IEEE Information Theory Society Newsletter

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President's Column

Frank R. Kschischang

Juan de Pareja (ca. 1608–1670), the apprentice and manservant of Spanish painter Diego Velázquez, is immortalized in the famous portrait painted by Velázquez now displayed in New York's Metropolitan Museum of Art. Pareja, the trusted and able assistant (manumitted in 1654) went on to a career as a painter in his own right. He is, of course, the namesake of *Pareja*, the Information Theory Society's own trusted and able online manuscript submission and peer-review system. As most readers will know already, the Society's paper-handling system is in transition to ScholarOne; thus, as we now set *Pareja* free once again, it is an excellent occasion to reminisce about the origins of our unique paper-handling system.

Pareja was actually not the first online system to support the Transactions. A custom database system written in C with a web interface called *Sage* was written in 1998 at the University of Illinois by then-student Christopher Barton to the specifications of Editor-in-Chief (EiC) Alexander Vardy. This system was used from August 1998 to about 2003, but, due to the nonstandard database, became difficult to maintain. The Publications Editor of the Transactions, Kevin Quirk, then a postdoctoral fellow at UCSD, implemented a personalized interface to *Sage* to automate some of his duties. This interface came to the attention of EiC Paul Siegel, who suggested to Kevin that a similar interface, but aimed at all the people in involved in the process, from Authors to EiC to the Associate Editor (AE) to the Reviewers, could be useful. And so the idea to create *Pareja* came to be.

Kevin Quirk single-handedly implemented *Pareja* in 2003, using a combination of a standard MySQL database, combined with an Apache web server using server-side PHP scripts to provide the various database interfaces. A clear design goal, very successfully achieved in the implementation of *Pareja*, was to maintain the "personal touch" that is a hallmark of the reviewing process in our Society, allowing, for example, AEs to personalize the emails sent out by the system. A significant challenge was to port pre-existing data from *Sage* into the new database, which was accomplished through a combination of automated scripts and significant human intervention from Paul Siegel's editorial assistant, Katherine Perry.

The initial implementation entered beta testing with a handful of AEs in the Fall of 2003, and was rolled out for general use at the stroke of midnight, May 31st, 2004. Since about 2005, *Pareja* has been maintained by Kerry Takenaka, who introduced some additional functionality (support for Special Issues, for example). *Pareja* is hosted through a commercial service, though the 1 GB disk-space limit (ridiculously small by today's standards) has occasionally provided some challenges.

Every current Transactions author, AE and reviewer is by now very, very familiar with *Pareja*. Thus, even as our Society embraces ScholarOne, let us tip our hats and raise our glasses to Kevin Quirk and his own *Pareja* masterpiece, a system that has served us extremely well over the past six years.

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Liaison (*n*): a person whose function it is to maintain communication between two organizations acting together for a common purpose.

A **natural affinity** exists between the IEEE Information Theory Society and the IEEE Communications Society (ComSoc); after all, Shannon's theory was intended as a mathematical theory of communication. The Information Theory Society has for many years maintained the position of ComSoc Liaison, a post held until this year by Laurence Milstein. I am very happy to report that this position is now held officially by Andrea Goldsmith, who has in many ways served as an unofficial ComSoc liaison for a number of years. The two societies cooperate officially on the selection of the Joint Paper Award, but also cooperate unofficially in many ways – for example, the

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From the Editor

Tracey Ho

Dear IT Society members,

Hope you are having a good summer break. Among the items in this issue, we have an article by Conference Committee Chair Bruce Hajek with suggestions for more varied and accessible workshops, and a tribute to L. M. Fink contributed by the Russian IT Society chapter on the hundredth anniversary of his birth. Also, warmest congratulations to Arogyaswami Paulraj and Thomas Kailath on receiving prestigious awards.

A committee was recently formed to help look into ways to expand the scope of content for the newsletter and website. The members are Helmut Bölcskei, Giuseppe Caire, Meir Feder, Joerg Kliewer, Anand Sarwate and Andy Singer. Please join me in thanking them for volunteering their help. We look forward to interesting new articles in future issues.

As a reminder, announcements, news and events intended for both the printed newsletter and the website, such as award announcements, calls for nominations and upcoming conferences, can be submitted jointly at the IT Society website http://www.itsoc.org/, using the quick links "Share News" and "Announce an Event". Articles and columns intended only for the printed newsletter should be e-mailed to me at tho@caltech.edu, with a subject line that includes the words "IT newsletter". The deadlines for the next few issues are:

Issue	Deadline
September 2010	July 10, 2010
December 2010	October 10, 2010
March 2011	January 10, 2011

Please submit ASCII, LaTeX or Word source files; do not worry about fonts or layout as this will be taken care of by IEEE layout specialists. Electronic photos and graphics should be in high resolution and sent as separate files.

I look forward to your contributions and suggestions for future issues of the newsletter.

Tracey Ho

IEEE Information Theory Society Newsletter

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The Historian's Column

Anthony Ephremides

This year we complete 62 years since the momentous publication of Shannon's original paper. The novelty, elegance, and power of that contribution has been truly staggering. It resulted in the establishment of a new field (some would say, cult), it fostered a new way of thinking about the communication process, and elevated the Founder to , almost, the level of a "prophet"; it has become a tacit understanding in the community that to question his teachings is tantamount to blasphemy.

It so happens that in some countries, notably ones that are in financial trouble right now, 62 is considered a mandatory retirement age. So, the "blasphemous" thought arises whether it is time to "retire" the awesome contribution that "A Mathematical Theory of Communication" has made. Let me dispel any suspicions or worries by declaring unequivocally that mandatory retirement has been ruled unconstitutional by the Supreme Court of the United States and, hence, it is ill-advised to contemplate doing so. On a more serious note, however, I would add that, even if the half-life of Shannon's contribution has expired (which is far from being true), an everlasting quality of his heritage that will never die is the aesthetic style of how to do research. Many people have argued in the past, and I have echoed their feelings, that stripping away the spurious and irrelevant complicating features of a problem and retaining only its fundamental core is, perhaps, the biggest lesson that Shannon has taught us. That quality of its heritage is truly immortal.

Nonetheless, it may be time to move to, what one might call, the "Beyond Shannon" territory. In the beginning, when the communication process had been formulated as a point-to-point transmission problem, it was natural to be preoccupied with the issue of how fast and how accurately messages could be transmitted from point A to point B. The surprising result of Shannon's approach was that there was no fundamental limit to the accuracy but, rather, to the speed of that transfer. This resulted in a preoccupation with rates of transmission (or representation) of information. Although the Information Theory community has boldly explored a variety of new questions in new fields (using the magic of the unique scientific "aesthetic" of Shannon's thinking), the dominant force has been always the determination of capacity.

Shannon himself, during interviews conducted in the seventies and eighties, declared clearly that he thought that NEW methods and ideas were needed to extend the theory of Information representation and transmission to multi-user systems and networks. Indeed, today, the development of systems such as the Internet or ad hoc wireless networks has created new questions that shift attention away from speed and capacity. There are concerns about the connection of information to control actions. There is interest in meaning and context of information (notions that were taboo and frowned upon during the early days of the field's development). There is a new focus on the overriding application; things like content delivery from databases that reside distributed around the nodes of the network; or reliable detection of the presence of a target based on sensed measurements that need to be merged to form sufficient statistics; or latency reduction; or bursty and random traffic; or energy efficiency; or non-ergodic, non-stationary environments. These new questions simply do not fit in the classical mold. To quote the director of the Media-Lab at MIT, Negroponte, "latency is far more important than speed"; who needs more than a few Gb/s? On the other hand our lifetime on this earth is finite (something that becomes more acutely perceived as one advances in age); thus latency is far more important. Of course speed and delay are related but they are not one and the same thing.

Some years ago, I coauthored an article that was titled "Information Theory and Networking: An Unconsummated Union"; it hit a sensitive chord and many people have commented lightly or seriously on it. In fact, Sergio Verdu, who was the "instigating" editor who invited that article for the golden jubilee commemorative issue of our Transactions, when he saw the title of the submission, asked (tongue-in-cheek) whether the lack of consummation was due to the frigidity of Information Theory or the impotence of Networking. Leaving aside the facetious intent of the question, there was a deeper truth in his question. Information Theory has developed like a puritanical lady that is cold and indifferent to suitors who do not share the devotion to the founder's legacy. Think of Princess Turandot. On the other hand, Networking has developed like a solicitous scatterbrain child who is easily distracted by new gadgets and smart protocols. It is eager to "consummate" unions but lacks the wherewithal to do it. Think of Don Jose in Carmen. If only the Princess could mollify her virtuousness!! She is the one who has the potential and the capability to cause a fruitful union. But for that to happen it is necessary to abandon some of the sacred taboos.

There are some hopeful signs in the horizon; a new Science and Technology Center founded by the National Science Foundation supports the theme of "Beyond Shannon"; it urges new and unbiased looks at aspects of Information that were not on the agenda of classical Information Theory. What it does not abandon from the legacy of the classical Theory, however, is that unique scientific aesthetic that came across along with Shannon's original theory. THAT is our most cherished heritage. No matter how our field develops and how technology evolves, that uncanny ability to strip down a complicated problem to its essential elements will remain our biggest source of strength.

Therefore, whether it is 62 years old or 162 years old, our field does not qualify for retirement!

President's Column *continued from page 1*

annual Communications Theory Workshop has for many years had a strong information-theoretic flavor.

At the February meeting of the IT Society Board of Governors, in recognition of an increasing affinity between our Society and the IEEE Signal Processing Society (SPS), the Board decided to create the position of SPS Liaison. I am delighted to report that this position has been filled by Urbashi Mitra and, furthermore, that SPS has appointed a reciprocal liaison in the person of Nikos Sidiropoulos. My hope is that Ubli and Nikos will be able to find much common ground for a closer cooperation between the two societies (perhaps in the form of shared Workshops or Special Transactions Issues). I look forward to seeing the outcome of their discussions.

As always, if you would like to get more involved in the activities of the Society or share your comments, please contact me at frank@comm.utoronto.ca.

IT Society Members Honored

Professor Arogyaswami Paulraj, Stanford University has been awarded the prestigious Padma Bhushan award by the Govt. of India in the category of science and engineering. The Padma group of awards is primarily awarded to citizens of India to recognize distinguished service of a high order to the nation in different fields. Padma Bhushan stands at the middle in a three tiered system. Paulraj joins three other IEEE members who have received this award earlier – Professor Emeritus Thomas Kailath, Stanford University, Professor Raj Reddy, CMU and Dr. Arun Netravali, Former President, Bell Laboratories.

Professor Paulraj received the award from the President of India in New Delhi in March 2010.

The 2009 BBVA Foundation Frontiers of Knowledge Award in the Information and Communication Technologies category has been awarded to engineer and mathematician, Thomas Kailath, for creating knowledge with transformative impact on the information and communication technologies that permeate everyday life. These pioneering developments laid the mathematical foundations enabling solutions to some of the challenging problems in this area and have also served to break through the barrier of chip miniaturization.

Kailath, the Hitachi America Professor in the School of Engineering, Emeritus, was cited as, "that rare combination: a scientist with the ability to solve profound mathematical problems and translate them into practical applications, generating new technologies and transferring them to industry."

The BBVA Foundation is the corporate social responsibility arm of the BBVA Group, a multinational financial services corporation based in Spain. BBVA collaborated with the Spanish National Research Council in the awards process.

Professor Kailath is a member of National Academy of Engineering, National Academy of Sciences, and American Academy of Arts and Sciences. He is a Foreign Member of the Royal Society of London, England and Indian Academy of Engineering. He also received the third highest civilian honor of the Government of India, the Padma Bhusan Award. He has received honorary doctorates from universities in France, Spain, Sweden, Scotland and India.

The prize, which carries a purse of 400,000 Euros, will be awarded at ceremonies in Madrid in June 2010.

Recent Activities of the IT Student Committee

Salim El Rouayheb, Bobak Nazer, and Aylin Yener

We are happy to report that the Student Committee has had another productive year. We had the opportunity to continue several successful traditions and have also tried to create some new ones.

At ISIT 2009, the Student Committee organized a panel called "When does Conversation become Collaboration?" We are grateful to Michelle Effros (CalTech), Nihar Jindal (Minnesota), Gerhard Kramer (USC), Daniela Tuninetti (UIC), and Jack Wolf (UCSD) for sharing their insights with attendees. At the end of the panel, as is now tradition, free IT Student Committee t-shirts were distributed to the attendees. A second panel was held at Allerton 2009 on "Navigating the Academic Job Market." Thanks to Matthieu Bloch (GeorgiaTech), Todd Coleman (UIUC), and Pierre Moulin (UIUC) for speaking about their experiences with the job search and answering student questions. An audio recording of this panel is available at www.itsoc.org/people/committees/student/events-1/job-market-panel.

Another well-attended round-table research discussion was held at ISIT 2009. Participating students had the opportunity to chat with other students interested in one of several research topics. We would like to thank the following students for leading a discussion:

- Secrecy – Ersen Ekrem
- Network Coding – Salim El Rouayheb
- Energy Efficiency – Aman Jain
- Feedback in Communication Systems – Baris Nakiboglu
- Achievability Techniques for Network Communication – Paul Cuff
- Biometric Security – Tanya Ignatenko
- Scaling Laws – Urs Niesen
- Compressed Sensing – John Sun
- Interference Channels – Bobak Nazer

Students at the research round table event at ISIT 2009 in Seoul

Students and prospective employers at the CISS 2010 Networking Event

- Sparse Graph Codes – Satish Babu Korada
- Experimental Information Theory – Lav Varshney
- Coding Strategies for Relay Networks – Leila Ghabeli

Also during ISIT, the Student Paper Award – first proposed by the Student Committee and presented for the third time in Seoul – was awarded to three students. The awardees were:

1) **Ali Nazari** (University of Michigan) for his paper "*New Bounds on the Maximal Error Exponent for Multiple-Access Channels*" (co-authored with S. Pradhan, and A. Anastasopoulos),

2) **Changho Suh** (UC Berkeley) for his paper "*Symmetric Feedback Capacity of the Gaussian Interference Channel to within One Bit*" (co-authored with D. Tse), and

3) **Satish Babu Korada** and **Eren Sasoglu** (EPFL) for their paper "*Polar Codes: Characterization of Exponent, Bounds, and Constructions* " (co-authored with R. Urbanke).

Congratulations!

At CISS 2010, the Student Committee hosted, for the first time, a pizza lunch and networking event aimed at fostering discussion between students, faculty, and industry professionals on how to find postdoctoral positions. There were over 100 attendees. We hope to continue to organize and support such events in the future.

We are currently preparing for the upcoming ISIT, as always we will have lunch time events for students. Please see the ISIT web page for details: we look forward to the participation from all student and postdoc attendees.

Preparations are currently underway for the third annual School of Information Theory, hosted this year by USC. For more details on the school please see the article in this issue.

Finally, we would like to call volunteers to action. The student committee events are organized with the help of the student volunteers: This is your committee and we need your help! Please consider being involved in the committee as a volunteer and as a student leader. Contact us by E-mail Salim salim@eecs.berkeley.edu, or Bobak bobak@ece.wisc.edu and we will get you involved in this rewarding service to our society.

Can Workshops Serve Us Better?

Bruce Hajek

I write, on behalf of the Society's Board of Governors and Conference Committee (which I currently chair) to you, members of the Information Theory community, about how you might organize a much greater variety of workshops that could serve us all better. By and large, the Information Theory Workshops of the last five years have been very similar in format and scope to the annual ISITs. While the meetings have been in appealing places, it has been expensive for many members to travel to the workshop locations and to pay the registration fees. Many think one workshop of that sort per year is fine to promote global outreach. But the Conference Committee and the Board of Governors would welcome proposals for workshops that do not conform to the recent norm. We would like to challenge you to be creative in organizing workshops which complement, rather than mimic, ISITs. In particular, there are substantial opportunities to:

a) Run workshops with focused, cutting-edge technical agendas, in a variety of sizes and creative formats. Workshops can be run jointly with other technical organizations, with half the program committee coming from each organization, to form an agenda at the intersection. Workshops can have panel discussions. Poster sessions can play a significant role in some workshops, and be absent in others. Workshops can include working sessions which seek to foster new collaborations. Workshops can be as short as one or two days long. Workshops do not need to have contributed papers and twenty minute talks with papers reviewed by TPCs very similar to ISITs. A workshop can be highly productive with as few as twenty to forty participants. For example, the 1993 IT Workshop on coding, system theory and symbolic dynamics, introduced three communities to each other. Each participant had a color-coded badge indicating which "languages" s/he spoke, and the organizers produced a "multilingual dictionary." At the insistence of the mathematicians, costs were held very low.

b) Make workshops more accessible. Due to their large size, ISITs are mostly held at hotels and a certain level of expense is unavoidable. But workshops can be organized on university campuses or other venues which can be significantly more affordable than ISITs. Creative or no-frills venues in locations near major transportation nodes can lead to meetings roughly half as expensive as an ISIT or high-end workshop, for each participant. In addition, participants often appreciate seeing and using actual teaching and research facilities in other countries, rather than getting a generic hotel experience.

A mitigating factor is that there are already many varied workshops being organized by members of the Information Theory Community. Organizers don't think of asking for IT Society sponsorship, because their meeting doesn't look like a miniature ISIT. But the Society would welcome the chance to support such meetings. The process for gaining technical co-sponsorship for a workshop is simple, and is described under organizer information, under the conferences link, on the IT Society website. Society sponsorship can raise the visibility/attendance for your meeting.

GOLOMB'S PUZZLE COLUMN™

Infinite Sequences with Bounded Overlap

Solomon W. Golomb

It is well-known that the family F of all infinite subsequences of the positive integers is uncountably infinite.

1) Can there be an uncountably infinite subfamily G of F such that, for each pair of sequences S_1 and S_2 in G, the intersection $S_1 \cap S_2$ is finite? (If *yes*, give an explicit description of such a subfamily G. If *no*, prove that such a subfamily cannot exist.)

   For any sequence $A = \{a_1, a_2, a_3, \ldots\}$ with $0 < a_1 < a_2 < a_3 < \ldots$ in F, define $\overline{A} = \{\alpha_1, \alpha_2, \alpha_3, \ldots\}$ to be the infinite binary sequence where $\alpha_j = 1$ if $j = a_i$ for any $a_i \in A$, $\alpha_j = 0$ otherwise. (For example, if $A = \{2, 4, 6, 8, 10, 12, \ldots\}$ is the sequence of positive even integers, then $\overline{A} = \{0, 1, 0, 1, 0, 1, 0, 1, 0, 1, 0, 1, \ldots\}$. We may also write $\overline{A} = \{010101010101\ldots\}$ for simplicity.) We further extend the definition of $\overline{A}$ by the rule $\alpha_j = 0$ for all $j \leq 0$, so that α_j is now defined for all integers $j \in Z$ (i.e. for j positive, negative, and zero).

2) Can you find two sequences, $A = \{\alpha_i\}$ with $\overline{A} = \{\alpha_j\}$, and $B = \{b_i\}$ with $\overline{B} = \{\beta_j\}$, such that the infinite unnormalized crosscorrelation

$$C_{AB}(\tau) = \sum_{j=-\infty}^{\infty} \alpha_j \beta_{j+\tau}$$

   is finite for all τ, $-\infty < \tau < +\infty$?

3) Can you further find such sequences A and B such that $C_{AB}(\tau) \leq 1$ for all τ, $-\infty < \tau < +\infty$?

4) Let $P = \{2, 3, 5, 7, 11, 13, 17, \ldots\}$ be the infinite sequence of the primes, so that $\overline{P} = \{01101010001010001\ldots\}$. Can you find a sequence A in F such that $C_{AP}(\tau)$ is *finite* for all τ, $-\infty < \tau < +\infty$?

5) In Problem 4, can you find a sequence A such that $C_{AP}(\tau) < K$, for some finite (though perhaps very large) bound K, for all τ, $-\infty < \tau < +\infty$?

GOLOMB'S PUZZLE COLUMN™

Calendar Puzzles Solutions

Solomon W. Golomb

1) If the day of the week were statistically independent of calendar date in the Gregorian calendar, the period would be $7 \times 400 = 2800$ years. But in fact the Gregorian calendar, G, repeats identically every 400 years.

2) This statistical dependence arises in G as follows. A "normal" year of 365 days consists of 52 weeks plus one day. A leap year, of 366 days, has one more day than a normal year. In 400 years, G has 97 leap years (because years with numbers ending in 00 are *not* leap years unless the year is a multiple of 400). Thus, in 400 years, G has 400×52 weeks, +400 days, +97 days, or 20,800 weeks plus 497 days. But $497 = 7 \times 71$, and 497 days in *exactly* 71 weeks. So in 400 years, G has *exactly* 20,871 weeks, and year 2001 (for example) looks exactly like year 1601. Since everything repeats every 400 years, and 400 is *not* a multiple of 7, no calendar date falls on a given day of the week *exactly* one-seventh of the time, in the long run. Amusingly, in the 4800 months of a Gregorian cycle, the 13*th* day of the month is (slightly) more likely to occur on Friday than on any other day of the week.

3) Of the seven months from May through November, each starts on a different day of the week, so in every year exactly one of these months (the one that begins on Sunday) has a Friday the thirteenth. This is equally true in the Julian calendar (J) and the Gregorian calendar (G).

4) From 44 B.C. to 2010 A.D. is not 2054 years, but only 2053 years, because there was no "year 0." The year 1 B.C. was followed by the year 1 A.D.

5) When the Romans numbered their months, their first month was March, so September really was the seventh month. This is also why, in J (and now in G) the extra "leap day" was added at the end of the year, in the last month, February. Curiously, the extra day was not originally February 29, but a repetition of February 24. It was called a "bissextile day," from *bis* meaning "again" and *sextile* because it was "six" days before the calends of March. In current usage, our leap day (February 29) is called a "bissextile day," even though this is etymologically incorrect.

6) The mean length of a year in G is 365.2425 days. In the Moslem calendar, M, a year is exactly 12 lunar synodic months, or 354.367129632 years. The difference is roughly 11 days per year, or three years per century. More precisely, a year in M is shorter by 10.87537 days than a year in G.

7) For the year number in M to catch up to the year number in G, the extra 10 days 21 hours plus must be accumulated enough years to overcome the 621 year head start of G. Roughly, if the difference is three years per century, 621/3 = 207, the number of centuries needed to catch up, to which 621 years must be added to get the year (in G). More precisely, 20,856 years are needed to catch up, so that the year number should be the same in 21,477 A.D. = 21,477 A.H.

8) The average length of a year in H is (235 lunar months/19 years) = 365.246822 days, between the 365.25 days of a year in J and the 365.2425 days of a year in G.

9) From shortest to longest, we have

M = 354.3671 days
E = 365.0000 days
A = 365.2422 days
G = 365.2425 days
H = 365.2468 days
J = 365.2500 days

10) Since a year in G exceeds a year in A by about 0.0003 days, it will take about 3323 years for G to get one day ahead of the true solar year. It has been proposed, in keeping with the present rules of G, to declare that years whose numbers are multiples of 4000 should not be leap years.

Note. After about 6420 solar years, the Hebrew calendar as presently defined will be one lunar month ahead of the solar year. A reasonable fix would be to decide that at the end of every 338 nineteen-year cycles, no leap month should be added to that last ninteenth year.

The 100th Anniversary of Professor L.M. Fink's birth

One of the Informal Leaders of the Russian Information Theory School

Prof. Valery Korzhik, and Dr. Yuri Okunev

Biographic Sketch

Lev Matveevich Fink was born on February 11, 1910 in Kiev. Initially he was a humanistic-oriented young man and studied music composition at St.Petersburg (Leningrad) conservatory in the beginning of the 1930-s. But at the same time he was very interested in radio amateur activity and successfully worked in the electronics industry. Such a rare combination of musical and engineering talents brought an unusual result – the young man published simultaneously his first symphony and his first scientific paper.

In 1933 Fink was called up for military service as a signal-corps soldier, where he showed himself as a highly professional telecommunication specialist. As a result, he was soon directed for further education at the Military Communication Academy (MCA) in Leningrad. After graduation from the radio engineering faculty of MCA in 1940, L.M. Fink was assigned to a R&D laboratory of the Research Military Communication Institute in Moscow. Just after the beginning of the Great Patriotic War in 1941, this laboratory developed a special system for intervening into broadcasting of Hitler's radio stations. In a very short time period this system was fully developed and implemented – it allowed Soviet commentators to comment on propaganda statements of fascist leaders within pauses of their speeches. In spite of the strict order of Nazi propaganda minister Goebbels, fascist engineers were unable to remove such interventions. The idea of this intervention was based on the use of so called Gorky-Luxemburg effect, when radio waves radiated by a very powerful transmitter result in strong ionizing the ionosphere, and then even a very low-power transmitter is able to broadcast, on the same frequency, in pauses of the main speakers. The development of this system was very effective in anti-Hitler propaganda in Germany and L.M. Fink, as an inventor of this method, was awarded the first degree Stalin prize.

After the end of the war L.M. Fink was approved as a lecturer to the Military Communication Academy in Leningrad, where he worked till 1970. In 1953 and in 1959 he successfully defended his PhD and Doctoral theses, respectively. (It should be noted that in the USSR and presently in Russia there is a two-stage system of scientific degrees different than in the West.) In period of 1953–1970 L.M. Fink worked very intensively as a Professor and as a researcher in MCA.

In 1970 L.M. Fink left the MCA and was approved as a Professor of Leningrad Electro-engineering Institute named after Prof. M.A. Bonch-Bruevich. But in 1979 he was removed from the Professor's position because his adult daughter emigrated to the USA. (This was a terrible, but common practice of political repressions in the Soviet Union). From 1979 till his death on December 8, 1988, L.M. Fink worked as a chief scientist in the Laboratory of Discrete Information Transmission (LPDI) in Leningrad.

Scientific Achievements

Professor Fink's area of scientific interest was communication theory, and he provided significant contributions in several fields of this large scientific area, namely: in signal theory, optimal signal processing, and in coding theory, including applied information theory.

In his most notable work in the field of the signal theory [1], he established for the first time a fundamental relation between spectrum and instantaneous frequency. Many important notions and results of signal theory were also presented in an elegant and very simple manner in his book [2], which was addressed firstly to young scientists and engineers. This unique book was written in a popular style, as a sequence of comparatively short essays, but contains very profound ideas of signal and communication theory.

In the field of signal processing algorithms, one can remark that L.M. Fink was a strong adherent of Academician V.A. Kotelnikov's theory of optimal signal processing in noisy channels. However, Fink extended this theory to more general channel models, namely: to channels with random parameters, including random phase and different types of fading, as well as to different types of noise – colored Gaussian, non-Gaussian, and so on. System approach to solution of complex theoretical problems was typical for his research work: synthesis of optimal receiver, deriving explicit expressions for error probability for the optimal receiver, finding optimal signals (multi-position or binary) which provide minimum error probability, finding suboptimal decision rules with simple practical implementation and a clear physical sense. Fink also developed algorithms of optimal and sub-optimal receivers with different types of diversity for fading channels, and algorithms for optimal processing of Differential Phase-Shift Keying (DPSK) signals. His fundamental results in DPSK modulation opened a new direction in optimization of classical detection algorithms – noncoherent multi-symbol processing with symbol-by-symbol decision [8].

Fink's main results in the field of signal processing where published in monographs [3, 4, 5]. Although printed in large numbers, they were sold out in the twinkling of an eye and soon became rarities – reflecting great interest of engineers and scientists to new brilliant ideas and excellent methods of their presentation by Professor Fink.

L.M. Fink was one of the first scientists in the Soviet Union who clearly understood the applied meaning of Shannon theory, and he became an active adherent of this theory. We remember that only Professor Fink in contrast to professional interpreters was able to translate correctly a lecture by C. Shannon during his first visit in the USSR. Fink's contribution to information theory includes, first of all, considerable extension of channel models, for which he was able to find their capacities – channels with random carrier phase, channels with slow Rayleigh fading [3,6], and channels with fading and diversity [4].

L.M. Fink was one of the first scientists who proved that the conventional modulation gain for the analog modulation sometimes gives incorrect results and proposed so called generalized modulation gain [7]. Having considered a number of linear error correction codes, he found that the most of them, defined earlier as the optimal ones by D. Slepian, are in reality ineffective in terms of energy consumption, and he introduced a new criterion of error correcting codes – efficiency-equivalent error probability [3].

A significant contribution of Professor Fink in coding theory was his invention of convolutional codes with their application to correction of burst errors. Lev Matveevich told his pupils that the idea of convolutional codes appeared as he was playing piano. This invention was published practically at the same time as the corresponding paper by D. Hagelbarger, therefore it is completely justified that these codes can be called Fink-Hagelberger codes.

L.M. Fink was one of the first scientists in the world who paid his attention to algorithms of soft decoding, combining the main elements of communication systems – modems and codecs – in such a way as to provide maximization of the coding gain at a given reliability [3, 5]. He proposed (jointly with his pupils) several algorithms of soft decoding, for example, the Kagan-Fink algorithm [3].

The last research work of Professor Fink at the end of the 1980s was development of the first European digital audio broadcasting system.

In total L.M. Fink published more than 100 scientific papers. Unfortunately, Fink worked in the period of strong political restrictions on cooperation of soviet scientists with foreign colleagues. Because of this he was unable to visit international conferences (although he had many invitations) or to publish his papers in western journals. Some of his papers became known to western scientists only through English translation of some Russian journals like "Problem of Information Transmission" or "Radio-engineering".

Teaching and Scientific-Public Activity

L.M. Fink was an excellent teacher: he could explain very complex problems with very simple manner using as a rule engineering clarification. He developed and lectured more than ten new courses, wrote several textbooks, including the first textbook in the world on "General Communication Theory" in 1959. He was a supervisor of about a thousand masters students and more than 40 Ph.D. students. More than 10 of them became later outstanding scientists – professors and doctors of sciences. Actually, L.M. Fink was an informal head of the Soviet school on "Applied Communication Theory".

L.M. Fink was for many years a head of Leningrad's division of the All-Union scientific-technical society "Radio Electronics and Communication named after A.S. Popov" and the Chairman of seminars on the stochastic radio-engineering based on this division. He was a member of editorial boards of many scientific journals in the Soviet Union, and a member of program committees of national and international conferences, including the International Symposium on Information Theory. L.M. Fink was a reviewer of hundreds Ph.D. and Doctoral theses, a reviewer of many scientific journals and an informal adviser of many authors and researchers.

Of course it is impossible to describe in a short paper the life of such an outstanding scientist and teacher as Professor Lev Matveevich Fink. His life is a dramatic example for his pupils and next generations of young scientists. Some high-tech companies use the RBCC criterion for evaluation of high level specialists – this abbreviation means Responsible, Benevolent, Creative, Cooperative. Professor Fink has shown to us the highest RBCC level – the optimal combination of scientist characteristics.

He often said: "If you face with a complex problem, you have to think, think, and think all the time about this problem, and doing so, after all you will certainly find the solution". For us – the loyal adherents of Professor Fink – word "think" sounds like "Fink", and we try to think like Fink. Maybe, it is the best memorial for our outstanding teacher and friend.

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Workshop Report: Linear Programming and Message-Passing Approaches to High-Density Parity-Check Codes and High-Density Graphical Models

Tel Aviv University, Tel Aviv, Israel, March 1–2, 2010

Yair Be'ery, Michael Chertkov, Stefan Ruzika, and Pascal O. Vontobel

After a rainy weekend, a sizable group of people coming from near and far gathered at the Green House at Tel Aviv University during two beautiful days to discuss the latest advances on linear programming and message-passing approaches to high-density parity-check codes and high-density graphical models.

As is well known, channel coding theory was revolutionized in the early 1990s by the invention of turbo coding schemes by Berrou, Glavieux, and Thitimajshima, along with the subsequent rediscovery of Gallager's and Tanner's work on low-density parity-check codes. Since then graphical models and message-passing iterative algorithms have been a very popular approach for designing very well performing channel coding schemes.

In terms of graphical models, a code is represented with the help of a graph that shows what constraints are satisfied by the components of any codeword. Decoding is then interpreted as an inference problem, where one tries to find the codeword that best explains the observed channel output sequence. In the world of graphical models this inference problem is efficiently (and approximately) solved with the help of so-called message-passing iterative algorithms where messages are passed along the edges of the graph, where vertices process incoming messages and produce outgoing messages, and where the final decision is based on a suitable combination of messages after several iterations.

Another recent development in channel coding theory is to formulate the decoding problem as an optimization problem. Given that the most straightforward formulation of such optimization problems typically yields problems that are computationally intractable, the art is to come up with relaxations that are tractable. Strictly-speaking such relaxations solve a different problem but they are designed such that very often they give the same result as the ideally solved optimization problem. A very popular approach in that direction has recently been to formulate decoding as solving a certain linear program, an approach that was proposed by Feldman, Karger, and Wainwright in 2002/2003, and that is now known as linear programming decoding. Although such decoders seem to be at first sight rather different from the above-mentioned graphical-model-based decoders, it turns out that they share many similarities when it comes to their implementation and characterizing their performance.

There are many good reasons to use graphical models that are of *low* density, and in fact, many of the best-performing codes are based on such graphical models. One aim of the workshop was to see how far the boundaries can be pushed, i.e., to see if and how linear programming and message-passing approaches can be used to decode codes based on *moderate*-density and *high*-density graphical models. Among the reasons to do so are that sometimes the parameters of the coding scheme are such that it is difficult to design a code based on a low-density graphical model, or that sometimes one is restricted in the choice of graph structure. Another motivation is that many legacy coding systems are based on codes like Reed-Solomon codes and one would like to understand if and how message-passing

approaches can be used to decode such codes more effectively than currently done. (Note that because of their structure, Reed-Solomon codes are most naturally described by high-density graphical models.)

Besides the main focus on channel coding related problems, the workshop tried to also attract and bring together people working in adjacent fields. This was in the strong belief that, more often than not, results from other fields have proven beneficial for channel coding theory, and vice-versa, insights from channel coding theory have proven useful for adjacent fields. In this respect, there were presentations on linear programming and message-passing approaches to applications in communications, compressed sensing, and artificial intelligence.

The workshop also included an evening excursion to Jaffa and a day-long excursion to Jerusalem.

Overall there were 92 registered participants: 38 from Tel Aviv University, 34 from Israel (outside Tel Aviv University), 10 from Europe, 2 from Asia, and 8 from the Americas.

More information about the workshop, including the schedule and the slides of the presentations, is available at www.pseudocodewords.info (follow the link HDPCC Workshop 2010).

This workshop was made possible by the generous financial support of the following organizations:

1) Advanced Communication Center at the School of Electrical Engineering, Tel Aviv University, and the Faculty of Engineering, Tel Aviv University, Israel.

2) Center for Mathematical and Computational Modelling, a research center at the University of Kaiserslautern, Germany.

2010 North American School of Information Theory

Gerhard Kramer, and Aylin Yener

The Annual School of Information Theory will be held for the third time this year. Following the success of the schools at Penn State in June 2008 and at Northwestern in August 2009, we are now moving to the west coast: the 2010 School will take place at the University of Southern California in Los Angeles from Thursday, August 5, to Sunday, August 8. As in past years, the school is being organized by a number of colleagues who are volunteering their time: Program and Applications are being handled by Michelle Effros and Tracey Ho (CalTech), local arrangements by Alex Dimakis and Michael Neely (USC), our Treasurer is Sriram Vishwanath (UT Austin), and our web master is again Matthieu Bloch (GeorgiaTech).

The number of lecturers for 2010 has increased to six, in part to ease the teaching load and in part to improve the student-to-teacher ratio. We are delighted that Emmanuel Candes (Stanford), Andrea Goldsmith (Stanford), Alon Orlitsky (UCSD), Rüdiger Urbanke (EPFL), Sergio Verdú (Princeton), and Jack Wolf (UCSD) have agreed to speak. Jack Wolf will be the second Padovani Lecturer of the IEEE Information Theory Society. The Padovani Lecture is sponsored by a generous gift of Roberto Padovani.

As has become a welcome tradition, there is no registration fee and graduate students and postdocs apply with the abstracts of poster presentations. We have arranged dorms on the USC campus for student participants. We look forward to an exciting week of intellectual exchange and, of course, some fun, and we look forward to seeing you there!

Positions Available

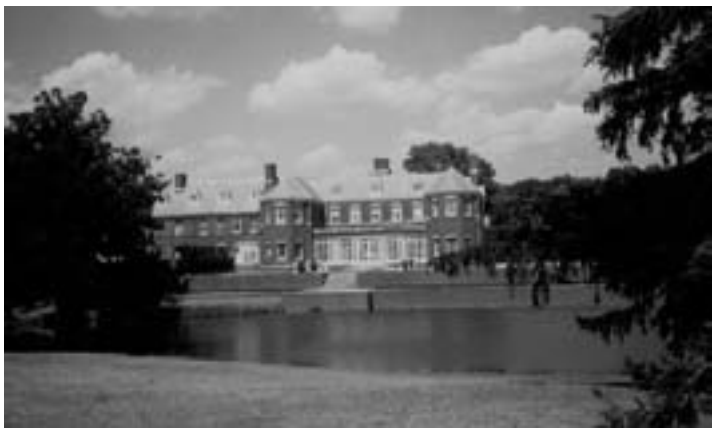
Positions of Postdoctoral Fellows and Research Associates are open at the Institute of Network Coding (INC) of The Chinese University of Hong Kong (CUHK). Initial appointments are typically for two years, and the commencing date is flexible.

Applicants should have a strong research record in network coding related areas, including theory, applications, or implementation.

For further information please visit the INC home page at http://www.inc.cuhk.edu.hk/or contact Raymond Yeung at whyeung@ie.cuhk.edu.hk

Paper Submissions Moving to ScholarOne Manuscripts

The IT society is moving its paper submission and reviewing activities to ScholarOne Manuscripts. ScholarOne Manuscripts (formerly known as Manuscript Central) is a web-based submission and peer review workflow solution which will replace Pareja. Existing papers will continue to be processed through the Pareja system. Further information will be available on the "Information for Authors and Reviewers" page of the website and upcoming announcements.



FORTY-EIGHTH ANNUAL ALLERTON CONFERENCE

ON COMMUNICATION, CONTROL, AND COMPUTING

September 29 – October 1, 2010

Preliminary Call for Papers

The Forty-Eighth Annual Allerton Conference on Communication, Control, and Computing will be held from Wednesday, September 29 through Friday, October 1, 2010, at Allerton House, the conference center of the University of Illinois. Allerton House is located twenty-six miles southwest of the Urbana-Champaign campus of the University in a wooded area on the Sangamon River. It is part of the fifteen-hundred acre Robert Allerton Park, a complex of natural and man-made beauty designated as a National natural landmark. Allerton Park has twenty miles of well-maintained trails and a living gallery of formal gardens, studded with sculptures collected from around the world.

Papers presenting original research are solicited in the areas of communication systems, communication and computer networks, detection and estimation theory, information theory, error control coding, source coding and data compression, queueing networks, control systems, robust and nonlinear control, adaptive control, optimization, dynamic games, large-scale systems, robotics and automation, manufacturing systems, discrete event systems, intelligent control, multivariable control, computer vision-based control, learning theory, neural networks, VLSI architectures for communications and signal processing, and automated highway systems.

I**nformation for authors:** Regular papers suitable for presentation in twenty minutes are solicited. Regular papers will be published in full (subject to a maximum length of eight 8.5" x 11" pages, in two column format) in the Conference Proceedings.

For reviewing purposes of papers, a title and a five to ten page extended abstract, including references and sufficient detail to permit careful reviewing, are required.

Manuscripts must be submitted by **Wednesday, June 16, 2010**, following the instructions at the Conference website: http://www.csl.uiuc.edu/allerton/**.**

Authors will be notified of acceptance via e-mail by July 28, 2010, at which time they will also be sent detailed instructions for the preparation of their papers for the Proceedings.

NOTICE: Deadlines are earlier than in previous years. Final versions of papers to be presented at the conference must be submitted electronically by August 25, 2010.

Conference Co-Chairs: Pramod Viswanath and Sean Meyn

Email: *allerton@csl.uiuc.edu* URL: http://www.comm.csl.uiuc.edu/allerton

COORDINATED SCIENCE LABORATORY AND THE
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

University of Illinois at Urbana-Champaign

Conference Calendar

DATE	CONFERENCE	LOCATION	WEB PAGE	DUE DATE
June 01–04, 2010	**First African Winter School on Information Theory and Communications**	Kruger National Park, South Africa	http://www.awsitc.info/	Passed
June 12–18, 2010	**2010 IEEE International Symposium on Information Theory (ISIT 2010)**	Austin, Texas, USA	http://www.isit2010.info	Passed
August 30–September 3, 2010	**2010 IEEE Information Theory Workshop (ITW 2010)**	Dublin, Ireland	http://www.shannoninstitute.ie/itw2010/	Passed
September 06–10, 2010	**6th International Symposium on Turbo Codes & Iterative Information Processing**	Brest, France	http://conferences.telecom-bretagne. eu/turbocodes/	Passed
September 13–14, 2010	**3rd International Workshop on Multiple Access Communications**	Barcelona, Spain	http://www.csit-spb.ru/macom2010.html	Passed
September 29–October 01, 2010	**48th Annual Allerton Conference on Communications, Control, and Computing**	Monticello, Illinois, USA	http://cslgreenhouse.csl.illinois.edu/allerton/	June 16, 2010
October 17–20, 2010	**2010 International Symposium on Information Theory and its Applications and the 2010 International Symposium on Spread Spectrum Techniques and Applications (ISITA 2010 and ISSSTA 2010)**	Taichung, Taiwan	http://isita2010.cm.nctu.edu.tw/	Passed
November 7–10, 2010	**The Asilomar Conference on Signals, Systems, and Computers (Asilomar 2010)**	Pacific Grove, CA, USA	http://www.asilomarssc.org/	June 1, 2010
December 6–10, 2010	**2010 IEEE Global Communications Conference (GLOBECOM 2010)**	Miami, Florida, USA	http://www.ieee-globecom.org/	Passed
July 31–August 05, 2011	**2011 IEEE International Symposium on Information Theory (ISIT 2011)**	St Petersburg, Russia	http://www.isit2011.info	

Major COMSOC conferences: http://www.comsoc.org/confs/index.html