

# IEEE Information Theory Society Newsletter



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## President's Column

Elza Erkip

My President's columns in the Newsletter started on a high note with my first column in the March issue, talking about how I fell under the spell of information theory. They end on a more somber, yet still optimistic note with this column.

This was not the easiest year for the Information Theory Society. A sexual harassment case involving two society members, a professor and a student, became public late last year, and the society spent most of this year soul searching. We talked about harassment, bullying, discrimination and retaliation. The Board of Governors (BoG) reaffirmed the IEEE Code of Conduct, IEEE Code of Ethics, and IEEE Non-discrimination Policy, and approved a statement strongly condemning sexual harassment. We passed a Conference Code of Conduct to ensure an inclusive, welcoming, and safe environment for everyone at all of our events (see page 12). We talked about the recent U.S. National Academies of Sciences, Engineering and Medicine (NASEM) report on sexual harassment, the prevalence of gender harassment and the importance of institutional culture and climate. Our society's experience with sexual harassment and the NASEM report also prompted the IEEE to reexamine its policies and reporting mechanisms to deal with sexual harassment and related retaliation. At BoG meetings, during a special session at ISIT, during breaks at conferences, in social media and personal webpages, we discussed whether we had the right approach and whether we did enough. Some of my reflections from 2018, which I shared with the BoG during its October meeting, are summarized in the meeting minutes on page 17, and in my President's Report at [https://www.itsoc.org/people/bog/past-meetings/bog-meeting-chicago-2018/Report\\_Oct181.pdf](https://www.itsoc.org/people/bog/past-meetings/bog-meeting-chicago-2018/Report_Oct181.pdf)/view.

Part of the difficulty of dealing with the conflict was that we are a small, close-knit society. Going forward, an important question for all of us is how we can maintain our strong sense of community, yet welcome a diverse group of members, a



diverse and fresh set of ideas. While information theory has an illustrious past, with many accomplished researchers and breakthrough discoveries, the only way we can continue to thrive is if we embrace the young and the new.

I am happy to report two important achievements from this year that will help increase the diversity of our membership and technical accomplishments. The first one is the newly formed Information Theory Society Diversity and Inclusion Committee, which started as an ad-hoc one in February 2018. This committee will be responsible for ensuring that policies, procedures, and practices are conducive to creating and maintaining a diverse and inclusive environment that best

serves all Information Theory Society members. It plans to develop strategies to increase engagement and representation of under-represented groups in the society. Other goals of the committee include ensuring inclusive recognition of the member contributions and achievements within the society and the greater IEEE, continually identifying processes within the society that are barriers to representation and inclusion, and suggesting improvements. Finally, the committee will evaluate the above in an ongoing manner to ensure the needs of under-represented groups are being met. It plans to communicate with the society membership through articles in the Newsletter and is working on its first event which will take place during ISIT 2019.

The second important achievement is establishing a new journal, IEEE Journal on Selected Areas in Information Theory (JSAIT). The final and second phase proposal of JSAIT was approved by the IEEE during its November 2018 meeting, and the Steering Committee, chaired by Jeff Andrews, is moving fast to publish the first issue in early 2020. An open call for the Editor-in-Chief (EiC) was circulated in Fall 2018, and I am happy to report that upon the recommendation of

*(continued on page 11)*

# From the Editor

Salim El Rouayheb



We start this issue with Elza Erkip’s last column as president of the IT society. Please join me in thanking Elza for her service and leadership in the past year and welcoming our incoming president Emina Soljanin. In addition to regular columns, this issue has an article by this year Shannon awardee, Gottfried Ungerboeck, summarizing his Shannon lecture on “Guidance from Information Theory – an engineering perspective”. We also have a contribution from Phil Regalia on several updates and news from the National Science Foundation. This issue also includes reports on the “Latin American Week on Coding and Information (LAWCI)” and “ShanghaiTech Workshop on Information, Learning and Decision (SWILD)”. This issue continues with our Conference Code of Conduct, a call for awards nomination and minutes from our society Board of Governors meetings in June and October. With sadness, we conclude with an in me-

moriam contribution by Alexander Barg celebrating the life and work of Vladimir Levenshtein who passed away in September 2017.

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 at the IT Society website <http://www.itsoc.org>. Articles and columns can be e-mailed to me at [salim.elrouayheb@rutgers.edu](mailto:salim.elrouayheb@rutgers.edu) with a subject line that includes the words “IT newsletter.”

The next few deadlines are:

Jan 30, 2019 for the issue of March 2019.

April 10, 2019 for the issue of June 2018.

Please submit plain text, 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.

Salim El Rouayheb

## IEEE Information Theory Society Newsletter

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# 2018 Shannon Lecture: Guidance from Information Theory—An Engineering Perspective

Gottfried Ungerboeck

Twenty years ago I retired from IBM, and ten years later from Broadcom. Five years ago I taught for the last time a course on *Classical and Modern Channel Coding* at ETH Zurich. And now – what a surprise – the Shannon Award.

The recipient has to give the next Shannon Lecture. I had to reflect on the role of information theory in my career as an application-minded communication engineer. Three topics to talk about came to my mind, (1) the origin of Trellis Coded Modulation (TCM); this story is a bit personal, (2) information theory in the development of the *10GBASE-T* Ethernet standard, and (3) information theory in Faster-Than-Nyquist (FTN) signaling.

## 1. How Trellis-Coded Modulation (TCM) Came About

After earning a Dipl.Ing.-degree in electrical engineering from the Technical University Vienna, I worked as a Systems Engineer at IBM Austria. On my own in search for a topic for a Ph.D. thesis, I became interested in *Multistage Decision Processes*. For example, I learned about *Bellman's Dynamic Programming* and *Pontryagin's Maximum Principle* for optimal control.

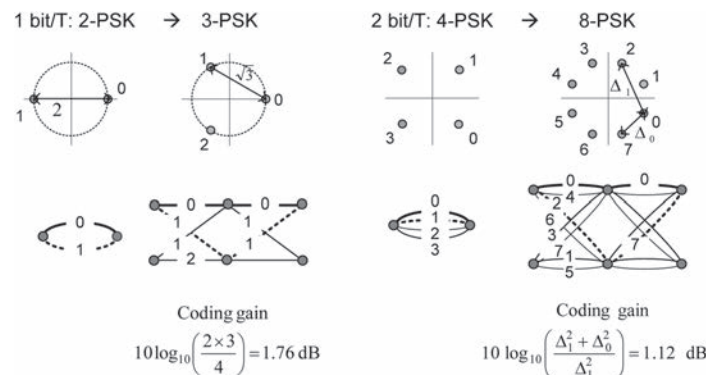
Later at the IBM Zurich Research Laboratory, this helped me to write a Ph.D. thesis followed by my first IEEE Transaction paper on *Nonlinear Equalization of Binary Signals in Gaussian Noise*. When David Forney saw the paper he commented: you found the bi-directional sum-product algorithm and its min-sum approximation, but missed the forward-only version – the Viterbi algorithm. Now everything about the new method of *Maximum-Likelihood Sequence Detection* (MLSD) was clear to me.

In search for applications, *Magnetic Recording* and *Voiceband Modems* looked most promising. In magnetic recording at this time, peak detection was the prevailing read-channel technology. Applying MLSD led to *Partial Response Maximum Likelihood* (PRML) sequence decoding and later extensions, now ubiquitously employed in every hard disk. In voiceband modems coded modulation had not yet arrived. Using MLSD to deal with intersymbol interference between uncoded modulation symbols resulted only in small improvements over linear equalization and symbol-by-symbol detection. The common belief was that adding error-correction coding to uncoded modulation would necessarily cause a loss in data rate that would be hard to compensate for.

Motivated by insights from information theory I began to think about *Coded Modulation with Redundant Sets of Modulation Symbols* with the goal to achieve larger Euclidean distance between coded sequences of redundant modulation symbols than between uncoded modulation symbols at the same data rate, signal power and signal bandwidth.

Fig. 1 illustrates the modest beginning with only two trellis states. Then with four trellis states the first TCM scheme with a signifi-

cant coding gain over uncoded modulation was found: four-state coded 8-PSK providing a 3 dB coding gain over uncoded 4-PSK, as depicted in Fig. 2. More hand-designed codes with a higher number of trellis states followed. It became clear that such encoder-modulators would consist of a binary rate- $k/(k+1)$  convolutional encoder followed by a mapping of binary symbols into modulation symbols called *mapping by set partitioning*, and that for higher-order modulations some information bits would remain uncoded. Soon thereafter the theory allowing for efficient searches for optimum TCM codes with maximum free Euclidean distance for given higher numbers of states was completed.



**Figure 1. From uncoded 2-PSK to 2-state coded 3-PSK, 1 bit/T (why not good?). From uncoded 4-PSK to 2-state coded 8-PSK, 2 bit/T (ok).**

At this time I began to design with small group prototype PRML systems and voiceband modems based on a self-developed digital signal processor *DSP12*, which was followed by *DSP16* and a DSP chip called *HERMES* developed by the IBM LaGarde Laboratory. Fig. 3 depicts the laboratory setup for the first fully operational voiceband modem employing TCM and shows a demonstration of 4-state coded 16-QAM versus uncoded 8-PSK. All leased-line modems and all switched-line modems up to V.34 were realized with these DSPs. Also under an Intelsat contract an SCPC 64 kbit/s satellite modem employing TCM was developed in cooperation with DLR, Germany. Project work had priority over publication.

The 1982 paper [1], actually written 1977–78, provided the framework for finding TCM codes with maximum free Euclidean distance for a given numbers of trellis states. Its contents are:

- Channel capacity for higher-order one- and two-dimensional symbol constellations. **Guidance from Information Theory:** with 2x-expanded symbol constellations up to 7 dB coding gain are achievable without bandwidth expansion.
- Preferred TCM encoder structure: systematic rate- $k/(k+1)$  convolutional encoder with feedback, mapping by set partitioning, some information bits remain uncoded.

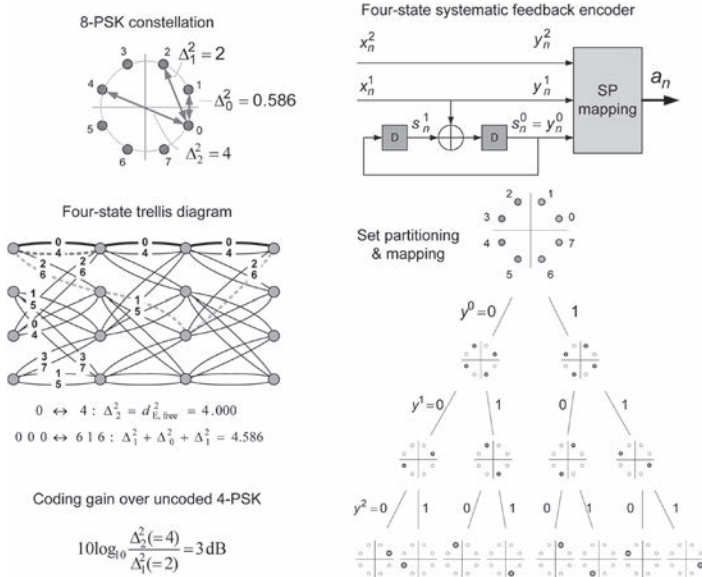


Figure 2. Four-state coded 8-PSK, 2 bit/T.

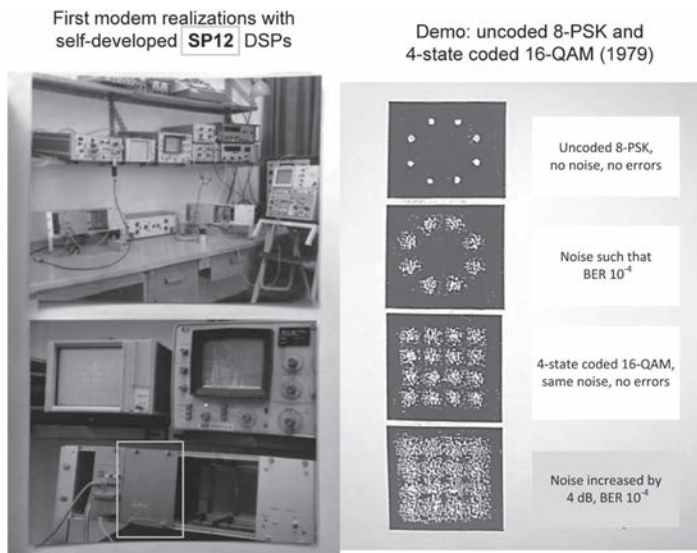


Figure 3. Modem realizations with self-developed DSP SP12 and demo of 4-state coded 16-QAM versus uncoded 8-PSK (1979).

- c) Lemmas and Theorems on free Euclidean distance. Free Euclidean distance can be determined similar to free Hamming distance in linear binary codes. Comparing any sequence of coded modulation symbols to any other sequence is not needed.
- d) Code tables for one- and two-dimension TCM with up to 256 states.
- e) Observations on carrier-phase tracking and a hint on high-dimensional TCM.

Fig. 4 illustrates the void filled by TCM as an expansion from coded binary modulation to coded higher-order modulations.

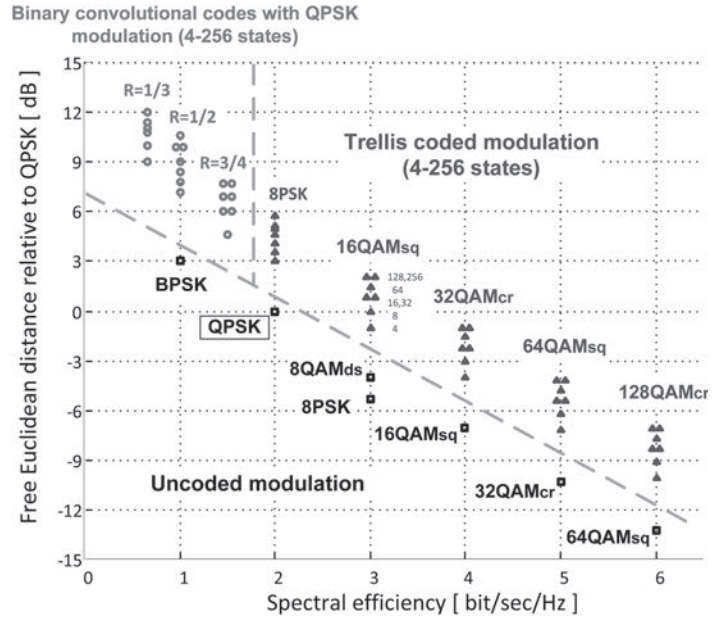


Figure 4. Free Euclidean distance versus spectral efficiency.

When searching for modulation codes with a Euclidean distance goal set-partitioning mapping with possibly uncoded bits emerged naturally. However, in many cases equivalent modulation-encoders with Gray mapping exist. This is shown in Fig. 5.

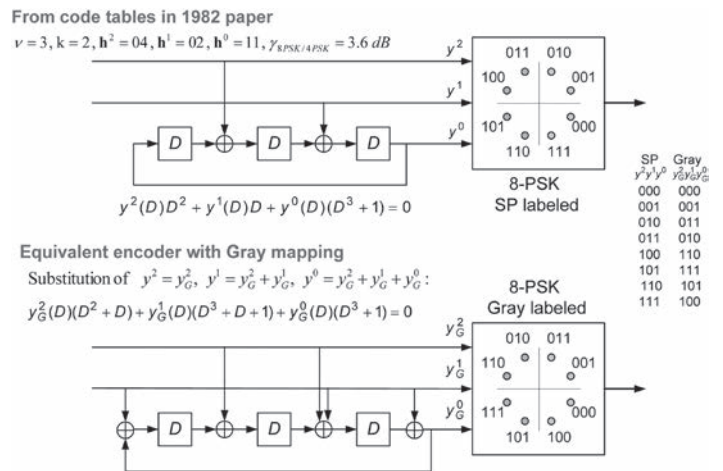
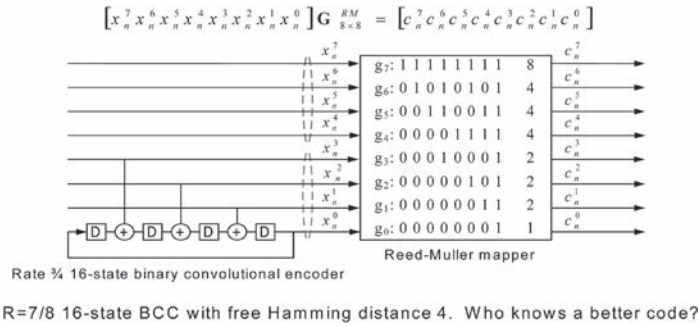


Figure 5. Equivalent TCM encoders with set-partitioning mapping and Gray mapping.

The TCM design concept could also be applied to find optimum binary rate- $k/n$  convolutional codes with maximum free Hamming distance. This is described in a not well known book chapter [2] and is illustrated in Fig. 6 for a rate-7/8 code. The construction is based on set partitioning binary  $n$ -tuples with respect to Hamming distance. The existence of parallel trellis transitions in high-rate convolutional codes is clearly revealed. A similar construction has later been employed in [3].

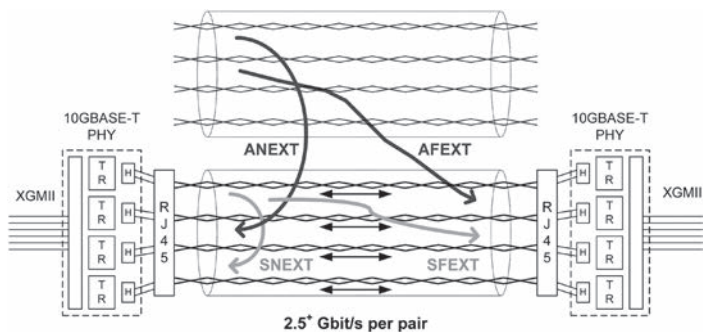


**Figure 6. Convolutional code constructed using a mapper based on set-partitioning with respect to Hamming distance.**

## 2. Information Theory in 10GBASET: 10 Gbit/s Over Copper

Wired Ethernet LANs came into wide-spread use when coaxial cabling was replaced by twisted-pair copper cabling connecting Ethernet stations in star-wired fashion to Ethernet hubs and switches. Data rates increased from 10 Mbit/s in 1991 (10BASE-T, 2-pairs UTP-3, HDX) to 100 Mbit/s in 1995 (100BASE-TX, 2-pairs UTP-5, FDX), to 1 Gbit/s in 1999 (1000BASE-T, 4-pairs UTP-5, quad DX), and finally to 10Gbit/s (10GBASE-T, 4-pairs UTP-6+, quad DX). When asked to participate in the development of the 10GBASE-T standard [4], I thought that this would not be possible. However, capacity calculations for improved cable characteristics and increased transceiver sophistication showed otherwise.

Fig. 7 displays the 10GBASE-T link structure. Echo and self-cross-talk (SNEXT and SFEXT) are cancelled. Alien crosstalk (ANEXT and AFEXT) from adjacent links and an assumed AWGN noise floor act as main disturbances. The application in server/storage clusters called for low transceiver latency, which ruled out OFDM. The IEEE 802.3 working group settled for serial baseband transmission. Capacity approaching coded modulation with Tomlinson-Harashima precoding (TH) was chosen. On each wire pair 2.5 Gbit/s are bi-directionally transmitted using 16-PAM, 800 Mbaud, 3.125 bit/dim, set-partitioning mapping, short-length LDPC coding. Information theory provided guidance in two ways: assuring the channel-capacity approaching nature of the chosen transmission scheme and selecting an appropriate modulation rate  $1/T$ .

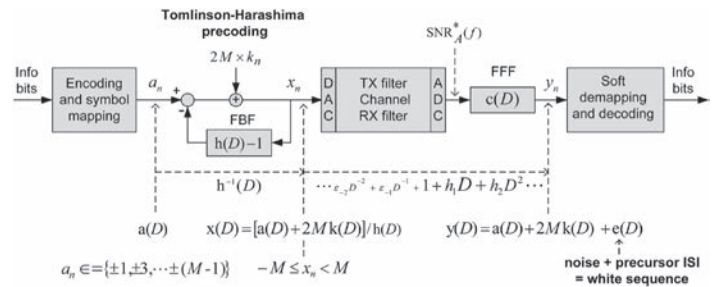


**Figure 7. 10GBASE-T link structure.**

In the 1995 “CDEF” paper [5] the authors investigated the signal-to-noise ratio  $SNR_{mmse-u}$  at the unbiased decision point of a decision feedback receiver with feed-forward filter (FFF) and feedback filter (FBF) optimized in the *mmse* sense. They showed the capacity formula

$$C_{[bit/s]} = \frac{1}{2} \int_{-1/2T}^{+1/2T} \log_2(SNR_A^*(f)+1) df = \frac{1}{2T} \log_2(SNR_{mmse-u} + 1),$$

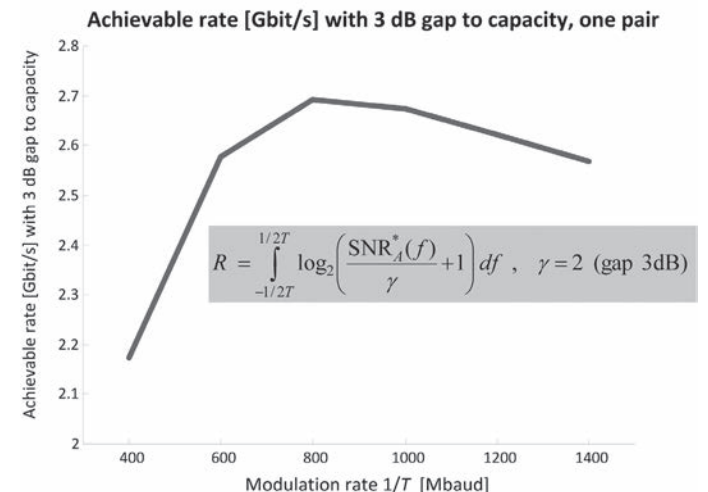
where  $SNR_A^*(f)$  is the  $1/T$ -periodic spectral signal-to-noise ratio at the  $1/T$ -sampling point of the receiver. This assumes “noise” at the decision point, which actually consists of noise and uncanceled residual precursor ISI. For a capacity approaching transmission the authors concluded – **Guidance from Information Theory** - train FFF and FBF in *mmse* sense, swap FBF to the transmitter for Tomlinson-Harashima precoding, and use capacity-approaching coded modulation, see Fig. 8. So done in 10GBAS-T.



**Figure 8. Coded baseband transmission with Tomlinson-Harashima precoding.**

Another point where information theory got involved in the 10GBASE-T design was the determination of the modulation rate. The achievable data rate with a 3 dB gap to capacity was calculated versus the modulation rate for agreed-upon worst-case characteristics of UTP-6+ cabling and an assumed simple transmitter front-end (differential current DAC, 1st-order LPF, transformer). **Guidance from Information Theory** – The result given in Fig. 9 led to choose  $1/T = 800 \text{ Mbaud} \times 3.125 \text{ bit/dim} \times 4 \text{ pairs} = 10 \text{ Gbit/s}$ .

UTP Class E/category 6+, screened, 100m, ANEXT from 10GBASE-T in adjacent links,  $P_T = 5 \text{ dBm}$ , background noise -135 dBm.



**Figure 9. Achievable information rate versus modulation rate.**

For the reader curious about the employed coded modulation: two 16-PAM symbols are viewed as one 256-QAM symbol; fixed binary set-partitioning yields a “128-DSQ” (double square, checkerboard) constellation; the 128-DSQ constellation is further set-partitioned into 16 8-point subsets; four coded bits select a subset; three uncoded bits select a symbol in the subset; the coded bits stem from an (2048,1723) LDPC codeword; a CRC checks the overall  $512 \times 7$  bit “PCS frame” of  $4 \times 256$  PAM symbols; transmission over four pairs at 800 Mbaud takes 320 nsec.

### 3. Information Theory in Faster-Than-Nyquist Signaling (FTN)

This section is based on unpublished work. Fig. 10 illustrates transmission over an AWGN channel of bandwidth  $W$  with a fixed power-spectral density (PSD) of the transmitted signal and modulation rates  $1/T$  varying from Nyquist rate for zero ISI to “zero excess bandwidth” rate and beyond.

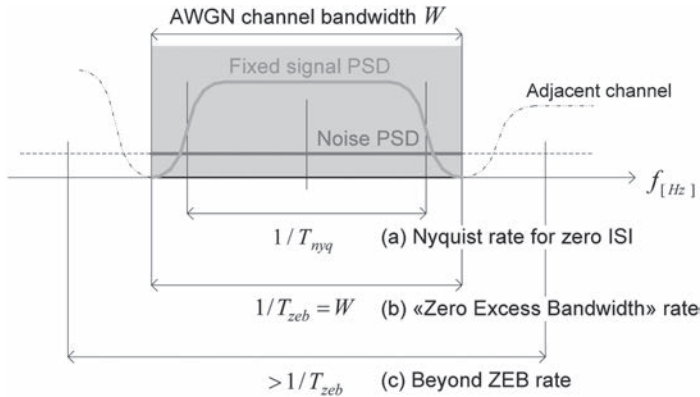


Figure 10. Fixed signal PSD and modulation at Nyquist rate and higher rates.

The following results are for real-signal baseband transmission. Matched square-root raised-cosine transmit and receive filters with roll-off factor  $0 \leq \alpha \leq 1$  are assumed, as shown in Fig. 11. The shape of the transmit PSD does not depend on the modulation rate  $1/T \geq 1/T_{nyq}$ . The definition  $W = (1 + \alpha)/T_{nyq}$  only relates  $\alpha$  and  $1/T_{nyq}$ . The signal-to-noise ratio  $SNR_W = P_S/N_0W$  is defined as the total signal power divided by the total noise power within bandwidth  $W$  and thus does not depend on  $\alpha$  or  $1/T$ . For  $1/T > 1/T_{nyq}$  Tomlinson-Harashima precoding is employed. The FFF and FBF are optimized in the mmse sense for each modulation rate.

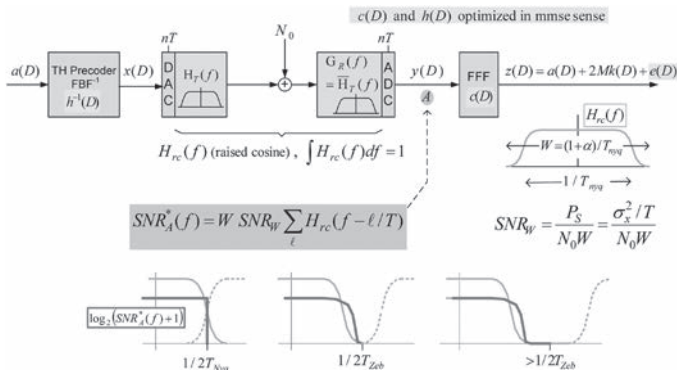


Figure 11. Baseband transmission with raised-cosine filtering at different modulation rates.

Capacity is calculated by integrating  $\log_2(SNR_A^*(f) + 1)$  over the channel bandwidth. From the spectra in Fig. 11 one can see - **Guidance from Information Theory** – that capacity increases from  $1/T = 1/T_{nyq}$  to  $1/T = W$ , as long as aliasing occurs, and remains constant for larger modulation rates, where there is no aliasing. In other words, aliasing destroys capacity.

Capacity in bit/s/W versus  $SNR_W$  is shown in Fig. 12 for modulation rates  $1/T = 1/T_{nyq}$  and  $1/T \geq W$ , and different values of  $\alpha$ .

This further illustrates - **Guidance from Information Theory** – that spectral roll-offs reduce capacity, but the capacity loss is significantly smaller for FTN than for NYQ. This suggests that wider spectral roll off can be tolerated with FTN, thus facilitating separation from adjacent channels.

So much about capacity results for FTN. There could be much more said about FTN. For example, one can show that with practical channel coding of a given complexity, the gap to capacity widens as the modulation rate is increased beyond  $W$ .

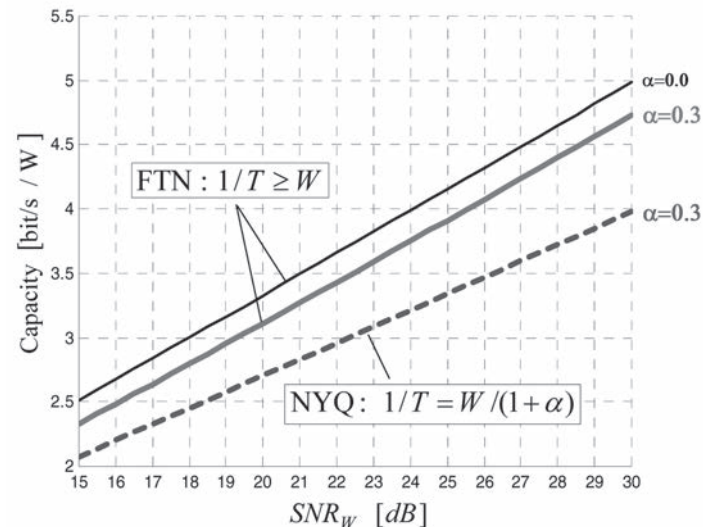
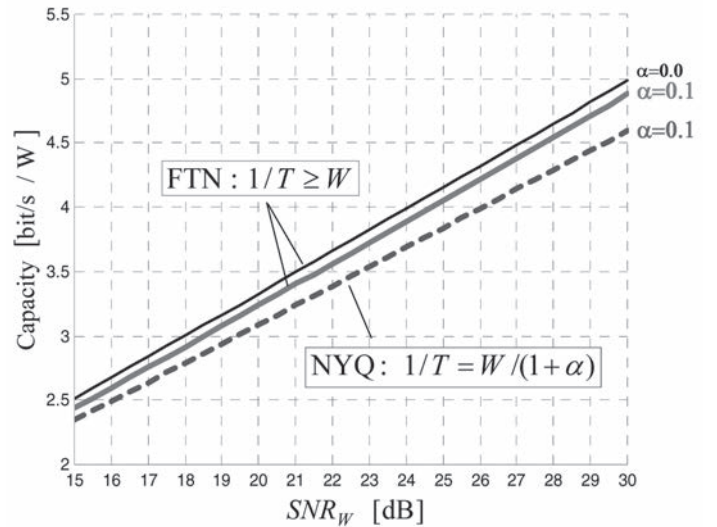


Figure 12. Capacity versus signal-to-noise ratio for different roll-off factors  $\alpha$ .

Other aspects of FTN are beyond the scope of this lecture/article, for example, the peak-to-average ratio of transmitted FTN signals and the fact that higher modulation rates allow to achieve a given data rate with smaller symbol constellations.

## Some References

[1] G. Ungerboeck, "Channel coding with multilevel/phase signals", *IEEE Trans. Information Theory*, vol. IT-28, pp. 55–67, January 1982. Also: "Trellis-Coded Modulation with Redundant Signal Sets", Part I and II, *IEEE Communications Magazine*, vol. 25, pp. 5–21, February 1987.

[2] G. Ungerboeck, "Binary convolutional codes revisited", chapter in *Communications and Cryptography – Two sides of one tapestry*,

Kluwer Academic Publishers, pp. 399–408, 1994. (Jim Massey's 60th birthday book)

[3] A. Graell Amat, G. Montorsi, S. Benedetto, "Design and decoding of optimal high-rate convolutional codes", *IEEE Trans. Info. Theory*, vol. 50, pp 867–881, May 2004.

[4] IEEE Standard 802.3, Part 3, *Carrier sense multiple access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications*, Clause 55, pp. 453–550, 2008.

[5] J. M. Cioffi, G. P. Dudevoir, M. V. Eyuboglu and G. D. Forney, Jr., "MMSE decision-feedback equalizers and coding— Parts I and II," *IEEE Trans. Commun.*, vol. 43, pp. 2582–2604, Oct. 1995.

# Greetings again from the National Science Foundation!

The Coordinated CISE Solicitation, including NSF 18-568 for CIF, was released in July and reflects several advances on the technical front, alongside some logistic changes. On the technical side, the CCF division has a new cluster on Foundations of Emerging Technologies which encompasses biological communications and signaling, as well as quantum communications, as topics of potential interest to the Information Theory community. The usual CIF topic areas, of course, are still active, and information theory will continue to play a significant role in CIF's funding portfolio.

On the logistical side, the biggest change in this year's Core CISE solicitation is the requirement for meaningful Broadening Participation in Computing plans for all medium (and larger) funded projects. More information on the CISE Directorate's commitment to broadening participation may be found at <https://www.nsf.gov/cise/bpc/>.

Would you like more frequent news from NSF? In addition to these occasional articles in the IT Society Newsletter, CIF has set up a CIF-Announce mailing list where we send news of general interest to the CIF community on approximately a quarterly basis. Typical news items include upcoming deadlines, new program announcements, workshop announcements, and our annual volunteer panelist survey. The volunteer panelist survey conducted in January 2018 had over 300 responses (thank you!) and helped to streamline and update our reviewer invitation process.

If you aren't already subscribed to the CIF-Announce mailing list and would like to do so, just follow these simple instructions:

- Compose an email to [LISTSERV@listserv.nsf.gov](mailto:LISTSERV@listserv.nsf.gov) (leave the subject blank)
- In the body of the message, just write "SUBSCRIBE CIF-Announce Firstname Lastname" (without the quotes and replacing Firstname and Lastname with your name). Alternatively, you can subscribe anonymously by writing "SUBSCRIBE CIF-Announce ANONYMOUS" (without the quotes).
- Send the message. You will receive a confirmation email that you have subscribed. Please read the confirmation email since you may need to respond to it.

A special invitation to Information Theory researchers visiting the US or Canada on sabbatical: *Please respond to the volunteer panelist survey or contact us directly to serve on an NSF panel!* This will offer you a first-hand view of how projects are selected for funding in the US merit-review system, and allow you to judge whether the NSF Merit Review process is indeed the gold standard (as NSF maintains ;). It's also an excellent opportunity to network with your colleagues, and to be exposed to the latest and greatest from some of the brightest minds in the field. In short, any sabbatical stay in North America cannot be considered complete if you have not served on an NSF panel while here.

Concerning related programs, we should also note that the Secure and Trustworthy Cyberspace (SaTC) program has moved to a no-deadline submission regime, meaning that researchers can submit a proposal whenever they feel they have a worthwhile idea. The SaTC program funds cutting edge research in all areas of security, and has measurably benefitted in recent years from the infusion of information-theoretic ideas to privacy, anonymity, and secure communications and storage. Of course, other programs, including Network Technology and Systems (NeTS), Spectrum Efficiency, Energy Efficiency, and Security (SpecEES), Information Integration and Informatics (III), Energy, Power, Control and Networks (EPCN), and Communications, Circuits and Sensing Systems (CCSS), remain areas where information theory, in collaboration with adjacent disciplines, can tip the scales.

The 35-day lapse in appropriations from which we have just returned has impacted many people in the US, both personally and professionally; the Foundation will strive to continue its mission of advancing the scientific community at large. This includes our long-standing commitment to the goals of the Information Theory Society within the CIF portfolio. For more information on how the lapse may impact proposers and awardees, please visit <https://www.nsf.gov/bfa/dias/policy/postshutdown.jsp>.

As usual, if you have workshop ideas on ground-breaking or cutting-edge advances, please be in contact.

Phil Regalia ([pregalia@nsf.gov](mailto:pregalia@nsf.gov))

## Historian's Column

Anthony Ephremides



Even Historians dream sometimes. I know. They are supposed to only report on cold facts. But, they are human too, and sometimes they indulge in their weaknesses.

So, the other day, I had a dream! No, I am not trying to emulate Martin Luther King. My dream was so puny compared to his. But, I did have a dream. As it is mid-summer when these lines are written, this was a true Mid-summer Night Dream. Like Felix Mendelssohn's musical dream, think of it starting as a whisper and gradually strengthening to its apex and then quietly receding back to a whisper and into oblivion.

As I looked back over 50 years of being part of the Information Theory Community, I saw images of the past. I saw people like Fano, Elias, Cover, Massey, Wolf, Pinsker, Dobrushin, and many others who more or less "defined" our Society and who are no longer with us. I did not even think of Shannon. He is outside our grasp. Then I saw images of the present, people like the standard-bearers whom we know so well, and so many others, too many to name. I saw these people and I vividly remembered their aura, their comments, their humor, their sense of values. They illuminated the darkness of my dreaming. Those who are amongst us, continue to enrich our subject of interest with their contributions, and still radiate their wisdom and class. I was wondering why these visions of the past (and present) were dominating my thoughts.

The dream evolved. I saw images of the future. I saw some talented young people who were emerging from the sides of the stage, as it were, and timidly were wondering whether they were worthy of the founders and the contributors who were bigger than life as they looked over them. They were wondering what it was that would make them worthy of entering this wonderful pantheon. Would it be distinctions and awards? Would it be giving speeches and getting applause? Would it be carrying banners of different causes?

My dream tuned into somewhat of a nightmare. I saw suddenly some people pushing each other and vying for position. I saw them planting unrest and discord. I saw them looking at indices of success as measured by numbers of papers published or grants awarded. I even saw them shedding the legacy of the founders on the side. They were ambitious. They were looking for opportunity. They were seeking dominance. They wanted to rise to the top.

What was going on? What had happened to the purity and dedication our elders had taught us? Even they had their little spats and disagreements (like the debate on stargazing and navel contemplation) but always with civility and mutual respect. This was a real nightmare. I went into a denial mode. No, this cannot possibly happen. This Society always had the highest standards of quality, fairness, and commitment to excellence. Is it possible that something terrible happened? Why was I having this awful dream?

Suddenly, it dawned on me. The field has changed. Times have changed. There have been new developments in technology and in the public perception of our field. What with AI, with Big Data, with Machine Learning? How could our Society catch up with

those? Were we oblivious of what was happening? Had we drifted astray? Did we let our predecessors down? No, it cannot be! This Society was blessed with a singular legacy. Its name is **excellence!** So, it should be easy to adapt.

Indeed, the dream drifted into a different mode. I saw most of our members shaking off the lures of the sirens of easy success. I saw them tossing aside those who had tried to push them into extraneous endeavors. I saw a resurging of pride and optimism. I saw the clouds of discord dissipating. I felt like Faust who in his moment of epiphany shames Mefistofele into oblivion. Quoting from the libretto of the relevant opera by Boito, the devil's words are "taci, guarda", which means, "quiet, watch" (referring to the opening of the skies and the appearance of the divine light). To which Faust answers inspired by this moment of epiphany, "Arrestati, sei bello", that is, "Stop, you are beautiful"! What a feeling of liberation! The malaise of the nightmare was lifting. What joy! The clouds seemed to part and reveal Shannon's face again, serene, kind, and reassuring! Now, this was real catharsis.

I could not shake off the impact of this dream. Was I getting too sentimental? Was I imagining things? Had something really happened? Something terrible? Something transformative? One of the definitions of the word "transformative" is the process of a cancerous cell taking over a healthy one. But, there is also another meaning. It is the process of an amorphous and undefined entity acquiring a new and dominant profile, which changes completely its previous condition.

I tell you! It is good to dream, occasionally. It can have curative effects. It can push aside disturbing events. It can escape the haunting effects of discord. It can turn one's attention to the rising sun. It can lower your blood pressure. It can assure you of the goodness of fate and destiny. It can reinforce your faith in the good forces of nature.

For a historian, dreaming is also an escape from harsh reality. It allows a detachment from awful developments. It permits seeing beyond them and detecting glimmers of hope in the darkness. It can boost the faith in the forces of good. It can confirm that the laws of nature simply ensure that in the end only what is good and right prevails.

I hope the readers pause and wonder what made a mature historian get into this mode of dreaming. Was it phantasy? Was it too much white wine? Was it indigestion? Was it perhaps the distillation of recent events that shook him up?

We will never be sure. But, such a dream, even if it borders to a nightmare, in the end it heralds hope and faith in the soundness of the solid roots of our Society and the healthy stock that was bequeathed to us that nobody can corrupt.



# Report Summary of the Ad-hoc Committee on the Historian Column

*Committee Members: Salim El Rouayheb (Chair), Matthieu Bloch, Elza Erkip, Tara Javidi, Daniela Tuninetti.*

This issue's Historian Column prompted a long and perhaps overdue discussion among Board of Governors (BoG) members regarding the editorial process of the IEEE Information Theory Newsletter (NL) and the handling of contributed columns. Some members of the BoG, including the 2018 Society President, expressed their concerns and reservations about the tone and the content of the latest submitted Historian Column, and thus its suitability for the NL. While the BoG recognized Professor Ephremides' decades of contribution to the NL, many members noted that the Historian Column has been unique in providing him a platform to share his perspective on past events, a position not bestowed on any other contributor.

This committee of the BoG was formed in October 2018 to act as an ad-hoc fact-finding committee and make the final editorial decision on the publication of the submitted Historian Column. The committee collected information on the column, investigated the historical precedents and the formal editorial process of the NL. Moreover, the committee sought input from a wide range of IT Society members, including several rounds of interactions with Professor Ephremides. The committee was unanimous in its findings and final decision. The committee chair will present a detailed report on findings and recommendations during the February 2019 meeting of the BoG in San Diego, CA. The present document discusses the rationale for the final decision to publish the submitted Historian Column unaltered, along with a short summary of the committee's conclusions and recommendations to the BoG.

The committee noted that the proposed Historian Column was perceived very differently by different members of the BoG and the IT Society. Some perceived the column as a thinly veiled attack on members of IT Society and their colleagues in the AI and machine learning communities who publicly criticized Professor Ephremides' support letter in the Princeton Title IX case. Others, in contrast, viewed the column as Professor Ephremides' best effort at providing an olive branch of hope coming out of this rough time. Some members worried that the euphemistic language, lacking specificity, would give the impression that the IT Society as a whole does not nurture transparent dialogue on sensitive matters. Some others, in stark contrast, appreciated the fact that the column does not name individuals, and does not even refer to specific events. Some found the column inappropriate as a Historian Column, and noted the absence of historical content apart from vague references to a golden-era, and

perceived its message as berating new-comers and discouraging to younger generation. The committee reached out to Professor Ephremides and summarized the above grievances; however, he did not acknowledge their validity. Given the limited scope of the BoG's directive to the committee, and lack of formal editorial processes for the NL (which is further elaborated below), the committee did not feel that it had the mandate to pronounce one reading more valid than the other, and thus decided to publish the submitted Historian Column unaltered along with a report summary.

The committee came to two important conclusions. Firstly, the NL should remain faithful to its mission to provide highlights of important technical developments, meetings and events, and to communicate issues of interest to members, such as technical awards and recognitions, as well as pointers to and updates on future events. As such, the content should be tailored for a broad segment of the membership and the NL must not be a platform for debating personal opinions and values. Secondly, and more importantly, the current NL editorial process suffers from several shortcomings and, as a result, the NL is not equipped to handle controversial contributions. The committee noted that the Society Bylaws do not specify an editorial committee for the NL except for the NL editor, and therefore the existing editorial committee cannot act as an agent of the BoG. In addition, there are no formal mechanisms for contributed NL columns and no associated term limits for the contributors. The committee expressed concerns with the vague role and appointment process of the current NL editorial committee, as well as the purely default (re-)appointment of individuals in certain roles, such as the Historian, over multiple decades. The committee concluded that the practice of privileging an individual with a regular column without a formal process is outdated and problematic.

In its recommendations to the BoG, the committee asked the BoG to prioritize a set of bylaw revisions to constitute a formal process for the selection and the appointment of the NL editorial board according to established academic standards and best practices regarding diversity and inclusion. The committee also asked the BoG to guide the newly formed NL editorial committee to institute a set of guidelines for contributed columns, including contributor term limits, and formal ways of reviewing content. The committee strongly recommended that the NL stops the publication of such contributed columns until the formal guidelines are in place.

## Latin American Week on Coding and Information



The Latin American Week on Coding and Information (LAWCI) took place at University of Campinas, São Paulo, Brazil. It was a six-days long event (from July 22 to July 27) attended by 96 researchers and students, coming from universities spread upon 14 countries.

This week was an initiative supported by IEEE Information Theory Society and The São Paulo Research Foundation (FAPESP), aiming to become a regular biannual program to foster the research in the area in Latin America.

The program was divided in two parts: the first three days consisted of a school, shaped as the traditional schools promoted by the Information Theory Society. The last three days was devoted to a workshop.

During the three-days school, students attended four mini-courses of four academic hours each, on diverse subjects, given by prominent researchers: *Finite fields, applications and open problems* (Daniel Panario – Carleton University), *Quantum error-correcting codes: Discrete maths meets physics* (Markus Grassl - Max Planck Institute, Erlangen), *Information theory fundamentals and multiple user applications* (Max Costa – University of Campinas) and *Coding for DNA*

*storage in live organisms* (Moshe Schwartz – Ben Gurion University). Also during the school, there was a talk given by the ITsoc Distinguished Lecturer, Ram Zamir (Tel Aviv University, about *The superiority of equiangular tight Frames*.

During the three-days workshop, counted with five invited talks and 24 short communications. The invited talks were: *Different facets of the repair problem* (Alexander Barg – University of Maryland), *Q-ary antipodal matchings and applications* (Gadiel Seroussi - Universidad de La República), *String reconstruction problems inspired by problems in -omic data analysis* (Olga Milenkovic – University of Illinois), *Good algebraic codes exist* (Patrick Solé - CNRS) and *Function computation in networked environments* (Vinay Vaishampayan - City University of New York). There was also a lively poster session, which, besides the posters exhibition, included a flash five-slides oral presentation.

A special attention was given to the social part, including the lunch in the first day and a special closing Brazilian barbecue (churrasco).

A special issue of the Advances in Mathematics of Communications will be devoted to the workshop.

# Report on ShanghaiTech Workshop on Information, Learning and Decision (SWILD) 2018



The first ShanghaiTech Workshop on Information, Learning and Decision (SWILD) was held by the School of Information Science and Technology (SIST) at ShanghaiTech University, from June 30 to July 1, 2018. The workshop featured twenty two talks presented by world-wide researchers from universities and industry. Those talks were broadly divided into four sessions: Network Science, Information Theory, Optimization and Statistics Learning, and Signal Processing.

The workshop attracted more than 300 domestic and foreign participants. The audiences mostly were young faculty members, post-doctoral researchers, graduate students, and final year undergraduate students in related fields from China and the Asian Pacific region.

The social program included a banquet at a dragon-boat like dining hall along the Huangpu River. The attendees enjoyed the scenery on both sides of the river during the banquet when the night fell. Besides, coffee, tea, fruit and snacks were provided all day. This ensured the utmost wellness of all participants.

The organizers, Xiliang Luo, Yanlin Geng, Ziyu Shao, Yuanming Shi and Youlong Wu, would like to thank the staff at the school and volunteers for their great job, and the University for the financial support.

The detailed program, conference photos are all available at the web address <http://sist-swild.shanghaitech.edu.cn/2018>

## President's Column *(continued from page 1)*

the Steering Committee and approval by the BoG, Andrea Goldsmith will be the inaugural EiC of JSAIT.

JSAIT will be a multi-disciplinary journal consisting of special issues that focus on the intersections of information theory with fields such as machine learning, statistics, cryptography, biology, neuroscience, theoretical computer science, economics and physics. These fields and many others rely on the fundamentals of information theory, including concepts such as entropy, mutual information, divergence, capacity, compression, coding and decoding. In addition, several of these fields are looking to develop rigorous mathematical models, analysis, and fundamental performance limits, which can be rooted in information theory. There will also be special issues on important topics firmly within information theory. An important component of the new journal

will be tutorial papers that facilitate our members exploring new fields, and illuminate how information theoretic tools can solve open problems in other disciplines. As such, JSAIT will lead to cross-pollination between information theory and other fields, help incubate new topics in the society and eventually move them into the mainstream. Having a journal focusing on inter-disciplinary topics will allow the Information Theory Society to diversify its technical tools, adapt and respond to new trends and expand the horizon and impact of our field.

I step down as the President of the Society, but I will continue to serve in my capacity as the Junior Past President in 2019, and Senior Past President in 2020. I am also the chair of the Diversity and Inclusion Committee in 2019. I am happy to hear from all of you; please feel free to contact me at [elza@nyu.edu](mailto:elza@nyu.edu).

## Conference Code of Conduct

The following conference code was recently approved by the IEEE Information Theory Society Board of Governors.

The IEEE Information Theory Society Board of Governors (IT-Soc BoG) is committed to ensuring an inclusive, welcoming, and safe environment for everyone in the field of information theory at all of our events and experiences. In particular, we require ITSoc sponsored conference/workshop organizers to commit to uphold this standard at ALL events held at or in conjunction with their main conference/workshop, including those events broadly defined as conference social events and non-technical activities. We advise that at the discretion of the conference chairs, an appropriate variant of the following note be displayed prominently in the conference programs/handouts/websites and that a copy of that variant be emailed to registrants of any ITSoc conferences/workshops/schools at the time of registration:

Conferences, workshops, and technical schools—along with the social outings, events, and activities that are integral components of them—are excellent venues for researchers and scholars who despite the inherent hierarchical nature of the research community in terms of seniority, advancement, contributions, and recognitions, often strive to build communities of collaborators, and friends across seniorities, generations, and institutions. On the other hand, exactly because of their less formal settings, conferences, workshops, and technical schools along with their associated

social events can fall short of providing an inclusive, welcoming, and safe environment for all.

In this context, we are encouraged by a cultural shift to making it safe and supportive for all those who need to report violations. We recognize and acknowledge the importance of ensuring that the academic and professional communities pay more attention, take note, and continue to take appropriate actions. We remind every attendee to help ensure that our events do not become venues for abuse of power, harassment in any form, (including but not limited to harassment based on race, gender, religion, age, color, national origin, ancestry, disability, sexual orientation, or gender identity), and/or bullying. We recommend our attendees to use common sense, support each other, and create a safe space by speaking up against and/or reporting any form of harassment or bullying.

We will also like to remind our attendees to review the IEEE policy against discrimination and harassment and the IEEE code of conduct and follow the suggestions and best practices for how to make the IEEE Information Theory Society conferences and venues safe and inclusive. The ITSoc BoG is continually working on improving procedures to handle incidents and reporting of issues. Meanwhile, we are eager to help participants identify relevant help services. We gratefully accept feedback from the community on policy and actions; please contact the chair and/or any member of the IT Society Committee on Diversity and Inclusion.

## In Memoriam: Vladimir Levenshtein

Alexander Barg

Vladimir Iosifovich Levenshtein (**Владимир Иосифович Левенштейн**), a prominent researcher in coding theory, computer science, and combinatorics, passed away in September 2017. His scientific biography encompasses close to half a century and his legacy has enriched the landscape of coding theory with such terms as *Levenshtein distance*, *Levenshtein bounds*, *Levenshtein's automaton*, and many others. This note presents a brief overview of his research, accompanied by biographical information, and some personal recollections.



Levenshtein was born in Moscow, Russia (then, the USSR) in May 1935. He received his undergraduate degree in mathematics from the Department of Mathematics and Mechanics (MekhMat) of Moscow State University in 1958. He joined the Institute for Applied Mathematics of the Soviet (later, Russian) Academy of Sciences in Moscow and spent his entire scientific career working there. His Ph.D. degree in mathematics was granted by this institute in 1963. Throughout his life he was also closely associated with the Institute for Information Transmission Problems (IITP, Moscow), for many years at-

tending the weekly seminars in coding theory, and becoming personal friends with many information theorists at the IITP.

### Around Synchronization

If it is true that mathematicians are either theory builders or problem solvers, then Levenshtein was a bit of both. His research in the first years after graduation was devoted to classical coding theory, and his first paper came out in 1960 [1]. In it he gave a proof of the following curious fact observed experimentally by Vladimir Siforov a few years earlier. Construct a binary code  $C$  with a given distance  $d$  by adding the

smallest vector in the lexicographic order of binary  $n$ -vectors that is not already in  $C$  and that does not violate the condition on the distance. Siforov noticed that the codes he obtained were always linear (the term of the day was “systematic”), and asked Levenshtein to prove this. Levenshtein obliged, giving a proof and showing that for the suitable values of the length  $n$  and distance  $d = 3$  the code  $C$  thus obtained coincides with the Hamming code.

This theorem was rediscovered a quarter-century later in the well-known “lexicodes” paper by John Conway and Neil Sloane [27] (which also contains many other results).

In 1964 Levenshtein published another result that was to become classic, a construction of a family of codes attaining the well-known Plotkin bound of coding theory relying on Hadamard matrices [2]. This paper introduced his lifelong fascination with extremal problems of coding theory, on which more is said below.

Following the lead of his MekhMat advisor Prof. Oleg Lupanov, Levenshtein spent some years in the 1960s working at the interface of coding theory and finite automata, including coding of their states, synchronization and other properties. Motivated by questions in synchronization as well as some prior work (e.g., [28]), in 1965 he published a paper that is currently among the best known pieces of research originating in information theory. This four-page text [3] introduced the problem of constructing codes for correcting insertions and deletions (‘indels’) in codewords as well as a construction of asymptotically optimal codes that correct one indel error. These codes, based on the Varshamov-Tenengolts construction of codes that correct asymmetric errors, have since appeared in multiple papers on classical as well as modern coding problems. At the same time, what propelled this paper to a classic status (and to over ten thousand citations, of which a thousand were added after the author’s demise), is the notion of the distance that controls properties of the codes that correct synchronization errors. The Levenshtein distance, also known as edit, or Levenshtein-Damerau distance (the latter also accounts for transpositions of adjacent symbols) appears in dozens of modern applications, from sequence alignment for phylogenetic analysis, reference-based genome assembly, DNA-based data storage, and numerous other uses in bioinformatics to spellcheckers and other natural language processing tasks, and has become a household name<sup>1</sup>.

In the second half of the 1960s, Levenshtein published two more results of fundamental importance. The first of these, published in a series of papers, is a study into constructions of codes that correct errors and maintain synchronization. In these works, he generalized the comma-free codes of Golomb, Gordon, and Welch [29], determined the maximum possible size of such codes, and proposed an explicit construction of an infinite family of codes with these properties [4], [5]. Concurrently with this work, Levenshtein developed the first efficient prefix coding scheme of natural numbers [6]. (This result was rediscovered in 1975 by Peter Elias [30].)

### In Pursuit of Optimal Polynomials

In the 1970s Levenshtein focused his efforts on extremal problems. His first work in a series of papers on bounds for codes [7] appeared in 1971. In it, he studied the problem of the maximum size of binary constant weight codes. A constant weight code is a collection of binary vectors of length  $n$  with a fixed number  $w$  of ones. If the distance of the code is  $d$ , then the Hamming balls of radius  $d/2-1$  do not intersect, and this gives the Hamming upper bound on the size of the code. Under the standard approach, one would place the centers of the balls at the codewords and compute their intersections with the sphere of radius  $w$ . Levenshtein noticed that the bound becomes tighter if the balls are intersected with the sphere of a different, slightly greater radius, and obtained a final form of the asymptotic Hamming bound

<sup>1</sup>The well-known scripting language PHP has a function `levenshtein(#1, #2)` that computes this distance for two given string arguments.

for the binary constant weight space. This paper also showed certain monotonicity properties of the bounds that played an important role in later research on upper bounds for codes (e.g., [31]).

Much of the research into bounds on codes in the 1970s was dominated by the groundbreaking thesis of Philippe Delsarte [32]. One of many results in this work was a reduction of the problem of upper bounds on codes in finite metric spaces to an extremal problem for certain real polynomials with nonnegative coefficients. This result was used to great effect in the famous 1977 paper by Robert McEliece and co-authors [33] that derived asymptotic upper bounds on codes and on constant weight codes which are unmoved to this day. A far-reaching extension of this line of work was obtained in the 1978 Kabatyansky-Levenshtein classic [8]. This paper made contributions on many levels. It owes its fame to the new, and the best known to-date, bound on the maximum packing density of  $R^n$  with equal spheres. This bound was derived using a new bound on the maximum cardinality of spherical codes with a given angular distance, obtained in [8] using the same analytic tools as the McEliece et al. bounds for binary codes. At the same time, this paper put forward a general approach of obtaining bounds on packings of metric (and other) spaces endowed with action of a compact group. Representations of the group and positive definite functions that arise as natural Fourier bases, give a general tool for bounding the size of packings (codes), and connect this problem with classic results of Salomon Bochner, Israel Gelfand and others in the area of modern (non-commutative) harmonic analysis and positive-definite kernels. More recent semi-definite programming bounds on codes and optimality proofs of classic lattice packings [34], [35] draw their roots from this work which continues to inspire many decades after its publication<sup>2,3</sup>.

The general approach developed in [8] bore the first fruit a year later: Levenshtein made an advance in another storied problem of discrete geometry, showing that the  $E_8$  and Leech lattices give optimal “kissing configurations” in their respective real spaces [10] (this result was independently proved in the contemporaneous work [37]).

Thus the problem of optimally sized codes, and its Delsarte-dual objects known as designs, was firmly connected with an optimization problem in the space of functions that have nonnegative expansions in the Fourier basis of certain classical orthogonal polynomials. Does this problem have a closed-form solution? In other words, which polynomials give the best Delsarte-type bounds on codes? This problem occupied Levenshtein for some years after [8]. Through an excursion into the theory of classical orthogonal polynomials, he constructed a family of functions that yield universal bounds on codes in the Hamming space and other spaces of interest [9]. That these functions, now known as Levenshtein polynomials, are indeed optimal, was finally shown by Sidelnikov relying on the Gauss-Markov method of moments [38].

Upon developing his theory for several years, Levenshtein published in 1983 a long paper that was to become his *magnum opus* [11]. This work systematically presented bounds on codes in the  $q$ -ary

<sup>2</sup>During the first 30 years of his career, this was the only paper in which Levenshtein had a coauthor. An anecdote that goes with it is that the pair computed the main bound independently and compared the answers, which turned out to be the same. Surprised, Levenshtein agreed to the co-authorship.

<sup>3</sup>An accessible introduction to [8] is given in [36], whose Chapter 9 is devoted to the “Kabatyansky-Levenshtein theory”.

Hamming space, on constant weight binary codes, spherical codes in the real and complex spaces, projective codes, sequences with low cross-correlation, and other related problems. The unfortunate choice of the publication venue (a Russian-only collection) prevented this paper from being better known; those who could read it, myself included, kept returning to it for years to find previously overlooked results and connections. A 4-page compendium of the results in [12] was all that was available to the non-Russian reader. Later the author published excerpts and modernized presentations of his theory in English, such as the Hamming case in [13], the same theory with a focus on designs [14]–[16], a 150-page, dense monograph as a chapter in [17], and a beautiful overview in the Commemorative Issue of our Transactions, coauthored by none other than Philippe Delsarte [18]. He also presented a version of [11] as a dissertation for the advanced degree of Doctor of Science (a second postgraduate degree in the German-French-Russian system) [19], and was awarded this degree by Moscow State University in 1984.

### Post-Bounds

By the mid-1980s Levenshtein was largely done with bounds (even though he spent some more time writing down the various versions and extensions of his theory<sup>4</sup>). In 1992 he returned to the problem of insertions and deletions. The metric had been defined and had made its way into various applications, and some constructions were obtained. Among the classical results of coding theory, one idea had been untouched: namely, are there perfect packings of the indel space? How does one even formulate this question properly? The problem setting and partial answers (in the form of optimal constructions for small values of code length) were given in Levenshtein's comprehensive, technically involved paper [20].

Levenshtein was always focused on research, and conversations with him (in which he would eagerly engage) invariably turned to mathematics. A dominating interlocutor, he would discuss at length the problem that occupied him at that point, linking it with his earlier works and making conjectures on the fly. His thirst for scientific exchanges combined with his passion for traveling were realized when the new opportunities to meet the world opened after the breakup of the Soviet Union. In the 1990s and the first half of the 2000s he traveled to Europe (Norway, Germany, The Netherlands), the US and Japan, and spent extended periods of time at universities around the world. Always open to new problems, he picked up new topics such as group testing [21], constrained coding [22], and involved his hosts in problems that interested him (properties of linear codes [23], graph reconstruction [24]). Papers of these years are more diverse, but there was still one big new idea that he would contribute, the topic of recovering a sequence from its sub- or super-sequences [25], [26].

Vladimir Levenshtein had an open, friendly personality, and it was easy to strike up a conversation with him. Always willing to crack a joke, he wouldn't mind people picking at him, and would not bear a grudge. He possessed a natural child-like curiosity for new problems, places, and people, and preserved this trait throughout his life. He also had a competitive streak in him, and would always take up a challenge, be it mathematics or a chess game. I remember him playing in a simultaneous display given by an international master at a conference in information theory somewhere in Russia. He and the late Sol Golomb were among the last men standing in a field of about fifty (although both eventually fell to the superior power).

<sup>4</sup>I invited him to write about it for a volume I was putting together in 1999; he said that he was tired of writing about this subject.

Levenshtein's travels and intense mathematical pursuits began to take a toll on his health in the mid 2000s. Even though he was always physically active (he loved windsurfing, too), he began to suffer from cardiac problems, and had a massive stroke in 2006. Following this, his life took a sharp turn, and his ability to do research had also diminished. That he lived for a decade more was made possible by selfless devotion of his wife Natalia, of his children, and by the help of several friends from the IITP.

Levenshtein never sought recognition for his work, and his list of awards consists of just one item, the 2006 IEEE Richard W. Hamming medal. It came after the health setback, and he could not travel to pick it up. Sending the medal to Moscow by mail had to overcome many hurdles, from IEEE regulations (of not having insurance to mail a golden item) to the Russian customs (who tried to collect duties on the import of that item), and took many months.

Apart from his wife, Vladimir Levenshtein is survived by his three children and five grandchildren. Those fortunate to have known him will remember his thirst for knowledge and research focus, his amiable personality, his never-ending mathematical "small talk," generosity in sharing ideas, support of young colleagues. He has been, and will be missed by many.

## I. Papers by Vladimir Levenshtein<sup>5</sup>

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[2] —, "The application of Hadamard matrices in coding theory," *Problemy Kibernetiki*, vol. 5, pp. 125–136, 1964, English translation in *Problems of Cybernetics*, vol. 5, pp. 166–184, 1964.

[3] —, "Binary codes capable of correcting deletions, insertions, and reversals," *Doklady Akademii Nauk SSSR*, vol. 163, no. 4, pp. 845–848, 1965, English translation in *Soviet Physics – Doklady*, vol. 10, no. 8, pp. 707–710, 1966. The Russian original is available online from <http://mi.mathnet.ru/dan31411>.

[4] —, "Bounds for codes ensuring error correction and synchronization," *Problemy Peredachi Informatsii*, vol. 5, no. 2, pp. 3–13, 1969, English translation in *Problems of Information Transmission*, vol. 5, no. 2, pp. 1–10, 1969.

[5] —, "A certain method of constructing quasilinear codes that guarantee synchronization in the presence of errors," *Problemy Peredachi Informatsii*, vol. 7, no. 3, pp. 30–40, 1971, English translation in *Problems of Information Transmission*, vol. 7, no. 3, pp. 215–222, 1971.

[6] —, "On the redundancy and delay of decodable coding of natural numbers," *Problemy Kibernetiki*, vol. 20, pp. 173–179, 1968, English translation in *Systems Theory Research*, vol. 20, Consultants Bureau, New York, pp. 149–155, 1971.

[7] —, "On upper bounds for codes with codewords of a fixed weight," *Problemy Peredachi Informatsii*, vol. 7, no. 4, pp. 3–12, 1971, English translation in *Problems of Information Transmission*, vol. 7, pp. 281–287, 1971.

<sup>5</sup>A list of Levenshtein's main publications of about 60 items can be found in the Mathematical Reviews Database at [mathscinet.org](http://mathscinet.org).

- [8] G. A. Kabatyansky and V. I. Levenshtein, "Bounds for packings on the sphere and in the space," *Problemy Peredachi Informatsii*, vol. 14, no. 1, pp. 3–25, 1978, English translation in *Problems of Information Transmission*, vol. 14, no. 1, pp. 1–17, 1978.
- [9] V. I. Levenshtein, "On the choice of polynomials for obtaining bounds in packing problems," VII All-Union Conf. Coding Inform. Theory, Pt. II, Moscow-Vilnius, 1978, pp. 103–108 (in Russian).
- [10] —, "On bounds for packings in  $n$ -dimensional Euclidean space," *Doklady Akademii Nauk SSSR*, vol. 245, pp. 1299–1303, 1979, English translation in *Soviet Math. Dokl.*, vol. 20, pp. 417–421, 1979.
- [11] —, "Bounds for packings of metric spaces and some of their applications," *Problemy Kibernet.*, vol. 40, pp. 43–110 (In Russian), 1983.
- [12] —, "Bounds on the maximum cardinality of a code with bounded modulus of the inner product," *Doklady Akademii Nauk SSSR*, vol. 263, pp. 1303–1308, 1982, English translation in *Soviet Math. – Doklady*, vol. 25, pp. 526–531, 1982.
- [13] —, "Krawtchouk polynomials and universal bounds for codes and designs in Hamming spaces," *IEEE Trans. Inform. Theory*, vol. 41, no. 5, pp. 1303–1321, 1995.
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## Call for Nominations

*(ordered by deadline date)*

### Thomas M. Cover Dissertation Award

The IEEE Information Theory Society Thomas M. Cover Dissertation Award, established in 2013, is awarded annually to the author of an outstanding doctoral dissertation.

**NOMINATION PROCEDURE:** Nominations and letters of endorsement must be submitted by February 1, 2019. All nominations should be submitted using the online nomination forms. Please see <http://www.itsoc.org/cover-award> for details.

### IEEE Joint ComSoc/ITSoc Paper Award

The Communications Society/Information Theory Society Joint Paper Award recognizes outstanding papers that lie at the intersection of communications and information theory. Any paper appearing in a ComSoc or ITSoc publication during the preceding three calendar years is eligible for the award.

**NOMINATION PROCEDURE:** Nominations and letters of endorsement must be submitted by February 15, 2019. All nominations should be submitted using the online nomination forms. Please see <http://www.itsoc.org/honors/comsoc-information-theoryjoint-paper-award/comsoc-itsoc-paper-award-nomination-form> for details. Please include a statement outlining the paper's contributions.



### IEEE Information Theory Society Claude E. Shannon Award

The IEEE Information Theory Society Claude E. Shannon Award is given annually to honor consistent and profound contributions to the field of information theory.

**NOMINATION PROCEDURE:** Nominations and letters of endorsement must be submitted by March 1, 2019. All nominations should be submitted using the online nomination forms. Please see <http://www.itsoc.org/shannon-award> for details.

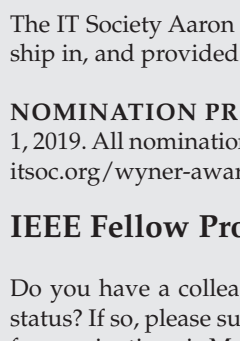
### IEEE Information Theory Society Aaron D. Wyner Distinguished Service Award

The IT Society Aaron D. Wyner Service Award honors individuals who have shown outstanding leadership in, and provided long standing exceptional service to, the Information Theory community.

**NOMINATION PROCEDURE:** Nominations and letters of endorsement must be submitted by March 1, 2019. All nominations should be submitted using the online nomination forms. Please see <http://www.itsoc.org/wyner-award> for details.

### IEEE Fellow Program

Do you have a colleague who is a senior member of IEEE and is deserving of election to IEEE Fellow status? If so, please submit a nomination on his or her behalf to the IEEE Fellow Committee. The deadline for nominations is March 1, 2019.





IEEE Fellow status is granted to a person with an extraordinary record of accomplishments. The honor is conferred by the IEEE Board of Directors, and the total number of Fellow recommendations in any one year is limited to 0.1% of the IEEE voting membership. For further details on the nomination process please consult: <http://www.ieee.org/web/membership/fellows/index.html>

### IEEE Information Theory Society Paper Award

The Information Theory Society Paper Award is given annually for an outstanding publication in the fields of interest to the Society appearing anywhere during the preceding two calendar years. The purpose of this Award is to recognize exceptional publications in the field and to stimulate interest in and encourage contributions to fields of interest of the Society.

**NOMINATION PROCEDURE:** Nominations and letters of endorsement must be submitted by March 15, 2019. All nominations should be submitted using the online nomination forms. Please see <http://www.itsoc.org/honors/information-theory-paper-award/itsoc-paper-award-nomination-form> for details. Please include a statement outlining the paper's contributions.



### IEEE Information Theory Society James L. Massey Research & Teaching Award for Young Scholars

The purpose of this award is to recognize outstanding achievement in research and teaching by young scholars in the Information Theory community. The award winner must be 40 years old or younger and a member of the IEEE Information Theory Society on January 1st of the year nominated.

**NOMINATION PROCEDURE:** Nominations and supporting materials must be submitted by March 15, 2019. All nominations should be submitted using the online nomination forms. Please see <http://www.itsoc.org/honors/massey-award/nominationform> for details.

### IEEE Awards

The IEEE Awards program pays tribute to technical professionals whose exceptional achievements and outstanding contributions have made a lasting impact on technology, society and the engineering profession. For information on the Awards program, and for nomination procedures, please refer to <http://www.ieee.org/portal/pages/about/awards/index.html>

## IEEE Information Theory Society Board of Governors Meeting

**Location:** Hotel Talisa, Vail, USA

**Date:** 17 June 2018

**Time:** The meeting convened at 1:03pm MDT (GMT-6); the meeting adjourned at 7:00 pm.

**Meeting Chair:** Elza Erkip

**Minutes taken by:** Stark Draper

**Meeting Attendees:** Jeff Andrews, Alexander Barg, Matthieu Bloch, Helmut Bölcskei, Guiseppe Caire#, Robert Calderbank#, Suhas Diggavi, Natasha Devroye#, Alexandros Dimakis, Stark Draper, Anthony Ephremides#, Elza Erkip, Christina Fragouli, Andrea Goldsmith#, Stephen Hanly, Tara Javidi, Matt LaFleur#, Muriel Médard#, Neri Merhav#, Prakash Narayan, Alon Orlitsky, Vincent Poor, Chris Rose#, Anand Sarwate#, Igal Sason#, Lalitha Sankar#, Yanina Shkel#, Emina Soljanin, Vincent Tan#, Antonia Tulino#, Dan-

iel Tuninetti, Rüdiger Urbanke, Emanuele Viterbo, Aaron Wagner, Tsachy Weissman\*, Michelle Wigger, Gregory Wornell, Wei Yu.

(Remote attendees denoted by \*, non-voting attendees by #.)

**Business conducted between meetings:** Between the Feb. 2018 and Jun. 2018 Information Theory Society (ITSoc) Board of Governors (BoG) meetings, a number of items of business were conducted and voted upon by email. These items and the results are summarized below:

- 1) Professor Raymond Yeung was elected to serve on the Nominations and Appointment Committee.
- 2) **Motion:** "To approve the budget for ISIT 2020, Los Angeles, USA." The motion passed.
- 3) **Motion:** "To support the 2018 Joint Technology Group/IEEE Information Theory Society Summer School to be held at IIT

Bombay in Mubai, India, in the amount of \$11,250 USD." The motion passed.

- 4) **Motion:** "To provide additional funding in the amount of \$8,000 USD to the children's book *Information in Small Bits*." The motion passed.
- 5) **Motion:** "To provide funding in the amount of \$30,000 USD for the production of two new educational videos in 2018." The motion passed.
- 6) **Motion:** "To approve the draft minutes of the February 2018 ITSoc BoG meeting." The motion passed.

At 1:00 pm local time, ITSoc President Elza Erkip called the meeting to order. She started by reviewing the agenda.

**Motion:** A motion was made to approve the agenda. Elza moved, Aaron Wagner second. The motion passed unanimously.

- 1) **President's Report:** Elza Erkip presented the President's report. She started by discussing the Shannon Documentary, *The Bit Player*, the premier of which will be held here at ISIT'18 in Vail on Tuesday. The director, Mark Levinson, and the actor who plays Shannon in a 1980s interview, John Hutton, will both participate in a question and answer session after the premier; a reception will follow. Elza then reviewed the many Society members that have been instrumental to the process. These include Executive Producers Michelle Effros, Christina Fragouli, Alon Orlitsky, and Rüdiger Urbanke; Creative Producer Sergio Verdú; special thanks were extended to Elza Erkip, Emina Soljanin, and Matt LaFleur. Elza noted that a number of Society members appear in the movie and will be credited as well. There was a round of applause from the BoG.

Elza next discussed the five-year IEEE Society Review that just finished. An in-person review was conducted in February and the report was finalized in April. The review made especial note of two things. The first was the success in the production of the Children's book *Information in Small Bits*, an initiative led by Anna Scaglione and Christina Fragouli. This project targets the youngest audience yet for the IEEE. The second were the ISIT roundtable events run by the Outreach Subcommittee, led by Jörg Kliewer and Aaron Wagner. The IEEE also made five main suggestions. These were (i) to formalize interactions and engagements with both IEEE and non-IEEE entities, (ii) to be pro-active in developing a strategic plan for the Society, (iii) to expand the gender diversity amongst the associate editors (AEs) of the Transactions, (iv) to form technical committees as a method to increase membership, and (v) to develop long-term thinking in addressing the Society's financial situation.

Elza next highlighted Society awards. Frank Kschischang was selected as the Padovani Lecturer for this year's North American School of Information Theory. Alex Dimakis received the James L. Massey Research and Teaching Award for Young Scholars. Jingo Liu received the Thomas M. Cover Dissertation Award. Finally a paper published in the

Transactions revived the 2018 ACM SIGMOBILE "Test-of-Time" Paper Award. This paper "Network Information Flow" was authored by Rudolf Ahlswede, Ning Cao, Shuo-Yen Robert Li, and Raymond W. Yeung, and appeared in the *IEEE Transactions on Information Theory* (henceforth the "Transactions") in Jul. 2000.

Elza next expressed condolences on the passing of Gérard Cohen. Emina Soljanin will say a few words later in the meeting.

In conclusion, Elza discussed the location of the Oct. 2018 BoG meeting. There has been a discussion of whether the third meeting of the year needs to be an in-person meeting and, if it does, whether the recent location in Chicago (scheduled just after the Allerton Conference) continues to be a good choice. There were no comments from BoG members. So, for 2018 at least, the final BoG meeting for 2018 will be held in Chicago on Saturday 6 Oct.

- 2) **Discussion on Society Values with respect to Sexual Harassment:** Elza next introduced the session on Society Values with respect to Sexual Harassment. She referred attendees to the broad discussion of these issues in society and the media and to incidents involving Society members. She remarked that these discussions and events have prompted all our members to think about sexual harassment maybe a bit more carefully than before, and have resulted in a number of activities, decisions, and conversations.

Elza described the purpose of this session as to understand where we are as a society and how we can emphasize and prioritize our values with respect to gender diversity moving forward. Elza referred to a just-released report from the National Academies of Science, Engineering, and Medicine: *Sexual Harassment of Women: Climate, Culture, and Consequences in Academic Sciences, Engineering, and Medicine*. She noted that the report was commissioned prior to the #MeToo movement. Elza pointed to a paragraph from the preface of the report that noted organizational climate and responsiveness is key. She quoted the report: "However, we are encouraged by the research that suggests that the most potent predictor of sexual harassment is organizational climate—the degree to which those in the organization perceive that sexual harassment is or is not tolerated. This means that institutions can take concrete steps to reduce sexual harassment by making systemwide changes that demonstrate how seriously they take this issue and that reflect that they are listening to those who courageously speak up to report their sexual harassment experiences." The objective of the session is thus how ITSoc can improve our own organizational climate in respect to sexual harassment and bullying.

Elza next described how she planned to moderate the session. There would be three parts. (i) The first part involves a motion from Jeff Andrews. The goal of the motion is to assert the values of our society with respect to sexual harassment and retaliation and addresses the type of climate that we would like to have in our society. (ii) The second part involves statements from a number of ITSoc members and meeting attendees. The statements relate to the

recent Title IX events at Princeton and to a letter that was sent to Princeton. Elza proposed to conduct this second part of the session in three rounds. In the first round Elza would distribute hardcopies of written statements that had been sent to her on the subject. Meeting attendees would have about 15 minutes to read these statements. In the second round, a number of people who had contacted Elza prior to the meeting would be given an opportunity to address the attendees. In the third round, Elza would ask the audience if anyone else in attendance would like to present their perspective and thoughts. In all three rounds Elza asked all attendees only to listen. This part of the session is not intended as a conversation or debate, but rather as an opportunity to hear and reflect on the perspectives of all our colleagues. At the end of the three rounds the conversation will pause. (iii) The third part of the conversation would, indeed, not be part of the BoG meeting, but rather would take place in a follow-up session on Wednesday. As with the BoG meeting, the Wednesday session would be open to all Society members. It would pick up from where we leave off today, after we have all had time to reflect on, discuss, and digest the perspectives presented here in the BoG meeting. The goal Wednesday would be to build on today's motion and discussion to determine what concrete steps ITSoc can take to create an organizational climate that perceives that sexual harassment will not be tolerated.

Elza asked for any comments on her plan for the session. There were none. Per the proposed format, the meeting therefore moved on to the first part.

Jeff Andrews presented the following motion:

**Motion:** "The Board of Governors condemns sexual harassment in the strongest terms and affirms that the Information Theory Society will be guided by best practices as outlined in the National Academies 2018 report suggesting 'that the most potent predictor of sexual harassment is organizational climate' and that research communities 'can take concrete steps to reduce sexual harassment by demonstrating how seriously' they 'listen to those who courageously speak up to report their sexual harassment experiences.'

"We therefore reaffirm that the guiding principle for ITSoc volunteers and members is to act ethically and respectfully towards other members, not to denigrate victims or reporters of sexual harassment, nor discourage other members from reporting sexual harassment. Volunteers and members are not to engage in any form of retaliation, bullying or cyber-bullying around sexual harassment cases. Volunteers and members are reminded that the IEEE has policies and procedures in place to handle reported violations."

The motion was made by Jeff and seconded by Helmut Bölcskei. After some discussion and proposed modifications accepted by Jeff (see below and incorporated into the version above) the motion passed unanimously.

The first question asked in the discussion was whether the IEEE already has a policy on sexual harassment. The

response was in the positive. Not only does the IEEE have a policy, but the ITSoc BoG passed a motion to reaffirm the policy in the Feb. 2018 BoG meeting. However, while the IEEE does have a statement, it is embedded in IEEE documents. In contrast, this statement would come directly from the Society. Some discussion of the wording of the original motion were raised, e.g., whether the wording would commit the BoG to follow "best practices" that it currently had not read nor considered. Some changes to the motion were made (reflected above) to adjust this, e.g., "guided by" best practices as well as to fix some typos. A question was raised as to consequence: What happens if people do engage in sexual harassment, retaliation, bullying, or cyber-bullying? There are consequences described in IEEE policy documents which we all agree to when joining the IEEE. A question was raised whether there is an obligation to report violations to the IEEE. There is no obligation to report. In fact, the Society cannot report violations to the IEEE, only individuals can report. The statement was modified to reflect this discussion in its last sentence, reminding members that the IEEE has procedures in place for reporting. The discussion then continued on to how this statement would get distributed and publicized in practice, e.g., through posting to the ITSoc website, publication in the Newsletter, highlighted in the presidential column. An analogy was made to the distribution of the ITSoc BoG Feb. 2018 reaffirmations of the IEEE Code of Conduct, IEEE Code of Ethics, and IEEE Nondiscrimination Policy, which has since been posted on our website and announced to ITSoc members via email.

The BoG next moved onto the second part of the session. Per the proposed format, Elza coordinated an open session for ITSoc members (BoG members as well as the general membership) to present their thoughts on the topic of this agenda item. Presenters included Society members who could not attend the ISIT that had submitted written statements to Elza, a number of members who had contacted Elza ahead of time requesting an opportunity to speak, and a number of meeting attendees who decided on the spot to make statements. Elza described the purpose of the session as not to adjudicate, but rather to listen to each other and to hear each others' thoughts and opinions and to learn about each others' experiences. She asked all to listen respectfully and to refrain from commenting on what others have said or done. The format Elza outlined (already described above) gave each person an uninterrupted time to speak to the attendees. Elza first circulated print-outs of the written statements she had received ahead of time. These included statements from (in alphabetical order) Daniel Costello, Anthony Ephremides, Robert Gallager, Andrea Goldsmith, Robert Gray, and David Tse. Elza gave attendees about 15 minutes to read through these statement. Next, Elza moved on to those speakers in attendance who had contacted her in advance. Again, these speakers spoke in (mostly) alphabetical order. These speakers included Tsachy Weissman, Anthony Ephremides (who read his written statement), Giuseppe Caire, Prakash Narayan, Robert Calderbank, Yana Shkel, Aaron Wagner, and Alon Orlitsky. Next, Elza turned to the attendees and asked if anyone in attendance would like to speak. These speakers included Jeff Andrews, Matthieu Bloch, Michelle Wigger, Muriel Médard (whom Robert Gray had asked to read his written statement to the

BoG), Neri Merhav, Suhas Diggavi, Helmut Bölcskei, and Lalitha Sankar. At this point there were no further speakers.

Elza then wrapped up the session. She told the meeting attendees that she was very happy to hear from so many voices and to hear all perspectives. She saw this as the first step in a healing process, hearing all perspectives and having time for quiet introspection before moving forward. There are not clear cut sides in these issues, we need to think for ourselves personally and as a society and consider what could we have done better, and could do better moving forward. Similar to a personal or family illness, as a society we are going through a tough period. This could be a teaching moment. She hopes that, going forward, we will become a better society than we would have been otherwise. She heard many voices just now thinking about how to move forward. We need to think about how to move forward in the context of serious consideration of the motion we have just passed. We need to recognize how impactful sexual harassment is and how we can create a climate where we do not tolerate such things. Beyond formal procedures with the IEEE, events can be below the threshold of formal complaints and yet be present in the organizational culture. She asked how we can address sexual harassment and bullying? Do we have trusted people to whom a student can go? Is there a way to address events early before things escalate? She hopes we can use this session as a starting point to go forward from. Elza thanked her fellow officers—Alon, Rüdiger, Emina, and Helmut—for helping organize this session which she felt worked out well. Elza closed by looking forward to the Wednesday session and invited attendees (and ITSoc more broadly) to think further about what to do next and to bring those ideas to the Wednesday meeting.

- 3) **Treasurer's Report:** ITSoc Treasurer Aaron Wagner next presented his report. Aaron presented a plot of the Societal year-end operational surplus from 2008 through 2018. In 2009 the surplus was (positive) \$500k USD. This year the estimate is (negative) \$70k USD. The predicted loss for this year excludes new initiatives. He next described the structural changes in the budget, focusing on the profit centers of the 2015 and 2016 budgets. These include the Transactions (revenue from IEEE Xplore and subscriptions, costs due to editing, printing, mailing), conference publications (revenue from IEEE Xplore), conference surpluses (revenue from conferences, costs to run conference and to fund schools), and membership fees (revenue). Between 2015 and 2016 there was a decrease of over \$200k in ITSoc year-end profits. The main contributors to the decline include a marked decrease in IEEE Xplore revenue generated by the Transactions, and the lack of conference profits. Other increased costs included a redesign of the the ITSoc website and increased activity by ITSoc committees (these include the Distinguished Lecture Program, Women in Information Theory, mentoring round tables, the editorial board dinner, some travel, and ITSoc administrator Matt LaFleur's salary). As reported by Elza in her President's address, some of the committee activities were positively remarked on in the IEEE five year societal review.

Aaron next focused on the revenue and costs of the Transactions over the past few years. Since 2014 revenue from Transactions has been decreasing roughly linearly

(from about \$900k USD in 2014 to about \$700k USD in 2017). In contrast, costs have been relatively constant in that period. ITSoc revenue from the Transactions is determined by subscriptions, the number of articles published, and the number of "clicks" (IEEE Xplore downloads). In 2015 there were 622,000 downloads of article that had appeared in the Transactions, while by 2017 that number had decreased to 463,000. Furthermore, while the number of articles that appear in the Transactions each year has held relatively constant, the total number of papers published by the IEEE grows by about 8–10% per year. Since librarians are the IEEE's main customer and they think in terms of number of articles (and not by page count), this means that the Transactions forms a shrinking fraction of the available IEEE content, which also contributes to a decrease in revenue. Aaron also looked forward. While it has not yet kicked in, the IEEE is revising the revenue model. The new model will be phased in over five years and is more "click"-driven. While Aaron anticipates a small bump in societal profits to result from the new model in the short term, in the longer term he anticipates a decrease in revenue. Aaron concluded his discussion of the Transactions by noting that the Society makes a (small) profit from the print subscriptions. Reviewing some other trends (e.g., a very slow decrease in membership revenue, income from conferences, and the cost of supporting schools) Aaron concluded that the drop in the profit from the Transactions (from \$600k USD in 2014 to \$400k USD in 2017) is the most important trend.

Aaron then recapped societal finances for 2017 and 2018. The Society ended 2017 with a surplus of \$30k USD. The forecast for 2018 is that ITSoc will end the year with a deficit of \$68k USD. The main cause of this predicted deficit is the decrease of \$85k USD in Transactions revenue just mentioned. Aaron asked all BoG members and committee chairs to limit expenses. Looking forward to 2019, the IEEE is requesting ITSoc to submit a budget for 2019 that will attain a surplus of \$22k USD. Aaron is working on the budget. The initial draft will be provided to the IEEE in early July.

Addressing the question of whether deficits are a real problem for ITSoc, Aaron noted that at the start of last year ITSoc reserves were \$4.3 million USD, and increased to \$5 million USD due to income from investments. However, while the reserves are large, the IEEE does not "officially" allow deficit spending, i.e., it is unclear whether the IEEE would approve a planned budget for 2019 that targets a year-end loss. He reminded the BoG that after a Society has deficits in any two years out of a three-year sliding window, the IEEE can step in. Finally there was a discussion of how the Society can access its reserves for new initiatives via the "3% Rule". (Please see minutes of other BoG meetings for detailed discussion of the 3% Rule.)

Turning to planning, Aaron then asked whether the Society should take concerted action to address Society finances. On the one hand, ITSoc has not run a deficit for a long time, the reserves are large (and running a deficit is one way to tap into them), ITSoc was forecast to end 2017 in deficit and did not, so things often have a way of working themselves out. On the other hand, the structural trends are clear, it takes time to implement change, without income the Society

has less flexibility, and were the IEEE to step in the BoG and the Society would lose some control. So, Aaron concluded, it's a matter of being proactive versus reactive. BoG members asked some questions regarding comparison to trends in other societies' finances (since we are all affected by click rates). One difference with other IEEE societies is that, since revenue from the Transactions was historically so large, the ITSoc BoG has, to date, asked conferences to target very small profits.

Aaron then proposed the following motion on forming an ad-hoc committee.

**Motion:** "Whereas: The Society is expecting operational budget deficits in the future; The BoG wishes to form a strategic plan for how to alter its revenues and costs in response to the expected deficits; and The BoG desires input on the strategic plan from a diverse set of stakeholders.

"Be it resolved: That the president shall appoint an *Ad-hoc Committee on Society Finances* with a charge to review all aspects of the Society's finances and report recommendations on changes the Society should make in response to anticipated deficits; and That the committee shall consist of members representing publications, conferences, schools; someone who has served or is serving as Society treasurer; and others that the president may select."

Aaron made the motion and it was seconded by Suhas Diggavi. The motion was passed unanimously

In conclusion, Aaron asked for proposals for "new initiatives" for 2019. It was discussed that new journals and magazines do not classify as new initiatives. That said, while the funding for new publications must be drawn from operating revenue (rather than from reserves), the IEEE does understand that the cost of launching a new publication will outweigh revenues for the first few years. The IEEE will take that into account if the Society ends up with losses for the first few years of the launch.

- 4) **Nominations and Appointments (N&A) Committees:** Nominations and Appointments (N&A) Committee Chair Alon Orlitsky began by reviewing the committee members (himself, Gerhard Kramer, Amos Lapidoth, Rüdiger Urbanke, and Raymond Yeung) and the set of nominations and appointments that the Committee oversees (External Nominations, Awards, Massey, Cover, Shannon, Outreach Chair, IEEE Fellows, Executive Editor, Wyner, and the BoG Slate). Alon recapped appointments and nominations made by the N&A and Membership committees at the February 2018 BoG meeting. The nominations were also confirmed at that meeting by the BoG. These include Stark Draper as Chair of the Schools Committee, Antonia Tulino to membership of the IEEE Fellows Committee, Yony Murin as the ITSoc Young Professional Representative, Vincent Tan as Outreach Subcommittee Chair, and Igal Sason as Executive Editor of the Transactions. In addition since the last meeting the chair of the External Nominations committee had to step down. Last year's chair, David Neuhoff, has agreed to step in for the

rest of 2018. Finally the Committee assembled a slate of 12 candidates for election to the ITSoc BoG. The election will be conducted by the IEEE. Alon then reviewed the statistics of the current BoG and the procedure followed to assemble the slate. The current BoG has 27 members, 20 men and 7 women; 20 members are from the US, 3 from Europe, 2 from Canada, and 2 from Australia. Of the 8 BoG members retiring all are male, 6 are from the US, 1 is from Canada, and 1 is from Australia. The considerations the Committee weighted in assembling the slate was qualification (in research and past contributions to ITSoc), balance (amongst levels of seniority and geographic diversity), and goals (increased involvement—only those retiring BoG members actively involved in activities were asked to stay for a second term—and acceptable attendance—all candidates were asked to attend at least two BoG meetings in person annually). He then reviewed the slate of 12 candidates, the bios of whom had been circulated to the BoG two weeks prior to the meeting. (Coming out of the committee, the slate of candidates did not need to be voted on.) Alon next reminding the BoG that revisions to the ITSoc Constitution and Bylaws are typically discussed and voted on in the October meeting. Alon next turned to the election of the ITSoc officers. At the BoG meeting names are proposed, with voting conducted online.

Alon asked for nominations to the position of second vice president: (i) Emanuele Viterbo was nominated by Helmut Bölcskei; (ii) Stephen Hanly was nominated by Alexander Barg. Alon then asked for nominations to the position of first vice president: Helmut was nominated, a nomination seconded by Jeff Andrews. Finally, Alon asked for nominations to the position of president: Elza Erkip nominated Emina Soljanin, a nomination seconded by Emanuele Viterbo.

- 5) **Awards Committee:** Awards Committee Chair Emina Soljanin started by remembering Gérard Cohen. She said that Gérard was both a great coding theorist and shared her sense of humor. There have already been events organized to remember Gérard. Emina hopes that something will be organized at ISIT'19 in Paris so that Gérard's family can attend.

Emina next reviewed the Awards Committee for 2018. She started by reviewing the logistics of the Awards Committee, the membership of the committee (noting that this year's Committee included more female than male members), the spread of expertise on the committee, and the dynamics of retiring members going forward. She also reviewed the process for selecting the ISIT student paper award, and activities surrounding the Joint Communications Society/Information Theory Society Paper Award. The Awards Committee had distributed a report on the Information Theory Best Paper Award to the BoG three weeks prior to the meeting. She talked through the nominations for the best paper award and the process followed by the Committee.

**Motion:** "To accept the report of the Awards Committee." The motion passed.

**Motion:** "To award the paper per the recommendation of the Awards Committee." The motion passed.

- 6) **Membership Committee:** Membership Committee Chair Helmut Bölcskei focused his report on the proposed reorganization of the Membership Committee. There are three main changes. First, the School Subcommittee would be moved into the Conference Committee. The Student and Outreach Subcommittees would be combined and would consist of two regular members (with staggered two-year terms) and two student or post-doc members each serving one-year terms. Finally, the number of regular members of the Membership Committee would be reduced from four to two; one would serve as chapters liaison, one would serve as WITHITS liaison. There is also one other member, the Young Professionals Representative. He also reviewed who would be the voting members of the committee and the processes for appointing the various members to the subcommittees. These proposed changes need to be incorporated into the Bylaws prior to adoption.
- 7) **Fellows and Massey Committees:** Helmut Bölcskei next turned to the Fellows and Massey Committees, both of which he also chairs. Helmut reported that this year there were eleven strong nominations for IEEE Fellow. The evaluations were submitted to the IEEE in mid-June, with decisions by Nov. 2018. He thanked the members of the Committee (Antonia Tulino, Ning Cai, Max Costa, Pramod Viswanath, Emanuele Viterbo, Hirosuke Yamamoto) for their work. He next turned to the Massey Award Committee. This committee received eight strong nominations. He thanked the members of the Committee (Tara Javidi, Erdal Arıkan, Vivek Borkar, Tom Fuja, Krishna Narayanan) for their work.
- 8) **Conference Committee:** Conference Committee Chair Emanuele Viterbo first reviewed the makeup of the committee (himself, Salman Avestimehr, Elza Erkip, Albert Guillén i Fàbregas, Brian Kurkoski, Chen Li, Alfonso Martinez, Emina Soljanin, Daniela Tuninetti, and Aaron Wagner). Emanuele reported that ISIT'17 Aachen closed with a 10% surplus. There is nothing to report about ISIT'18 Vail. ISIT'19 Paris accepted an offer to use the Conference Management System (CMS) for a three-year period. At the moment this contract is being processed by the IEEE. ISIT'20 Los Angeles has nothing to report. ISIT'21 Melbourne is now registered with IEEE. A presentation from an organizing committee to hold ISIT'22 in Helsinki, Finland, was to follow later in the meeting. There has been an expression of interest to hold ISIT'23 in New York City. Regarding ITSoc workshops, ITW'18 Guangzhou is on-track and ITW'19 Sweden is registered. The proposal to hold ITW'20 in Milan turned out to be too expensive. The organizing committee is therefore instead looking into holding the workshop at Garda Lake. The revised proposal is expected to be presented at the next BoG meeting.

Next Emanuele discussed ideas on how to reduce conference budgets. These included replacing the Award Luncheon with lighter fare, making the banquet optional (e.g., through a limited registration category), selection of cheaper venues (e.g., on-campus), improving efficiencies through multi-year contracts (e.g., with CMS), and optimizing the number of coffee breaks. Emanuele proposed to have a working group to define new formats for ISIT and ITW to keep registration fees manageable while providing sufficient profits to sus-

tain other important ITSoc activities such as schools. In the discussion the BoG was supportive of these ideas. A question was raised about the trouble some students have in acquiring visa to attend ISIT'18 Vail. It seems visas can be a problem regardless of the country in which a conference is located.

Muriel Médard next presented the proposal to hold ISIT 2022 in Helsinki, Finland. This was a revision of a previous proposal to hold ISIT in Helsinki that had not been chosen. Muriel reviewed the experience of the organizing committee, some details about the location, ISITs previously held in Scandinavia (Sweden in 1976 and Norway in 1994), and quickly focused in on the question of venue. The organizing committee had identified two possible locals: Finlandia Hall in central Helsinki or The Otaniemi Campus of Aalto University, which is a ten minute subway ride from downtown. The former option would result in a 10% surplus, the latter is less expensive so the surplus would be 20%. The organizing committee requested feedback from the BoG on which venue was preferable. After a discussion on the proximity of lecture rooms relative to one another, the availability of on-campus housing options, and whether lunch would be included (lunch is included in the Aalto campus option), the following motion was made.

**Motion:** "To hold ISIT 2022 in Helsinki." The motion carried unanimously.

To provide feedback to the organizers on the choice of venue the BoG held a straw poll. There were 4 votes to hold ISIT in Finlandia Hall in downtown Helsinki. There were 13 votes to hold ISIT on the Aalto University Campus. There were 3 abstentions.

- 9) **Schools Subcommittee:** School Subcommittee Chair Stark Draper first reviewed the Committee membership (himself, Helmut Bölcskei, and Parastoo Sadeghi), the schools already held or planned for 2018 (ESIT'18 in Berinoro, Italy; NASIT'18 in College Station, TX; and India'18 in Mumbai, India), and school planned or proposed for 2019 (ESIT'19 in Sophia Antipolis, France; NASIT'19 in Boston, MA; Australia'19 in Sydney, Australia; and India'19). Stark asked all organizers to contact him early in the year prior to when their proposed school is to be held to let him know of their intent to make a proposal. With the current severe constraints on ITSoc's budget and without sufficient notification there may not be budget available to support a school. Motions to support should be submitted to the BoG roughly one year prior to when the school will be held. Stark also discussed that one task of the Committee is to formulate "best practices" to help organizers arrange and run schools as well as to collect data on attendance. There is interest to have ITSoc support a new school in East Asia. This year ITSoc was not able to support a school in Taiwan due to budgetary constraints. The Committee aims to be able to support such a new school as a new initiative for the period 2020-2022 (new initiatives can last for up to three years). Regarding attendance at schools the BoG asked how the proliferation of "schools", beyond just those organized by ITSoc, has impacted attendance at ITSoc schools. This seemed an interesting question that could be measured through the aforementioned collection of statistics.

Next, Anand Sarwate presented a proposal to hold the 2019 North American School on Information Theory (NASIT) at Boston University. The proposal is to hold NASIT'19 over the 4th of July weekend, the week prior to ISIT'19. The hope is that this will make attending the school viable for students located on the west coast of the US. Such attendees can fly to the school in Boston one week and then continue on to Paris the next week. Housing for attendees would be provided at the Boston University dorms, a 15 min walk to the school. Anand reviewed the tentative technical program, four speakers have already been lined up. The budget was about \$55k USD.

**Motion:** "To support the holding of NASIT 2019 at Boston University, Boston, USA, and to support NASIT'19 in the amount of \$15,000 USD."

In the discussion of the motion the treasurer indicated that the Padovani fund now does not only support the travel and accommodations of the Padovani lecturer (the lecture is delivered at NASIT), but also contributes an additional \$10k USD to spend on student activities at NASIT. It was asked whether this was included in, or was in addition to, the \$15k request. Stark indicated that he was not aware of this \$10k USD from the Padovani fund. As the Treasurer indicated that the 2019 budget is due in early July, Stark told the BoG he would work with the Treasurer to determine the funding level for NASIT'19 (and the other schools) taking into account the Padovani Funds, bringing a motion back to the BoG for email vote later in the summer. He therefore modified his original (above) motion as follows:

**Motion:** "To support the holding of NASIT 2019 at Boston University, Boston, USA, with the funding level to be determined." This motion was passed unanimously.

10) **Publications:** Transactions Editor-in-Chief (EiC) Prakash Narayan next discussed the state of the Transactions. Prakash reviewed the statistics for the Transactions. In 2013 the sub-to-epub average was 20.7 months, by the end of 2017 it had dropped to 13.7 months. He noted that the reduction in sub-to-epub time has created a bit of a bottleneck, meaning that some accepted papers experience significant delays before appearing in print; the backlog is currently a few months. Prakash then reviewed the number of submissions and page counts over the past two years (both relatively constant) and the special issue in memory of Solomon W. Golomb. Prakash next reviewed some new initiatives. These include invited (and reviewed) cross-cutting articles in ideas from information theory and emerging developments in complementary fields. The aim is to publish three to four articles per year by teams of authors. The first three of these are either currently in review or are expected to be received for review this summer. The BoG asked how these articles will be advertised. Prakash responded that they will both appear as the first article in the issue of the Transactions and will likely be further highlighted in a suitable way, e.g., perhaps with a short preamble by (at that point) former EiC Prakash Narayan. Prakash reviewed the retiring Associate Editors and thanked them for their efforts on behalf of the Transaction. He next presented a slate of new Associate Editors, whose resumes had been circulated to the BoG.

**Motion:** "To approve the slate of new associate editors to the editorial board." The motion carried unanimously.

Prakash then reviewed the shift in the shift-register. Alexander Barg will assume the position of EiC on 1 July 2018, and Igal Sason will assume the position of Executive Editor (EE) on 1 July as well. In 2019 the Nominations and Appointments Committee will present to the BoG a nomination for the next EE.

Prakash concluded his final report as EiC by thanking many people. He first thanked Sasha Barg for working closely and harmoniously with him as EE. He also worked with Igal Sason as AE and stated that Igal will make a great new EE. Prakash thanked both previous EiCs Helmut Bölcskei and Frank Kschischang for their help and advice. He thanked the Presidents of the ITSoc BoG whom he worked with: Alon and Rudi and Elza. He thanked Anand Sarwate for developing the mechanism to push the Transactions table-of-contents to the membership by email each month. Finally, he thanked the IEEE staff with whom he worked: Matt Lafleur and especially Lisa Jess (IEEE Publishing Operations) and Megan Hernandez (IEEE Periodicals). Prakash wished to go on record with a final request: He requested that once ITSoc finances have improved, that Lisa and Megan be invited to an ISIT to be recognized for their excellent service.

Following the conclusion of Prakash's report, Elza stood up to thank Prakash for all his work, for the downward trend in sub-to-epub, and for initiating the push notifications. Helmut Bölcskei added his thoughts that this is the hardest job the Society has to offer. The BoG applauded Prakash for his efforts.

11) **Online Committee:** Online Editor and Online Committee Chair Anand Sarwate next provided a status update. Anand will complete his term of service at the end of 2018. Looking forward to the change over in the role of Online Editor, Anand suggested the Society implement a shift-register system similar to that now used by the Transactions. He encouraged all Society members to click on the links in the autonomously disseminated table-of-contents; that will be good for the Transactions and for the Society. Anand wasn't sure how best to promote the Shannon documentary through the website, but figured that that should be done. The film should drive people (researchers and the general public) to the website to learn more about information theory. Anand then reviewed some technical needs of the website. The version of the content management system used by the website (Plone) will shortly become obsolete. Thus, an update (from Plone 4.x to Plone 5.xx) is needed. While the upgrade will not be cheap, it should last for five to six years. Anand reviewed the history of the (below-budgeted) spending of the Online Committee and the proposed work to upgrade the system (which will be split across two phases of one year's duration each). In 2018 the phase one upgrade of the upgrade from Plone 4.x to Plone 5.xx will occur. Some website enhancements and existing service/bug fixes will also be implemented. The contract with the developers was structured to be flexible enough that all these deliverables can fit under the statement of work for this year. In total this

work would cost less than \$48k USD (the \$48k includes the Online Committee's already-allocated budget for 2018). A new contract would be issued in 2019 for phase two of the upgrade. The second phase would cost between \$32,000 and \$40,000. The allocation for those resources will be requested in the 2019 budget.

At this point in the discussion the Treasurer clarified for the BoG that the monies requested would come from new initiatives funds already accounted for in the 2018 ITSoc budget.

**Motion:** "The Online Committee requests an additional \$48k USD (\$33k + \$15k) as a new initiative to bring new and enhanced functionality for the itsoc.org site." The motion was approved unanimously.

12) **WITHITS:** The Women in Information Theory (WITHITS) Committee Chairs Natasha Devroye and Lalitha Sankar reviewed WITHITS events that had been conducted in the past couple years. Lalitha started by describing the "Samoan Circle" event that was held at ISIT'16 with topics that include the tenure process, challenges in transitions, finding good mentors, parenting as an academic, how to mentor and advise female students, and the role of gender in the academic job search and evaluation process. There were over 70 participants (both male and female). Many of the discussions initiated at ISIT'16 continued at the Allerton'16 WITHITS event. Topics of discussion at Allerton included how to work with male students that respond poorly to female mentors and advisers, advising students of opposite genders through life-events such as childbirth, and the particular challenges women face in landing academic positions. The ITA'17 lunch event focused on statistics, in particular statistics concerning gender and awards (awardees and nominations). Andrea Goldsmith led the discussion focusing on her efforts within the IEEE Technical Activities Board (TAB) to collect statistics on diversity and representation. At ISIT'17 a speed network evening was held that was attended by almost 80 students, postdocs, and faculty. The format was rotating one-minute "speed chats" with senior members of the Society. Finally, at ITA'18 the focus returned to statistics with a two-part binary questionnaire that revealed sobering statistics on women in the workforce worldwide as well as in academia in particular. This format will be continued here at ISIT'18 with a lunch event "Know your stats". Lalitha and Natasha then looked to the future. They are both ready to step down from their roles and need new volunteers. They foresee that with the nascent move of WITHITS to within the Membership Committee the process of hand-off could be regularized. Elza then stood to take the opportunity to thank Natasha and Lalitha for their work. She emphasized that the events are not just for women and are more interesting when the attendance is diverse. The BoG applauded Natasha and Lalitha.

13) **Ad-hoc Committee on Diversity and Inclusion:** Elza Erkip next presented an update on the Ad-Hoc Committee on Diversity and Inclusion, the creation of which was approved at the Feb. 2018 BoG meeting. She first reviewed the membership of the committee: herself (chair), Stark Draper, Sid Jaggi, Tara Javidi, Muriel Médard, Emanuele Viterbo. In

arranging the membership of the Committee the aim was to capture broad geographic and gender diversity as well as representation from the Conference and Schools Committees. Elza reviewed the initial tasks of the Committee: the collection of data and creation of metrics on diversity and inclusion, the development of best practices for conference, schools, and committees, the creation of a conference code of conduct (a direct charge of the BoG), and review of IEEE policies as well as the Title IX process.

The committee started by considering the definition of "diversity". There is quite a diversity of diversities, including gender, geographic, seniority, professional sector, ethnicity, religion, gender identity, sexual orientation, disability, and more. The Committee thereafter focused on four main tasks: (i) the collection of data on gender and geographic diversity starting with easier-to-collect publicly available data, (ii) the development of initial ideas on best practices for conferences, schools and committees, (iii) the revision of the draft conference code of conduct presented to the BoG at the Feb. 2018 BoG meeting, and (iv) better understanding of IEEE and Title IX processes. Elza commented that the IEEE is also working on a general conference code of conduct, so the ad-hoc committee temporarily put task (iii) on hold, awaiting the outcome of that process.

Elza then reviewed for the BoG some of the data collected in task (i): Shannon Award (1 female awardee of 40 Shannon Award winners), IT Paper Award (no female awardees of 64 papers with 125 authors). One might hypothesize that this is a matter of seniority, but Elza pointed out that the Jack K. Wolf ISIT Student Paper Award has been awarded to 32 papers with 85 authors since 2007. Of the 85 authors three were women, though none of the three female authors were students authors; all were female faculty members. A BoG member raised the question of the composition of the nominations to these awards. Elza replied that it is much harder to garner data on who was nominated, public data only records recipients. However, going forward that data can be recorded.

Elza next discussed the gender composition of various committees. She indicated that her numbers do not include ex-officio members. Since 2004 the Awards Committee (which deals with paper awards) has had 134 members, 18 of whom were women. i.e., 13.4%. (As mentioned above, Emina already noted in her report that in 2018 the Awards Committee is 50% female.) In contrast, the Shannon and N&A Committees have no female members. The EiC volunteered that currently 9 of the 52 members of the editorial board of the Transactions are women, and with the new AEs coming on board that will likely increase to a bit over 20%.

Elza next turned to lessons learned. First, it is time consuming to collect data. Even the data collected by the Committee to date by took quite some time to assemble. Second, best practices for conferences, schools, and committees need to be developed in accordance with scientific research on the subject (e.g., to expand the pool of nominees in terms of both geographic and gender diversity). Subsequently, adherence to these best practices and the impact of these practices needs to be tracked. Third, the conference code of conduct



needs to align with the IEEE conference code. And, finally, ITSoc needs to work closely with the IEEE in terms of its policies and Title IX.

In summary, Elza summarized the experience of the past few months as being that a standing committee is required. This will help to track complex and evolving notions of diversity and will enable ITSoc to be in better step with the IEEE, e.g., with the IEEE Committee on Diversity and Inclusion. The charter of such a standing committee should allow it to evolve as committee members better understand the landscape of diversity and inclusion and what is needed. As one example Elza noted that, e.g., physical disabilities were not on the radar of the committee at the start, so one purpose of having a standing committee is that we are learning what diversity means as we go and, without have a group of people actively thinking about these issues, we won't realize what we don't know.

The BoG then turned to a discussion of Elza's report and the possible formation of such a standing committee. Elza was first queried about possible overlaps with WITHITS and the Outreach Committees. Elza responded that the focus of those committees is on activities, while this committee would focus on data, metrics, and best practices. A question was raised as to the need of forming a permanent (standing) committee since an ad-hoc committee is easier to wrap up. Elza indicated that while the purpose of ad-hoc committees is to have a very focused and short-term goal, questions of diversity and inclusion involve long-term goals and long-term data collection and metric tracking. These aren't focused one or two-year objectives. A clarifying question was asked whether the purpose of such a committee would simply be to collect statistics. Elza responded that the purpose of the committee would extend beyond the collection of data. For example, building on the data collection task, the committee would also track and assess metrics and would formulate best practices based on the trends observed. There was a discussion of the charter of the committee and whether the approval of the committee should wait until the BoG is presented a charter. It was pointed out that in the Bylaws of the Society the various committees are described in a rather concise fashion, perhaps because the Society is small. A question was asked of the precedence of ad-hoc committees becoming standing committees. As one example, the Online Committee started as an ad-hoc committee. The evolution of this ad-hoc committee would follow those lines. One BoG member voiced the opinion that if members of the community are enthusiastic we should form a committee. If needed, it can always be wound down later.

**Motion:** "Form a standing committee on Diversity and Inclusion."

After the motion was made it was pointed out that, even if the motion were to be approved, the wording of the Bylaws would still need to be approved. As some BoG members again voiced the desire to see a committee charter, as would be included in the Bylaws, prior to approval, the motion was tabled (temporarily suspended), to be reconsidered at a later BoG meeting.

#### 14) **Journal on Selected Topics in Information Theory (JSTIT):**

Chair of the JSTIT Steering Committee Jeff Andrews provided a brief update on the special topics journal. He first reviewed the history. Two motions were passed at the ITA'18 BoG meeting. The first approved the steering committee. The second approved the submission to the IEEE of a proposal of a new publication for Phase I approval. Jeff told the BoG that he would be departing ISIT'18 early to present the Phase I proposal to the IEEE TAB and Periodicals Committee later in the week of ISIT. He noted that the IEEE Communications and Signal Processing Societies have both expressed support for the new journal and have not requested co-sponsorship. Jeff's expectation was that the proposal will be accepted. (Afterward: Indeed, following the BoG meeting the proposal was accepted at the TAB meeting.) Jeff then presented and reviewed some data previously requested by the BoG to assess the impact of the introduction of the IEEE Journal of Special Topics in Signal Processing (JSTSP) on the flagship IEEE Transactions on Signal Processing (TSP). In summary, TSP seems not to have been negatively impacted by the introduction of the JSTSP. TSP has not only maintained its page count but, in the period since the introduction of the JSTSP, TSP has generally increased both its page count and net income.

#### 15) **Magazine:** On behalf of the Ad-hoc Committee to form an ITSoc Magazine, Christina Fragouli made a short presentation. She first reviewed the rational and proposed structure of the magazine, which would build off the Newsletter. She reviewed the IEEE process for establishing a magazine. In 2018 a letter of intent was sent to the IEEE TAB Periodicals Committee. It was decided to delay the Phase I proposal until spring 2019 to avoid overlap with the above discussed proposal for a special topics journal. Next steps include the decision on the name of the magazine (Christina discussed a motion to hold a small competition to collect ideas for names), more detailed development of financial projections, and a decision on when to launch the magazine.

**Motion:** "We propose to start a competition (with an award of \$100-\$200) among ITSoc members to find a good name for the Magazine with final results by the February BoG meeting." The motion carried.

Following the motion the BoG held a discussion of the finances of the magazine. It seems that the Signal Processing Magazine (SPM) loses money every year, perhaps because of higher publication costs. This occurs even though the SPM is a very successful example of an IEEE society's magazine. A question was raised regarding how the anticipated loss from the magazine would compare to the cost of producing the Newsletter. The Newsletter costs between \$20k-\$30k USD per year to produce while, in recent years, the Signal Processing Society losses about \$100k USD a year on the SPM. It was clarified that while magazines do produce societal revenue via IEEE Xplore, the amounts are relative small in comparison to mainline transaction journals. In general, the feedback from the IEEE is that most societies have magazines to serve and help expand their membership rather than to provide income. The Ad-hoc Committee on Society Finances that is to be formed (see motion by ITSoc Treasurer Aaron Wagner, above) will help the Ad-Hoc Committee to understand better the financial context of a

Magazine. With a wink, EiC Prakash Narayan recommended the title “Earn a Bit” for the magazine.

- 16) **Educational Videos:** On behalf of the Committee that is working on Educational Videos, Matthieu Bloch reviewed the pilots video project. He reviewed the number of views of the first two videos that have been posted to YouTube. The video on network coding has been viewed about 9600 times and the video on space time codes about 7800 times. Two additional videos will be completed within the year, one on LDPC codes, the other on the Lempel-Ziv algorithm. The target is to have both videos completed by year end. Looking forward Matthieu reminded the BoG that

funding was already approved for two more videos. Matthieu also advocated that we publicize the videos more aggressively. A BoG member raised the question whether these videos can be integrated with content from schools, e.g., videos of the tutorials delivered therein. Matthieu answered that while integration is certainly an option, the target audiences for the two are quite different. On the one hand the educational videos that the committee is producing are aimed towards high school students while, on the other hand, the lectures developed for ITSoc schools (and therefore the videos thereof) target an expert audience.

- 17) **Adjournment:** The meeting adjourned at 7:00 pm local time.

## IEEE Information Theory Society Board of Governors Meeting

**Location:** Palmer House, Chicago, USA

**Date:** 6 October 2018

**Time:** The meeting convened at 9:00 am CDT (GMT-6); the meeting adjourned at 3:43 pm.

**Meeting Chair:** Elza Erkip

**Minutes taken by:** Stark Draper

**Meeting Attendees:** Jeff Andrews, Alexander Barg\*, Mathieu Bloch\*, Suhas Diggavi, Alexandros Dimakis, Stark Draper, Salim El Rouayheb#, Elza Erkip, Matt LaFleur#, Christina Fragouli\*, Tara Javidi, Frank Kschischang, Krishna Narayan, Alon Orlitsky, Igal Sason\*, Emina Soljanin, Daniela Tuninetti, Aaron Wagner, Gregory Wornell, Michelle Wigger\*, Aylin Yener, Wei Yu.

(Remote attendees denoted by \*, non-voting attendees by #.)

**Business conducted between meetings:** Between the June 2018 and October 2018 Information Theory Society (ITSoc) Board of Governors (BoG) meetings, a number of elections and items of business were conducted and voted upon by email. These items and the results are summarized below:

- 1) **Motion:** “Vote to approve the process to replace the BoG officers that resigned.” The motion was approved.
- 2) Aylin Yener was elected to serve as ITSoc Second Vice President (2VP) for the remainder of 2018.
- 3) Frank Kschischang was elected to serve as ITSoc Junior Past President (JPP) for the remainder of 2018.
- 4) **Motion:** “To approve the draft minutes of the 2018 ITSoc BoG meeting held in Vail, Colorado on 17 June, 2018.” The motion was approved.

- 5) **Motion:** “To allocate \$10k USD to support the 2019 North American School of Information Theory, to be held at Boston University.” The motion was approved.

- 6) **Motion:** “To approve Anne Canteaut (INIRIA, Paris) for the position of Associate Editor in Cryptograph of the *IEEE Transactions on Information Theory*.” The motion was approved.

- 7) **Motion:** “To approve Milan Mosonyi (Budapest University of Technology and Economics, Budapest) for the position of Associate Editor in Quantum Information Theory of the *IEEE Transactions on Information Theory*.” The motion was approved.

At 9:00 am local time, ITSoc President Elza Erkip called the meeting to order. She started by reviewing the agenda.

**Motion:** A motion was made to approve the agenda. The motion passed unanimously.

- 1) **President’s Report:** ITSoc President Elza Erkip presented the President’s report. She started by congratulating newly elected 2018 Junior Past President (JPP) Frank Kschischang and 2018 Second Vice President (2VP) Aylin Yener. Elza next recapped the BoG officer election process. She reminded the BoG that there was a three-step BoG-approved elections process to fill the seats vacated by the resignations of Helmut Bölcskei (2VP) and Rüdiger Urbanke (JPP). The first step is now complete. The second step is the collection of nominations for the positions of 2019 Second Vice President (2VP) and Vice President (VP). Emanuele Viterbo was originally nominated to the slate of 2019 2VP candidates, but since he agreed instead to run in the 2018 2VP election, there are at least two new nominations needed for the 2019 2VP position. Per the BoG-approved process, the BoG officers will select these candidates with additional nominations from the BoG if there are any. Aylin will become the 2019 VP

nominee. Next, Elza reviewed the process for additional nominations. After the nominees made by the officers are announced, the BoG has one week to suggest additional nominations. Any nominees must (i) be current members of the BoG, must (ii) agree to serve, and (iii) at least two BoG members must support the nomination. Once step two is complete, step three will follow. Step three is the standard process for electing (via email) the 2019 2VP, VP and President. After the election of the officers is complete, the BoG position of Tsachy Weissman, who resigned his position as regular BoG member and whose term lasted through 31 Dec 2020, must be filled. As specified in the ITSoc Constitution, within-term vacancies are by appointment by the remainder of the BoG (rather than through the general election). The officers will double check the process with the IEEE before proceeding.

Elza next recapped the Wednesday morning discussion session at ISIT in Vail. This session, on the topic of sexual harassment, bullying, and discrimination, was announced to all ISIT attendees. Many junior researchers attended. Suggestions made included the Transactions implementing double-blind reviews to reduce bias, the development of a conference code of conduct, the creation of a society ombudsperson, the deployment of a society climate survey, the holding of plenary session(s) at ISIT focused on the topic of sexual harassment, bullying and discrimination, and continuing discussion sessions like this one.

Next Elza reminded the BoG that in the June 2018 BoG meeting an ad-hoc committee on society finances was approved. Members of that committee include Aaron Wagner (Chair), Elza Erkip (ex-officio as ITSoc President), Gerhard Kramer, Vincent Poor, Daniela Tuninetti, Alex Vardy, Emanuele Viterbo, and Aylin Yener. Members were chosen to represent a wide breadth of ITSoc experience and include former ITSoc treasurers, conference committee chairs, and school committee chairs.

Elza then reflected on her personal view of events in 2018. She talked about how the culture and climate of an organization are important indicators of how an organization runs and how the members feel. Organization culture includes collective values, beliefs and principles. Organizational climate includes recurrent patterns of behavior, attitudes and feelings that characterize life in the organization. She commented that while culture is deeper and more stable, climate is easier to change. Elza pointed to a recent National Academy report on “Sexual Harassment of Women: Climate, Culture, and Consequences in Academic Sciences, Engineering, and Medicine.” Elza discussed this report at the June’18 BoG meeting in Vail and again encouraged all ITSoc members to read the report. The report is not an opinion piece, it is based on decades of research. Elza discussed the importance of examining, and changing for the better, the culture and climate in higher education and also in professional societies, including ITSoc for preventing sexual harassment. As the report states: “Professional societies have the potential to be powerful drivers of change through their capacity to help educate, train, codify, and reinforce cultural expectations for their respective scientific, engineering, and medical communities.”

Elza next turned to the question of what constitutes sexual harassment. While one might think of sexual harassment in terms of assault or coercion, a larger component is “gender-based” harassment. Elza presented a plot from the report. The plot is based on data collected from the University of Texas system and reports that 25% of female engineering students reported hostile sexism (reflecting negative views of women who challenge traditional gender roles). Statistics were given separately for male and female students across non-SEM, science, engineering and medicine. The National Academy categories sexual harassment into three categories: (1) Gender harassment (verbal and nonverbal behaviors that convey insulting, hostile and degrading attitudes), (2) unwanted sexual attention, (3) sexual coercion.

Elza then took a step back asking the BoG to consider what is the culture of ITSoc. She posited the first to be an emphasis on deep mathematical understanding; the second to value quality over quantity; and the third to be a small and tight-knit society. This last aspect helps foster a strong sense of community but can make conflicts harder to deal with since many (perhaps most) Society members have relationships that are both professional and personal with their colleagues. Returning to the events of the past year, Elza stated that it was a difficult year and we were tested. The root of the difficulties was a highly publicized sexual harassment case involving an ITSoc faculty member and an ITSoc student member. That case induced emotional responses from many, resulting in severe disagreements on how to react, with an overall result that impacted the society climate in a tremendously negative way. Returning to the National Academy report, Elza again emphasized that climate is a key factor in helping to prevent sexual harassment.

Elza then reviewed the reaction of the BoG and the Society. In the February 2018 BoG meeting the BoG reaffirmed an IEEE Code of Conduct and Ethics, accepted in principle a draft conference code of conduct presented by some BoG members, and formed an ad-hoc committee on Diversity and Inclusion, one of the mandates of which included finalizing the conference code of conduct. In the June 2018 meeting the BoG passed a statement on sexual harassment, which was followed by a discussion at the BoG meeting and the aforementioned Wednesday morning discussion at ISIT. The road involved severe objections, incurred a high emotional toll, and created deep divisions in the society.

Elza then looked to events in other societies to see how those societies reacted. She first considered what happened at NIPS’17. There a band of statisticians made crude remarks about sexual harassment. Following that on 13 December 2017 Kristian Lum wrote an article for Medium on her experience with sexual harassment and posted a comment on her Twitter feed. The first reply to her post was a comment from the President of the International Society for Bayesian Analysis (ISBA) condemning harassment, and establishing a task team for a safe ISBA meeting. That was followed by lots of on-line discussion. About seven months later at the Joint Statistics Meeting (JSM), there was a late-breaking session “Addressing Sexual Misconduct in the Statistics

Community". The session was large (it needed to be moved to a larger room) and was well received. Elza's point was that the statistics community reacted more quickly and materially than did ITSoc.

A second recently highly-publicized case was in the philosophy community. In this case a female professor at New York University harassed her male student. Similar to ITSoc, a letter of support was written by about 50 colleagues of the professor suggesting her innocence and that her status and reputation may earn her deferential treatment. This case was also widely reported—including in the *New Yorker*, the *Atlantic*, the *Chronicle of Higher Education*—and also engendered lots of open discussion within the community. Many of those latter pieces focused on the support letter, one signatory of which was the president-elect of the modern languages society. Some signatories later recanted their letter of support.

Beyond professional societies, the National Science Foundation (NSF) instituted a new policy requiring award-ee institutions to report findings of sexual harassment. The American Association for the Advancement of Science (AAAS) announced a new policy to revoke elected fellows for misconduct or ethics breach.

Coming back to ITSoc Elza stated that the BoG must provide leadership. While the BoG has passed statements it/ we need to work to make sure that the climate of the society is where it should be. While the culture of the society values consensus, we should not be afraid to disagree, and should be prepared to tackle difficult issues. We should always disagree civilly. Elza's key message to BoG was: do not be afraid to disagree, but do so civilly. ITSoc also needs better processes. Today the BoG will consider the revised Conference Code of Conduct. It also needs to develop better reporting mechanisms, and how to work with the IEEE. Sexual misconduct should be on par with research misconduct.

In terms of improving the climate of the society Elza suggested that the bulk of the problem is gender harassment. We should concentrate there, realizing that this is as much an issue for men as for women (if not more). We need to foster a diverse inclusive and respectful environment, should continue discussions, and need to involve and educate members. Elza stated that she is strongly in favor of open discussion sessions, and plenaries on these topics. Elza did not think that ITSoc could have had a session analogous to JSM's "Addressing gender harassment" session in the June 2018 ISIT. That said, there are discussions to hold such sessions at ISIT'19.

Elza concluded her report by sharing with the BoG that IEEE recently created an IEEE Ombudsman position to deal with conflicts across, or within, various IEEE societies. The first Ombudsman is Roberto de Marca, a very active member of the IEEE Communications Society and also an ITSoc member. A senior member of ITSoc reached out to Roberto after ISIT'18 telling him about the conflicts within the society, resignations from the BoG, and asked him to see what he can do to help the society. Roberto reached out to Elza in

August. Elza has had a number of conversations with Roberto, and Roberto has also had conversations with other ITSoc members. Elza brought this up in part so that ITSoc members know of the Ombudsman position, they know Roberto's name, and so that they can contact Roberto if they want to.

Following the conclusion of Elza's report there was a discussion within the BoG. Some BoG members whose universities have the position of ombudsman stated that the role of such positions is mediative and not investigative. The ombudsman office is not a complaints and grievances office. Further, these BoG members' experience is that professionals in these positions are accomplished mediators. Some questions were raised about the type of role that the IEEE envisions for this position. At the moment that is unclear.

A BoG member raised the concern that some members had promoted on the internet a narrative that the society leadership, and in particular some of the officers, did nothing to address the harassment issue and thereby made the society appear uncaring about harassment relative to sister societies that took action. The BoG member pointed to the various BoG actions that Elza had mentioned at the beginning of the meeting, and added several further initiatives that various officers and ITSoc members had brought to the fore. Some of these were followed up on while others were not. As an example of the former, the supervising officers made changes to increase the diversity of representation of ITSoc membership in the Shannon Movie. An initiative still in process that Elza mentioned is the drafting of an ITSoc conference code of conduct (to be presented and voted upon at this meeting). While a conference code of conduct had not been implemented by ISIT'18, a draft version had been approved "in principle" at the Feb. 2018 BoG Meeting. Some BoG members felt that the BoG failed to execute on having such a code ready in a timely manner, wishing the D&I Ad-Hoc Committee had presented a revised code at the June meeting. Finally, in late 2017 a number of ITSoc members contacted the officers requesting that the BoG make a public statement about the situation, but the IEEE advised the officers not to post publicly anything too specific. Some BoG member expressed regret in not having been more public about their opinions and in support of the ITSoc student involved. One BoG member stated that they very much stand by the public statement they had posted and do continue to think the BoG and officers collectively could have done better. Generally, some present felt that, in contrast to other societies, discussions within ITSoc have been more closed and limited to the BoG, with less being communicated to the broad membership. Other BoG members expressed appreciation of the care that the BoG took in approaching what to say publicly, but noted that things move much more quickly on social media than in the past.

Elza pointed out that in the spring she referred to some BoG members' web postings regarding the events in ITSoc on her Facebook page. This led to lots of push back. Elza thought that, perhaps, what we lacked was not the posting of official statements on the ITSoc website but the ability to have an open discussion. Even the holding of a discussion at

the ITSoc BoG meeting in Vail in June 2018 led to severe objections. Perhaps to move forward constructive we can focus on three things. First, we need to trust each others' intention, while agreeing to disagree. Second, we can all think back to what each of us we might have done better or differently, and carry those reflections forward. Finally, we can put in place mechanisms, such as those above, to help us in the future.

- 2) **Treasurer's Report:** ITSoc Treasurer Aaron Wagner next presented his report. Aaron first recapped the estimated end-of-year fiscal outcomes he presented to the BoG at the BoG meeting in June 2018 at ISIT in Vail. The prediction at that time for the 2018 operating budget was that ITSoc would run a deficit of \$67k (USD), due mostly to a decrease in income from the Transactions. However, as of the October BoG meeting, the prognosis improved. Aaron is now predicting that ITSoc will run a surplus of \$81k (rather than a deficit of \$70k). The change in situation was due almost entirely to efforts by the Vail ISIT organizers who returned to ITSoc a surplus of roughly \$160k. Aaron thanked the ISIT organizers who, at the last minute, did a lot of work to make ISIT more profitable. For example, they saved \$50k through last minute A/V renegotiation. Aaron noted that that hard-won surplus of \$81k will be placed in society reserves if not spent before 31 Dec, 2018. Once in reserves it is hard to get at. He asked if any BoG members had last-minute ideas of how to allocate the funds: perhaps to Shannon movie expenses, to accelerate web server updates, or to schools.

Aaron next discussed the "new initiatives" for 2018 which are funded from ITSoc reserves, rather than from the operating budget. In 2018 \$83k USD was allocated by the IEEE to new initiatives. The Society allocated a little over \$86k: to the children's book (\$8k), to the development of YouTube videos (\$30k), and to an upgrade to the ITSoc web server (\$48k). Aaron emphasized that all these allocated funds must be fully spent by the end of the year.

Aaron next discussed the 2019 operational budget. The first draft of the budget was submitted to the IEEE on 5 July 2018. The IEEE is currently projecting a decline of \$45k USD in revenue from the Transactions. However, it appears that the Transaction page count will be lower than predicted, leading to a reduction in publication costs which should roughly balance out the \$45k reduction in revenue. Even with that offset and assuming a (somewhat aggressive) \$60k surplus from ISIT Paris, cuts to the budget for schools and other committees are likely forthcoming in 2019. IEEE requested of ITSoc a 2019 budget with a surplus of at least \$22k. The draft budget submitted on 5 July contained a surplus of only \$3k. Aaron is still waiting to hear what the IEEE response is to that draft budget.

Aaron next discussed new initiatives for 2019. The budget for new initiatives is \$120k. There are three components. The first is \$40k for special sessions at ISIT 2019 (people from industry and people in other areas of research connected to IT). The second is \$40k for two other outreach workshops. The third is \$40k for phase-II upgrade to the ITSoc web server.

- 3) **Motion to change order of the agenda:** A motion was made to reorder some agenda items in order to maintain quorum as some BoG members needed to depart early.

**Motion:** "To change the order of the agenda." The motion was passed unanimously.

- 4) **Journal of Selected Topics in Information Theory (JSTIT):** Chair of the JSTIT Steering Committee Jeff Andrews updated the BoG on the progress made since ISIT. First, the IEEE Publications Development Committee (PDC) completed its financial and marketing projections. These were quite favorable. Next, on 18 September Jeff made a presentation to the IEEE Financial committee, which was supportive.

Looking forward, Jeff overviewed the Phase Two Proposal. At this Chicago BoG meeting Jeff would present a vote to approve the Phase Two Proposal and a vote to approve a call for nominations for the position of Editor-in-Chief (EiC) of JSTIT. Jeff summarized key facts contained in the Phase Two proposal which included the launch of the journal in early 2020 with a target of four issues per year at first, growing to six per year in steady state. A suggestion was made by the BoG was to allow electronic appendices. Jeff indicated that JSTIT will be an electronics-only journal (no hard copies) but even as an electronics-only journal cost continues to scale with page length due to typesetting charges. Further, an intention of having an upper bound on page lengths is to help maintain short review times. In response BoG members suggested that supplemental material might not need to be typeset and that not having page limits is a cultural norm of the ITSoc. Having non-typeset appendices might both maintain the cultural norm and meet the page limit restriction of the journal (which, in an earlier meeting Jeff had indicated is now applied by the IEEE to all new journals). Some current and former members of the editorial board of the Transactions indicated that the Transactions already has an option for non-typeset appendices. Such materials are posted on Xplore, but are required to be available during the peer-review process. The posting of such materials is at zero cost to the Society. The only restriction is one of a maximum file size limitation implemented by Xplore. In fact, one is allowed to post other types of supplemental materials as well, such as videos. A point was raised that as JSTIT is intended to be a cross-disciplinary journal, the possibility of having supplemental material might help JSTIT flex to the norms of the communities involved in the different special issues. For example, for one issue the important supplemental materials might be data sets while for another they might be mathematical proofs. There was also discussion of whether the supplementary material would be reviewed. Such materials are reviewed in the Transactions on Information Theory, and it wasn't known whether the IEEE allows posting of un-reviewed supplemental materials.

Jeff next reviewed the finances of JSTIT. After discussions with the interested sibling societies, in the end ITSoc will have 100% ownership of JSTIT. Jeff indicated he felt this was the desired outcome, one that would alleviate many possible headaches down the road. Jeff noted that the income from over length charges is used to offset typesetting costs,

rather than printing, this being an electronic only publication. The projections have JSTIT in the black by year two, though Jeff noted that this might be somewhat optimistic. The IEEE Journal of Special Topics in Signal Processing (JSTSP) provides the Signal Processing Society a net annual income of about \$100k USD.

Jeff next reviewed the proposed leadership structure. JSTIT will have a steering committee, an EiC nominated via an open and transparent process that is subject to BoG approval, and 8-12 senior editors of diverse areas of research to guide submissions. Each special issue will have its own guest editorial team. The EiC will serve a single non-renewable three year term. The proposed process for appointing the EiC is as follows. First, there will be an open call for nominations. Second, the Steering Committee will also solicit and make their own nominations. Third, the Steering Committee will choose from the nominees, confirming interest and availability of the candidate. Fourth, the Steering Committee will submit their nomination to the ITSoc BoG for approval. Regarding the JSTIT Steering Committee, there would be five members with staggered five-year terms. One member would retire each year with the replacement appointment being made by the VP of Publications (currently the Senior Past President of ITSoc). The Chair of the Steering Committee would be chosen by the Steering Committee itself.

Regarding the nominations of the JSTIT EiC, BoG members raised the point that ITSoc already has a Nominations and Appointments (N&A) Committee. Jeff was asked why not simply have the EiC nomination come from N&A rather than from the JSTIT Steering Committee? Further, it was asked why not also have members of the JSTIT Steering Committee be appointed by the N&A Committee? Jeff noted that the VP of Publications (as already noted the senior past president of ITSoc), who would be making the appointments to the JSTIT Steering Committee, also chairs the ITSoc N&A Committee. Thinking forward to the possibility of ITSoc having three publications (Magazine, JSTIT, and the Transactions), some BoG members indicated that in such an eventuality, it could make sense to have a separate position of VP of Publications. It was generally recognized that the new journal affects the structure of the Publications Committee. Currently in the ITSoc Bylaws the Publications Committee is focused on the Transactions. Thus, the Bylaws will need to be reexamined.

BoG members then asked whether the JSTIT Steering Committee would be composed solely of ITSoc members or would aim to have members from outside of ITSoc. There was also a suggestion of having the Steering Committee chair simply be the longest-serving member of the committee. However, following on the previous point about including non-ITSoc members, it was discussed that it could make sense to have members of the steering committee that might not be interested to serve as chair. So, the proposed structure of the committee choosing its chair gives flexibility for such situations. Jeff also indicated that, generally, the steering committee wouldn't be concerned with the day-to-day operations of the journal. He contrasted the role of the proposed JSTIT Steering Committee with that of the Executive

Editorial Board of the Transactions. While the Steering Committee would be the governing body of JSTIT, the Executive Editorial Board plays a more active role in the operations of the Transactions, e.g., helping the EiC of the Transactions make difficult decisions such as dealing with appeals.

Other suggestions raised by the BoG included the following. Contemplating the draft call-for-papers (CFP) BoG members suggested simply to require double-column submissions and to place a limit on that length. Authors could also submit a single-column version for review, but the call-for-papers can quote page limits in terms of double-column formatting to eliminate confusion. A suggestion made on the Phase Two proposal was to include conferences in theoretical computer science and in cryptography as possible sources of special issue proposals.

Bringing the discussion to a close, Jeff reviewed next steps and the timeline. Assuming the BoG approves the process, the Phase Two proposal will be presented in Vancouver on 15 November. Regarding the appointment of an EiC, the aim is to start to receive EiC nominations by 15 November (perhaps with an extension) with the goal to have a confirmed JSTIT EiC in place by 01 January 2019. The Committee will also try to seed ideas for a few special issues with the initial CFPs to be released in early 2019, with first special issues to be approved in mid-late 2019, and the first issue to be published around March 2020.

As there was much discussion (above) in the meeting the BoG inquired whether they could approve the Phase Two proposal in principle today, and then let the finalized Phase Two proposal come back to the BoG for final vote. A point was made that when subcommittees are formed, the BoG typically places its faith in the committee without the need for detailed oversight of all the specific particulars.

**Motion:** "To approve moving forward with the JSTIT Phase Two proposal." The motion was approved unanimously.

**Motion:** "To approve dissemination of a call for the JSTIT EiC." The motion was approved unanimously.

There was a final discussion surrounding the call for the JSTIT EiC. The BoG inquired how the call would be distributed; e.g., through ITSoc email lists, directly to individuals, via the ITSoc website. A discussion of the phrasing of the call ensued whether, for instance, it was important to require the EiC to be an IEEE Fellow. As such a fixed requirement might narrow the pool of candidates it was decided to replace the clause "an IEEE Fellow" with "of suitable stature".

- 5) **Ad-Hoc Committee on Diversity and Inclusion (D&I):** Ad-hoc Committee Chair Elza Erkip next described to the BoG the efforts of the committee. Elza reviewed the forming of the committee in Feb 2018 and its composition. Updates since the ISIT BoG meeting include the development of (i) a best practices document for ITSoc schools, (ii) a charter for a proposed ITSoc standing committee on D&I, and (iii) a code of conduct for ITSoc conferences, workshops, and events.

Regarding the code of conduct, the BoG will have a vote on approving the draft document. Elza noted that there is also an IEEE code of conduct in development. The BoG raised questions about the definition of under-represented groups (URGs), how they change over time and how the definition is allowed to evolve as, e.g., the geographic composition of ITSoc membership shifts. BoG member asked some questions about the specific duties of the committee, the composition, and the term of membership. Elza indicated that the document presented was the sketch asked for by the BoG in Vail with the essence to be distilled out by the Bylaws Committee next year. (The Bylaws Committee was working this year with only one member for the latter part of the year.) At the point that the committee is entered into the Bylaws the exact wording will become binding, and therefore much more important, and so will be dealt with through the regular process of changing the bylaws.

**Motion:** “Approve IEEE Information Theory Society Standing Committee on Diversity and Inclusion and its Charter.” The motion was approved unanimously.

Elza next presented the proposed ITSoc Conference Code of Conduct. There was a discussion of the actions that are promised in the statement. It was discussed that the specific text can be modified to suit the purposes of the event: “at the discretion of the conference chairs, an appropriate variant of the following note be displayed prominently in the conference programs/hand-outs/websites”. BoG member suggested that the code (or an appropriate variant thereof) be automatically sent to any conference registrant. Some BoG members suggested that the D&I committee be added as a place to report any form of harassment or bullying experienced at ITSoc event. There was a discussion of whether or not the D&I Committee would be the appropriate group to report to. Some additions and modification of wording was suggested, but it was also noted that BoG approval of the motion does not preclude further improvements/additions to the statement. There was encouragement from the BoG to advertise the statement quickly and broadly.

**Motion:** “Approve IEEE Information Theory Society Conference Code of Conduct.” The motion was approved unanimously.

- 6) **Newsletter:** There was a discussion of a piece that Tony Ephremides submitted to the ITSoc Newsletter. The submission is currently under review for possible publication. The BoG was asked to consider the piece. Many BoG members expressed their view that the submission provided an opinion on recent events in ITSoc that was not helpful in moving forward constructively. Numerous BoG members felt the submission could be discouraging to young researchers. Some BoG members thought that the piece could be published, though perhaps alongside other op-ed pieces that provide counterpoints. As Tony’s regular Newsletter contributions have been entitled “The Historian’s Column” BoG members asked what was the formal role of ITSoc “Historian”. In fact, there is no such formal role. No role of ITSoc “Historian” is mentioned anywhere in the Bylaws or Constitution. The one place such a role is mentioned is in a task list provided to several ITSoc volunteers. Therein one annual task is for the

president to appoint an historian, although no one present recalled such an appointment being made in recent years. BoG members asked what are the official columns of the ITSoc Newsletter. There are two: the President’s Column and, at the discretion of the Transactions EiC, an EiC’s column. There have been other regular contributors such as the late Solomon Golomb who contributed his “Puzzle Column”. Some BoG members questioned the value of having a regular “Historian’s Column”, and the privileging of one person with a permanent and non-technical column, and suggested discontinuing the column all together. There was an agreement not to appoint anyone as historian in 2019.

In the context of the Newsletter evolving into a Magazine, as well as in response to concerns raised by the IEEE, there was a discussion of the oversight of the Newsletter. In terms of Newsletter content the EiC of the Newsletter has final say. One step up, the ITSoc Bylaws stipulate that the Publications Committee (chaired by the EiC of the Transactions) oversees all ITSoc publications. Finally, the ITSoc President directs the BoG and oversees all Society activities. Therefore, final responsibility rests with the BoG as directed by the President. This chain of oversight was also confirmed by the IEEE, which was consulted in the context of the publication of Tony Ephremides’ latest submission.

Transactions EiC Sasha Barg had, prior to the BoG meeting, suggested forming an ad-hoc committee to consider Tony’s Ephremides’ submission to the Newsletter—rather than using the Publications Committee for this purpose. Sasha explained to the BoG that the membership of the Publications Committee includes all associate editors (AEs) of the Transactions. He expressed hesitance in involving the entire Publications Committee in discussions of the appropriateness of (and possible revisions to) submissions to the Newsletter. For one thing, such Publication Committee duties (which rarely arise) are not always clearly stipulated to potential AEs when they join the editorial board of the Transactions. And, further, since the AEs already do lots of ITSoc service, making these other (again, rarely arising) duties explicit might serve to discourage potential AEs. The BoG discussed that the formation of an ad-hoc committee as suggested by Sasha would need to be approved by the BoG (i.e., a BoG motion made and approved).

Returning to the issue of Newsletter oversight, a former Newsletter editor commented that in their tenure there were some occasions that submitted content was not appropriate for publication. In general, there was broad consensus that there is not a well formalized mechanism (as, e.g., there is in the Transactions) to deem whether content submitted to the Newsletter is appropriate, to manage possible revision cycles, and to decide upon final acceptance or rejection. The BoG concluded that based on Sasha Barg’s comments regarding the unsuitability of the Publications Committee to review the submitted column, there is a need to make the editorial committee of the Newsletter (not currently mentioned in the ITSoc Bylaws or Constitution) more formal. BoG members pointed out that, due to the (anticipated) launch of JSTIT, lots of changes to Bylaws that concern publications will shortly arise. The BoG decided that these considerations regarding the Newsletter should be bundled into those decisions regarding

changes to the bylaws. The decision was then made for the BoG to use its authority on overseeing society publications to appoint an ad-hoc committee to assist and advise the Newsletter EiC in the handling of this specific case.

**Motion:** “To appoint an ad-hoc committee to handle the revision and possible publication of the historian’s column and any opinion pieces regarding the column.” The motion passed unanimously.

- 7) **Schools Subcommittee:** Stark Draper, Chair of the Schools Subcommittee, presented the report of the schools committee. He pointed the BoG to two items posted to the BoG meeting website. First, the Schools Committee had been requested by the Ad-Hoc Committee on Diversity and Inclusion to start to collect statistics on who attends the schools. Stark’s report included such statistics from the first such collection, for the India 2018 school, reporting on gender and geographic diversity as well as whether attendees had previously attended an ITSoc school. The second is a “best practices” document the Committee is putting together to help future schools organizers. Finally, Stark presented two motions to support schools in Australia and in India in 2019.

**Motion:** “To support the holding of the Australia Information Theory School in Sydney Australia in the amount of \$7000 USD.” The motion passed unanimously.

**Motion:** “To support the holding of the JTG/IEEE ITSoc Summer School in Madras, India in the amount of \$7000 USD.” The motion passed unanimously.

- 8) **Conference Committee:** On behalf of Conference Committee Chair Emanuele Viterbo, Daniela Tuninetti presented the Conference Committee Report. Daniela reviewed the conference committee membership. Everything is on track for the currently approved International Symposia on Information Theory (ISITs) with expressions of interest to propose ISITs in 2022 and 2023. ITSoc workshops are on track. A proposal to hold the 2020 Information Theory Workshop (ITW) in Italy was next discussed.

The proposal was to hold ITW 2020 in Riva del Garda, Italy. Marco Dalai and Enrico Paolini would serve as general co-chairs with Nicolò Cesa-Bianchi, Olga Milenkovic, and Alon Orlitsky serving as Technical Program Committee co-chairs. The workshop would be four days in length, from 21 to 24 September 2020, and wouldn’t conflict with other major events. Daniela reviewed the conference center, travel to Riva del Garda, hoteling options, the budget and the structure of the technical program. Daniela confirmed that hotels have provided special rates for conference attendees and that there are less expensive options for students than the hotels included in the proposal. Daniela informed the BoG that the expected surplus would be around 15%.

**Motion:** “To approve the proposal to hold ITW 2020 in Riva del Garda, Italy.” The motion was approved unanimously.

- 9) **Constitution and Bylaws:** Committee chair Alon Orlitsky reminded the BoG that last year lots of clarifications were

made by the committee. These changes have been reviewed closely by the IEEE. Two of those changes, the IEEE is asking the BoG to modify; one the IEEE is asking the BoG not to add, the other the IEEE is asking the BoG to remove.

The first change concerns the chair of the Nominations and Appointments (N&A) Committee. Prior to last year the relevant clause was “The Chair shall not be eligible to be elected to the Board of Governors during his or her term of service.” Last year, in 2017, the BoG voted to replace that clause (ITSoc Bylaws Article V Section 2) with “The two most recent past Presidents of the Society.” While this effectively means the same thing, the IEEE is asking ITSoc to keep the original wording because according to IEEE governing documents “Chairs shall not be eligible to be elected to the [governing body] during their term of service”.

**Motion:** Retain the phrase “The Chair shall not be eligible to be elected to the Board of Governors during his or her term of service.” in the society bylaws. The motion was approved unanimously.

The second was a clarification added to ITSoc Bylaws Article III. Here the Bylaws read “.... the President shall vote only if his vote would change the outcome.” In 2017 the BoG voted to add the clarification “That is, the President may vote positively when the positive and negative votes of the other members of the Board are equal, and may vote negatively when the positive votes exceed the negative votes by one...” The IEEE is asking ITSoc not to add this clarification as it doesn’t deal with situations when there are, e.g., three candidates, it is not consistent with other societies, and in general it “embellishes” the bylaws which is undesirable.

**Motion:** “Do not add the phrase ‘That is, the President may vote positively when the positive and negative votes of the other members of the Board are equal, and may vote negatively when the positive votes exceed the negative votes by one’ to the society bylaws. Also change to ‘his / her vote’.” The motion was passed unanimously.

- 10) **Nominations and Appointments (N&A) Committee:** N&A Committee Chair Alon Orlitsky presented his report. He first discussed results of the ITSoc BoG election. Although of the 12 candidates five were not from North America, only candidates from North America were elected. These new BoG members are Matthieu Bloch, Suhas Diggavi, Stark Draper, Olga Milenkovic, Prakash Narayan, and Henry Pfister. These results perpetuate the lack of geographic diversity on the BoG. Alon then discussed how ITSoc Bylaws stipulate that the top nominee from every “under-represented” regions “shall be elected to the BoG”. For the purpose of the discussion the possibly under-represented regions are 8, 9, and 10 (Europe, South America, and Asia-Pacific). To be under-represented the region needs to have at least 5% of ITSoc membership as of 31 December 2017 and to have at most one BoG member after the election. Region 8 has over 5% of ITSoc membership (about 20%) and two members on the BoG (Michelle Wigger and Igal Sason) and so is not under-represented. Less than 5% of ITSoc membership is from South America and so Region 9 is not under-represented. Finally, Region 10 has about 25% of ITSoc membership and, as of



1 January 2019, will be represented by only one BoG member (Stephan Hanly) and thus will be under-represented.

Alon next described to the BoG that the the IEEE and the ITSoc officers differ on what “at most one” means. The IEEE believed that “at most one” means zero. The officers believe that “at most one” means zero or one. After some discussion, the IEEE agreed that the ITSoc officers’ interpretation is also valid and asked the BoG to vote to approve its interpretation. A BoG member pointed out that as the BoG has about 25 members and 5% of 25 is one, perhaps the intent of the Bylaws was indeed that “at most one” should be interpreted as zero. Alon then presented the following motion. Since at this point in the meeting, due to travel commitments of BoG members, the meeting had lost quorum, the following motion was presented and discussed, but not voted upon. Voting would be conducted by email following the meeting.

**Motion:** “The board interprets ‘at most one board member’ to mean zero or one board members, and hence that for the current board elections, Region 10 should be considered as under-represented.”

Finally the IEEE suggests rewording the Bylaws to be “less than two” though perhaps “strictly less than two” or “zero or one” would squash uncertainty on anyone’s part.

Following the vote, several options were discussed to address the issue of the geographic diversity of the BoG. For example, due to Tsachy Weissman’s resignation there is another open seat on the BoG. Perhaps the candidate with the next highest number of votes could fill Tsachy’s seat (all the rest of the BoG candidates were not from North America). Alternately, one might increase geographic diversity by appointing the next Conference Committee Chair to be someone from the Asia-Pacific region.

11) **Final matters:** As mentioned above, at this point quorum had been lost and thus no further votes were taken. Other matters on the agenda—the Shannon movie, awards, educational videos—were briefly mentioned.

12) **Adjournment:** The meeting adjourned at 3:43 local time.

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## Foundations and Trends in Networking

Volume 12, Issue 3

Age of Information: A New Concept, Metric, and Tool

By Antzela Kosta, Nikolaos Pappas and Vangelis Angelakis.

## Foundations and Trends in Signal Processing

Volume 11, Issue 3–4

Massive MIMO Networks: Spectral, Energy, and Hardware Efficiency

Emil Björnson, Jakob Hoydis, and Luca Sanguinetti.

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The **2<sup>nd</sup> Age of Information Workshop (AoI Workshop)** will be held in Paris on April 29, 2019, in conjunction with IEEE INFOCOM 2019. Topics of interest include, but are not limited to:

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The AoI Workshop calls for original and unpublished papers no longer than **6 pages**. The reviews will be single blind. The manuscripts should be formatted in standard IEEE camera-ready format (double-column, 10-pt font) and be submitted as PDF files (formatted for 8.5x11 inch paper). Manuscripts should be submitted as PDF files through the EDAS website <https://edas.info/N25573>.

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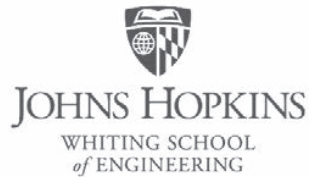
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 Notification of Acceptance: 12 February 2019  
 Camera Ready: 9 March 2019

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## CISS 2019: Call for Papers

53<sup>rd</sup> Annual Conference on Information Sciences and Systems

March 20 - 22, 2019

*Hosted by the*

**Department of Electrical and Computer Engineering, Johns Hopkins University**  
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The 2019 IEEE International Symposium on Information Theory (ISIT) will take place in the center of Paris at the Maison de la Mutualité in the heart of Paris, France, from July 7<sup>th</sup> to 12<sup>th</sup>, 2019.

Interested authors are encouraged to submit previously unpublished contributions in any area related to information theory, including but not limited to the following topic areas:

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- Coding Theory
- Combinatorics and Information Theory
- Communication Theory
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- Compressed Sensing and Sparsity
- Cryptography and Security
- Deep Learning for Communication Networks
- Distributed Storage
- Emerging Applications of Information Theory
- Information Theory and Statistics
- Information Theory in Biology
- Information Theory in Computer Science
- Network Coding and Applications
- Network Data Analysis
- Network Information Theory
- Pattern Recognition and Machine Learning
- Quantum Information and Coding Theory
- Shannon Theory
- Signal Processing
- Source and Channel Modeling
- Source Coding and Data Compression
- Wireless Communication and Networks

The submitted and published versions of papers are limited to 5 pages in the standard IEEE conference format. Submitted papers should be of sufficient detail to be evaluated by expert reviewers in the field. If full proofs cannot be accommodated due to space limitations, authors are encouraged to cite a publicly accessible long version of the submission that may be considered in the review.

### IMPORTANT DATES:

- Paper Submission Deadline: January 13, 2019
- Notification of Acceptance: March 31, 2019
- Advance Registration: April 30, 2019
- Author Registration: April 30, 2019
- Final Manuscript: April 30, 2019

We look forward to welcoming you to ISIT 2019 in Paris.



<http://www.isit2019.fr>





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**The IEEE Information Theory Workshop will be held in Visby, Gotland, Sweden, from the 25th to the 28th of August 2019.**

The Hanseatic city Visby is located on the island of Gotland in the Baltic sea. It is one of the best-preserved medieval cities in Scandinavia with its 3.4km long town wall and several church ruins in the old city center. Visby is listed on the UNESCO World Heritage Site since 1995 and Gotland is a very popular summer vacation destination for Scandinavians.

We seek original, unpublished contributions in **all areas of information theory**, including but not limited to the focus topics listed below.

- **Modern Coding Theory**

Graph based codes and iterative decoding  
Spatially coupled codes  
Polar codes

- **Security, Privacy, and Trust**

Physical layer security  
Private information retrieval  
Security and privacy in distributed storage  
Security and privacy in machine learning

- **Cyber-Physical Systems**

Interaction of information and control  
Time-sensitive source and channel coding  
Networked control systems  
Entropy in control, dynamics, and information theory

In addition, papers that broaden the reach of information theory, including emerging fields and novel applications of information theory, are encouraged.

Full papers of up to a five-page limit should be submitted via EDAS.

#### Important Dates

Date of submission: **April 1, 2019** (tentative)

Date of notification: June 10, 2019

Camera ready paper due: July 1, 2019

We are looking forward to welcoming you in Visby!

The organization committee

[itw2019.org](http://itw2019.org)





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## Conference Calendar

DATE	CONFERENCE	LOCATION	WEB PAGE	DUE DATE
December 09–13, 2018	<b>IEEE Global Communications (GLOBECOM)</b>	Abu Dhabi, UAE	<a href="http://globecom2018.ieee-globecom.org/">http://globecom2018.ieee-globecom.org/</a>	Passed
January 06–09, 2018	<b>ACM-SIAM Symposium on Discrete Algorithms (SODA19)</b>		<a href="https://www.siam.org/Conferences/CM/Main/soda19">https://www.siam.org/Conferences/CM/Main/soda19</a>	Passed
February 10–15, 2019	<b>The Information Theory and its Applications Workshop (ITA)</b>	San Diego, California	<a href="http://ita.ucsd.edu/workshop/19/?year=19">http://ita.ucsd.edu/workshop/19/?year=19</a>	—
March 20–22, 2019	<b>53rd Annual Conference on Information Sciences and Systems (CISS)</b>	Johns Hopkins University, Baltimore	<a href="https://ciss.jhu.edu/">https://ciss.jhu.edu/</a>	December 10, 2018
April 15–18, 2019	<b>IEEE Wireless Communications and Networking Conference</b>	Marrakech, Morocco	<a href="http://wcnc2019.ieee-wcnc.org/">http://wcnc2019.ieee-wcnc.org/</a>	Passed
April 15–19, 2019	<b>European School of Information Theory</b>	French Riviera, France	<a href="https://www.itsoc.org/conferences/schools/esit-2019">https://www.itsoc.org/conferences/schools/esit-2019</a>	—
April 29, 2018	<b>The 2nd Age of Information Workshop</b>	Paris, France	<a href="https://www.eng.auburn.edu/AoIWorkshop/2019/">https://www.eng.auburn.edu/AoIWorkshop/2019/</a>	January 6, 2019
June 03–07, 2019	<b>The International Symposium on Modeling and Optimization in Mobile, Ad Hoc, and Wireless (WiOpt)</b>	Avignon, France	<a href="http://www.wi-opt.org/">http://www.wi-opt.org/</a>	December 31, 2018
June 23–26, 2019	<b>51st Annual ACM Symposium on the Theory of Computing (STOC)</b>	Phoenix, Arizona	<a href="http://acm-stoc.org/stoc2019/">http://acm-stoc.org/stoc2019/</a>	—
July 02–05, 2019	<b>North American School of Information Theory (NASIT)</b>	Boston, Massachusetts	<a href="https://www.itsoc.org/conferences/schools/nasit2019">https://www.itsoc.org/conferences/schools/nasit2019</a>	—
July 07–12, 2019	<b>IEEE International Symposium on Information Theory</b>	Paris, France	<a href="https://2019.ieee-isit.org/">https://2019.ieee-isit.org/</a>	January 13, 2019
August 25–28, 2019	<b>IEEE Information Theory Workshop (ITW) 2019</b>	Visby, Gotland, Sweden	<a href="http://itw2019.org/">http://itw2019.org/</a>	April 01, 2019

Major COMSOC conferences: <http://www.comsoc.org/conf/index.html>