaling of some sort (in which one player communicated his or her bit to another) would make this game a lot easier.

But would quantum correlations necessarily be more advantageous than classical correlations? Not according to Mafalda L. Almeida (ICFO), Jean-Daniel Bancal (Genève), Nicolas Brunner (Bristol), Antonio Acín (ICFO/ICREA), Nicolas Gisin (Genève), and Stefano Pironio (Bruxelles) in an article appearing in *Physical Review Letters*. In this case, quantum correlations do not proffer an advantage. However, somewhat surprisingly, they demonstrate that if the correlations are governed *solely* by the no-signaling theorem, players can actually outperform both the quantum and classical scenarios. What this ultimately means is that, in multipartite situations, there is a point at which quantum nonlocality is superseded by even stronger correlations. (And now, thanks to this article, your fearless editor has a Gordon Lightfoot song stuck in his head...)

–ITD

book review

The Many Worlds of Hugh Everett III: Multiple universes, mutual assured destruction, and the meltdown of a nuclear family

by Peter Byrne

Oxford University Press, 2010, **$45.00**
ISBN13: 9780199552276
ISBN10: 0199552274

With the publication of Peter Byrne's biography of Hugh Everett, the story of the sometimes troubled life of the father of the many-worlds interpretation of quantum mechanics has finally been released from its abode in dusty boxes stored in a basement in California. As Everett's son Mark put it his foreword to Byrne's book,

> I knew the day was coming when the boxes would have to be opened. I just didn't want to be the one to do it. Although I've been lucky enough to end up being happy with my life (part hard work, part miracle) and feeling at peace with my family history, I still don't relish going back to that world. If I play a concert in the Washington, D.C. area, the moment I step off the plane I can smell death in the air. I was sure those boxes held the same smell...Luckily Peter Byrne came along to smell those boxes for me.

Byrne's well-researched summary of those boxes (and other sources) have brought the enigmatic Hugh Everett back to life.

Hugh Everett's name has (largely posthumously) become associated with one of the most indelible and controversial ideas in modern physics, the many-worlds interpretation of quantum mechanics (the term 'many-worlds' was coined by Bryce DeWitt) despite the fact that his only publication in the field of quantum mechanics was his 1957 PhD thesis. But, while we as people interested in quantum physics may be most interested in the genesis and subsequent ascendancy of this idea, it only consumed a small portion of his life.

More than anything, Hugh Everett's life was defined by his work in operations research where he found his niche in the military-industrial complex essentially attempting to turn ethics and morality into a mathematics problem. In a report for the Weapons Systems Evaluation Group (WSEG), Everett developed the notion of maximizing fatalities from radiation as a function of the total megatonnage utilized in a nuclear attack. He was a strong believer in the idea that the

Continued on next page

Review, continued

best way to prevent a nuclear war was to plan for one. Ironically, chemist Linus Pauling credited Everett and his co-author George Pugh by name in his 1962 Nobel Lecture upon receiving the Nobel Peace Prize for his work on nuclear disarmament.

Everett's work with Pugh, often referred to as the "fallout study," served as a foundation for the now infamous WSEG Report 50 that introduced the notion of assured destruction (referred to by the media as *mutually* assured destruction thanks to its acronym – MAD). This concept was to serve as the dominant paradigm of military planning for most of the remainder of the Cold War.

One of the key ingredients to Report 50 was Everett's generalization of the Lagrange Multiplier method that enabled complex problems to be broken down into smaller, more tractable ones. This generalization came to be known as the Everett Algorithm and has played a key role in operations research ever since. Since the Lagrange Multiplier method (and thus the Everett Algorithm) employed the Greek letter λ (lambda), it is no surprise that when Everett and a few of his colleagues left WSEG to start their own company, they called it Lambda Corporation.

Everett's personal life was partly typical of the times in which he lived except that Everett seemed to take things to extremes. While others merely dabbled in the excesses produced by the liberated culture of the 1960s, Everett imbibed, both figuratively and literally. He was an alcoholic who had trouble with the types of normal conversation that play out in typical middle class American homes and he had a penchant for philandering. John Bell once said that quantum mechanics "carries in itself the seeds of its own destruction." The same might have been said of Hugh Everett.

Peter Byrne's meticulously researched biography provides a detailed and intimate look at one of the most seminal figures in 20th century physics and mathematics. The writing is a bit uneven in spots (most notably in the first few chapters) and the copy editing was surprisingly weak (the book is filled with typographical errors). But, all told, it is a remarkable – and long-overdue – biography. As Susanne Misner (wife of Charles Misner) once apparently said, "Most physicists end up as footnotes." The publication of this remarkable book ensures that Hugh Everett will endure no such fate.

***Ian T. Durham** is the editor of this rag. In his day job, he is Associate Professor and Chair of the Department of Physics and Director of the Computational Physical Sciences Program at Saint Anselm College in Manchester, New Hampshire. He lives on the coast of Maine and blogs about quantum empiricism at http://quantummoxie.wordpress.com. He is on a lifelong quest to avoid ending up as a footnote.*

The Quantum Times
Volume 5, Number 2
Third Quarter, 2010

The Quantum Times is a publication of the Topical Group on Quantum Information of the American Physical Society. It is published four times per year, usually in March, June, September, and December, though times may vary slightly.

Editor

Ian T. Durham
Department of Physics
Saint Anselm College
Manchester, NH
idurham@anselm.edu

Editorial Board

Contributions

Contributions from readers for any and all portions of the newsletter are welcome and encouraged. We are particularly keen to receive

- **op-ed pieces and letters** (the APS is *strongly* encouraging inclusion of such items in unit newsletters)
- **books reviews**
- **review articles**
- **articles describing individual research** that are aimed at a broad audience
- **humor** of a nature appropriate for this publication

Submissions are accepted at any time. They must be in electronic format and may be sent to the editor at idurham@anselm.edu. Acceptable forms for electronic files (other than images) include LaTeX, Word, Pages (iWork), RTF, PDF, and plain text.

Editorial policy

All opinions expressed in *The Quantum Times* are those of the individual authors and do not represent those of the Topical Group on Quantum Information or the American Physical Society in general.