

# IEEE Information Theory Society Newsletter



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Editor: Lance C. Pérez

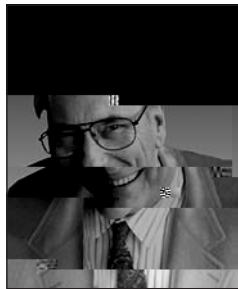
ISSN 1059-2362

## Lloyd Welch Named 2003 Shannon Award Winner

Tom Fuja

Lloyd Welch was announced as the recipient of the 2003 Claude E. Shannon Award at the conclusion of the banquet held at the International Symposium on Information Theory on July 4, 2002 at the Olympic Museum in Lausanne, Switzerland.

Dr. Welch is professor emeritus in the Electrical Engineering Department at the University of Southern California. His research career has spanned more than forty years and has had a profound impact on digital communications, coding theory, and signal processing. The "Baum-Welch algorithm" for detecting and predicting the behavior of hidden Markov models has found widespread use in a variety of disciplines - most noticeably as one of the "engines" that powers the turbo decoding of parallel concatenated codes. Dr. Welch has also established fundamental bounds on the



Lloyd Welch,  
2003 Shannon Award  
recipient.

cross-correlation values of a set of signals (the "Welch Bound") as well as the tightest known upper bound on the rate of an error control code (the "JPL bound", of which Welch is a co-author).

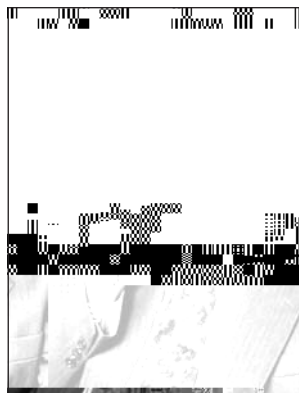
The Shannon Award is the highest honor bestowed by the IEEE Information Theory Society. It is given for "consistent and profound contributions to the field of information theory." Dr. Welch will be the 23rd recipient of the award, which was initiated with the selection of Claude Shannon himself in 1973.

As the 2003 Shannon Award recipient, Dr. Welch will present the Shannon Lecture at the 2003 International Symposium on Information Theory, to be held June 29 - July 4 in Yokohama, Japan.

## Vijay K. Bhargava Awarded the 2002 Graduate Teaching Award

Professor Vijay K. Bhargava, a long time member and former president of the IEEE Information Theory Society, was awarded the 2002 IEEE Graduate Teaching Award at the 2002 International Symposium on Information Theory (ISIT), held June 30-July 5 in Lausanne, Switzerland. Bhargava was cited "For excellence in graduate teaching, curriculum development, and inspirational research guidance of graduate students in the area of wireless communications."

Born in India in 1948, Bhargava earned B.Sc., M.Sc., and Ph.D. degrees at Queen's University, Kingston, Canada. He credits his Ph.D. examiner, Professor Ian F. Blake of the University of To-



Vijay K. Bhargava

ronto for mentorship and for introducing him to another one of his mentors, Gus Solomon, in 1981. Professor Bhargava joined the University of Victoria in 1984, and helped develop and nurture the graduate program, including regulations and curricula, of the newly established Department of Electrical and Computer Engineering. During Bhargava's 28-year career, he has supervised 17 Ph.D. theses and 35 M.S. theses. Seven of his graduate students are now faculty members at Canadian and US universities. Several have gone on to become researchers and leaders in industry and

continued on page 3



This issue of the IEEE Information Theory Society Newsletter is replete with announcements of awards given to members of the Information Theory Society. This includes the second year in a row in which a Society member has been awarded the IEEE Graduate Teaching Award. Please read the President's Column for some insightful commentary on this two year streak.

Please help make the Newsletter as interesting and informative as possible by offering suggestions and contributing news. The deadlines for the next few issues are as follows:

<u>Issue</u>	<u>Deadline</u>
December 2002	October 11, 2002
March 2003	January 15, 2003

Electronic submission, especially in ascii and Word formats, is encouraged.

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Lance C. P.

Sincerely,  
 Lance C. Pérez

## IEEE

### Information Theory Society

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government agencies. He enjoys being with students, and takes genuine interest in their program and in creating an outstanding learning environment.

A Fellow of the IEEE, the Royal Society of Canada, the Canadian Academy of Engineering, and the Engineering Institute of Canada, Dr. Bhargava has received numerous awards, including the IEEE's Haradan Pratt Award, RAB Larry K. Wilson Transnational Award, and Canada McNaughton Gold Medal, as well as the Science Council of BC Gold Medal and the EIC John B. Sterling Medal. A Fellow of the British Columbia Advanced System Institute, he is also a Distinguished

Speaker for the IEEE Communications Society and the IEEE Information Theory Society. He has served the IEEE in a number of roles, and this year is a board-nominated candidate for the Office of IEEE President-Elect.

Raymond Findlay, President of the IEEE, was present at the ISIT Awards Luncheon to make the Award. Established in 1990, the IEEE Graduate Teaching Award honors inspirational teaching of graduate students in electrical and electronics engineering and related disciplines. It is sponsored by the IEEE Foundation and consists of a bronze medal, certificate and honorarium.

## M M a W K a A a

Muriel Médard was presented with the IEEE Leon K. Kirchmayer Prize Paper Award at the awards luncheon held at the 2002 International Symposium on Information Theory on July 2, 2002 in Lausanne, Switzerland.

The Kirchmayer Prize is presented by the IEEE Board of Directors for the most outstanding paper by an author under 30 years of age at the date of submission, published anywhere in any IEEE publication between 1 January and 31 December of the preceding year. Dr. Médard received her award for the paper, "The Effect Upon Channel Capacity in Wireless Communications of Perfect and Imperfect Knowledge of

the Channel," published in the May 2000 issue of IEEE Transactions on Information Theory.

Muriel Médard is an Assistant Professor in the Department of Electrical Engineering and Computer Science at the Massachusetts Institute of Technology, and she is affiliated with the Laboratory for Information and Decision Systems (LIDS). Her research interests include high-speed access networks, the wireless/optical interface, and wideband wireless channels.

Dr. Médard was presented her award in Lausanne by IEEE President Raymond Findlay.

## 2002 P Pa A a A

The recipients of the 2002 Information Theory Society Paper Award were announced at the awards luncheon held July 4, 2002, in conjunction with the International Symposium on Information Theory in Lausanne, Switzerland.

The 2002 Paper Award will be shared by two sets of authors for two different papers:

- "The Capacity of Low-Density Parity Check Codes Under Message-Passing Decoding," by Thomas Richardson and Rudiger Urbanke.
- "Improved Low-Density Parity-Check Codes Using Irregular Graphs," by Michael Luby, Michael Mitzenmacher, M. Amin Shokrollahi, and Daniel Spielman.

Both papers appeared in the February 2001 issue of IEEE Transactions on Information Theory - a "Special Issue on Codes and Graphs and Iterative Decoding."

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 presentation of the award will be made at the 2003 International Symposium on Information Theory, to be held June 29-July 4 in Yokohama, Japan.

This is only the third time in the 40-year history of the award that it is being given to two papers with two different sets of authors. The first such occurrence took place in 1974, when two papers describing an algorithm for computing the capacity of an arbitrary DMC were so awarded - one paper by Richard Blahut, the other by Suguru Arimoto. The second "dual award" took place in 1978, when two papers pioneering public key cryptosystems were honored - one by Whitfield Diffie and Martin Hellman, the other by Ronald Rivest, Adi Shamir, and Leonard Adleman.

## New ComSoc/ITSoc Joint Paper Award Established

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Tom Fuja

The IEEE Communications Society and Information Theory Society Joint Paper Award has been established by the two IEEE societies to recognize outstanding published work in research areas of common interest appearing in one of the societies' publications.

The 2001 Joint Paper Award was the first given by the two organizations. It was presented to two papers:

- "Linear Multiuser Receivers: Effective Interference, Effective Bandwidth, and User Capacity." by David Tse and Stephen Hanly. It appeared in the March 1999 issue of the *IEEE Transactions on Information Theory*.
- "Iterative (Turbo) Soft Interference Cancellation and Decoding for Coded CDMA," by Xiaodong Wei and H. Vincent Poor. This paper appeared in the July 1999 issue of the *IEEE Transactions on Information Theory*.

The Wei/Poor award was presented at the International Conference on Communications (ICC) in New York, April 28

-May 2, 2002. The Tse/Hanly paper was recognized at the International Symposium on Information Theory in Lausanne, Switzerland, June 30 - July 5, 2002.

The 2002 Joint Paper Award recipient has recently 0.937n 0ed the

ets and Dave Forney, who at the time was in charge of the workshop arrangements and, who, regrettably, chose in the end not to be part of the delegation to Moscow, despite his valiant efforts to make it happen. The main “sticky” issue was the inclusion of Adrian Segall, an Israeli citizen, in our delegation. The issuance of a visa to him was perceived by the Soviet side as a loss in a battle of wills. Intense political maneuvering and diplomatic beating around the bush eventually led to the concurrence of the decision makers in Moscow (whoever they may have been) to grant Adrian a visa. The cable that settled the dispute arrived on December 1, 1975 (less than two weeks before the workshop) and caused a memo by Dave Forney to the delegates that included the word “whoopee” as a cry of joy.

The delegation consisted of fifteen members of our Society, ten of whom were supported by the National Science Foundation, and the other five by their own grants or institutions. It included Toby Berger, Bob Boorstyn, R. Bucy, David Cohn, Tom Cover, Lee Davisson, Anthony Ephremides, Bob Gray, Dale Harris (a member of the Department of Physiology of the Harvard School of Medicine), T. Huang, Fred Jelinek, Tom Kailath (who was President of our Society that year), Bob Kennedy, Adrian Segall, and Ed Van der Meulen. As you can see some of the members of the delegation are now retired, but most are still very active in our profession.

The Soviet side included a multitude of scientists. From the giants like Dobrushin, Pinsker, Yaglom, Stratonovich, to many colleagues who are now in our midst, like Tsybakov, Zigangirov, Koshelev, Bassalygo, Zyablov, Shtarkov, it also included a general, as well as a major, of the KGB. The latter’s involvement was covert. The Foreign Department of the Academy of Sciences of the USSR was allegedly a division of the KGB. We could not help, though, but sense the KGB affiliation of the person who stood up at the welcoming banquet and addressed us in a most confident, self-assured, domineering tone that had slight sinister undertones.

We were all supposed to use flight 44 of Pan American (remember that airline?) that was leaving New York’s JFK airport at 6:00 PM on December 13, 1975. To get to New York I was booked on National Airlines (remember that one?), which went on strike just before the departure date. I ended up using Braniff Airlines, and Allegheny for the return (remember those, too?). Our flight was uneventful, half-empty, and made a stop in Copenhagen, where Ed Van der Meulen joined our group. Our arrival in Moscow, originally scheduled for 1:05 PM on December 14, was delayed. We landed under dark overcast skies shortly after 4 PM. The vast plains that surrounded Seremetjevo airport had a solid snow cover.

A large Russian contingent met us at the airport and escorted us in a bus trip to the Ukraine hotel. After a painfully slow check-in (that included the legendary punching by one of our

hosts of an inebriated Russian citizen who milled in our group trying to buy chewing gum), we were hoisted to a restaurant that was warm and cozy, though tightly packed, and that provided for our seating in a cramped manner around a table that was literally covered by an unbelievable cornucopia of delicious offerings. Lots of grade A caviar, vodka, champagne, heart-warming soups, and endless choices of condiments and dishes. It felt more like being in the Court of Louis XIV than in the heart of a People’s Republic.

And then the “toasts” started. This is a Russian tradition that permits the “toasters” to engage in elaborate and lengthy toasts that usually provide for the opportunity of subtly delivering veiled messages. This was my first exposure to covert channels!

The feast was over at about 2 AM (i.e., 10 AM the next day, our time). We were whisked back to the Ukraine, sleepless, sleepy, exhausted, and, as possible as that may be, excited. Our hosts had given us on typewritten carbon copy paper the program for the workshop. To Tom Cover’s surprise, he was scheduled for the kick-off lecture the next morning. Unable to fit a reasonable rest in the frantic schedule, he chose to spend what was left of the night on a couch in the lobby mentally preparing his talk and contemplating his predicament.

The workshop got off to a glorious start in a full hall with a series of warm welcomes and followed by a brilliant talk by Tom (who subsequently collapsed in his room for a long and well deserved rest). The conduct of the workshop included translation, sentence-by-sentence, of every talk in real time. As the timing of the pauses by the speaker to allow the translator to intervene varied considerably from just a few words to quite a few sentences, it became clear to me how the choice of the pausing moments could be used to convey additional information and thus, in another stroke of illumination, I understood the notion of a broadcast channel.

The full-week duration of the workshop was punctuated by tours of the city, sumptuous meals, banquet-style, every night, and culminated in a day-long excursion on Saturday, December 19 to Zagorsk, a beautiful village in the outskirts of Moscow with rich medieval history and featuring the tomb of the legendary Tsar Boris Godunov. That day exemplified what Russian winter is like. It was dark and overcast with thick snow cover and temperatures hovering around 0° F. In the middle of the day, we had a heart-warming meal in a country restaurant booked exclusively for our group. Again, we had lengthy toast exchanges replete with subliminal messages, gift exchanges, and emotional farewells.

The next day we were escorted to the airport for our departure. It was a sunny day with tiny crystals sparking in the frigid air. Tom Kailath, suffering from a form of lumbago, had to be Inwework.5(TITJ)-214.7-217portwork.5(T.8(flanAs)-172.8(thHor



stitute was officially sealed. It looked almost like a Brezhnev-Nixon summit “detente” ceremony. The members of our group unused to such levels of formality, were marveling in the heavy aplomb. The week that had gone by was overflowing with impressions, emotions, eye-opening experiences, and newly found facts and images. After all, it was not that common in those days to get behind the Iron Curtain. We experienced first hand the warm hospitality that has always been a basic trait of the Russian culture; but we also experienced some of the ugly practices of the Soviet regime. One day upon returning in my hotel room I found the contents of my unlocked suitcase ramsacked. Nothing was missing but it was clear that a thorough search had taken place. When three Jewish members of our delegation requested to visit a synagogue, a mini-struggle of maneuvers ensured to make it possible. When consent of the authorities was secured, the three colleagues hailed a taxi that was by the hotel’s entrance. The driver was given only the name of the street, yet, even though no words were exchanged, he deposited them in front of the synagogue, as if he had been told ahead of time. The feeling of being watched could not be shaken.

The return trip was not smooth. A long delay in Copenhagen caused us to arrive in New York past midnight. The luggage took an additional hour to appear on the carousel. We had all missed our connections and we were booked to spend what was left of the night in a nearby motel, the seediness of which

made us long for the Ukraine hotel in Moscow. Eventually, we made it home and resumed our daily lives.

This landmark event set in motion a journey along a rocky and perilous path for the relations between the Society and its Soviet counterpart. There were numerous BOG meetings that lasted into the wee hours of the morning in which these relations were being discussed. The planned immediate sequel to this workshop was a reciprocal workshop in the US. It eventually took place in a mansion along the Hudson River in New York, north of the City. Subsequent contacts were always strained and fraught with suspicion from both sides. A brilliant move by the Swedes, who negotiated a separate agreement with the Academy of Sciences in the USSR for bilateral relations, provided a convenient escape route for both sides. Instead of having to deal with the thorny questions of prestige, “face”, etc., that were marring the direct US-USSR contacts, all Information Theorists who wanted to collaborate across the Iron Curtain would now go to the Swedish-USSR workshops that started in Granna, Sweden in 1985 and alternated

less-frequent scheduling, there was a consensus that rigidly holding the meeting in late June/early July every year is not a good idea. For too many potentially attractive venues – e.g., the American south, Australia, etc. – late June/early July is simply not a good time to schedule a meeting. (As an alternative, some members of the Board mentioned the model of the International Conference on Communications, or ICC – a yearly conference that typically convenes sometime in a three-month window from April to June.) In addition, there was agreement that we should avoid if possible having a submission deadline for the *next* ISIT only 3-4 months after the close of the *previous* ISIT; with electronic submissions and other efficiency-enhancing practices, we should be able to have the submission deadline “only” 6-7 months prior to the start of the Symposium, which (in most years, depending on the scheduling of the symposia) would give our community a little “breathing room” between deadlines.

So, given there was no consensus, we did what boards do best – we set up an *ad hoc* committee to study the issue. The

GOLOMB'S PUZZLE COLUMN

O a P b R a E

I received the following letter from Bulgaria, dated 6 April, 2002:

Dear Prof. Golomb:

Recently, I attended a lecture by Dr. Richard Epstein here at the University of Sofia.

Seeking a number-theoretic problem for my master's thesis, Dr. Epstein kindly offered the hypothesis that "there is a closed [i.e. *finite*] set of numbers  $n$  such that the last digit(s) of  $n^2$  is (are) the number  $n$  itself."

He gave the following examples:

$n$	$n^2$
5	25
6	36
25	6

Ja a C a A a F ITC a A a  
 IEEE I a T S C a M  
 Pa a B a , La a , S a , M a J 1, 2002

**Attendees:** Vijay Bhargava, Martin Bossert, Gerard Cohen, Marc Fossorier, Thomas Fuja, Alex Grant, Tom Hoeholdt, Bahram Honary, Hideki Imai, Jong-Seon No, Greg Pottie, Valdemar Rocha, Edward van der Meulen, Han Vinck, Hirosuke Yamamoto, Raymond Yeung, Ram Zamir.

The meeting was called to order at 1:00 PM by Chair Hideki Imai. Society President Thomas Fuja thanked Hideki Imai for organizing this meeting, and all chapter representatives for their efforts which greatly contribute to the international representation of Information Theory, and are very important to the Society. Each representative was asked to provide a short description of their chapter activities, as well as to discuss and comment on the connection between the chapter, the IT Society and IEEE.

Greg Pottie (UCLA, USA) indicated his intentions to start a new chapter in Los Angeles, USA, motivated by the closeness of UCLA, USC, Caltech and JPL. He plans the chapter to host an annual university/industry workshop as well as four regular meetings.

Jeong-Seon No (Seoul National University, Korea) represented the Seoul chapter, which started six years ago. It hosts three half day workshops composed of four papers and one tutorial a year. These workshops have 40 to 50 attendees, more than half being graduate students.

Ram Zamir (Tel Aviv University, Israel) represented the Israel chapter. Every other year, one convention with a few IT sections is organized. This meeting has international atten-



dance. In 2001, a half day workshop on “space time codes” was organized with two outstanding plenary speakers: Vahid Tarokh and Rudiger Urbanke. Unfortunately, the political problems prevented this workshop from being held in 2002. Ram Zamir asked about the availability of funds for plenary speakers. Vijay Bhargava and Tom Fuja mentioned the IEEE Distinguished Speakers program which is available not only to the IT Society (up to USD 500), but also to the ComSoc (a minimum of three visits to have the airfare covered, while the chapter takes care of the accommodations).

Hirosuke Yamamoto (University of Tokyo, Japan) represented the Japan chapter, which has 350 members, who also belong to the Japanese societies SITA or IEICE. The chapter holds one technical meeting every other month, organized in conjunction with IEICE, and one conference every year in conjunction with SITA. The meetings and conference are supported by IEICE and SITA.

Raymond Yeung (The Chinese University of Hong Kong, HK) represented the newly created Hong Kong chapter, which currently has about 55 IT members and is still growing. Several distinguished speakers have been invited recently and several meetings have already been organized, with the preparation of the 2003 Information Theory Workshop as the main item. Raymond Yeung mentioned that in addition to the USD 1,000 provided by the IT Society to new chapters, the Hong Kong section also provided start up money.

Gerard Cohen (ENST Paris, France) represented the France chapter, which is composed of about 100 members, mostly from ENST Paris and Brest. The chapter is currently preparing the next “Turbo Codes” symposium and the 2003 Information Theory Workshop in Paris.

Vijay Bhargava (University of Victoria, Canada) shared his experience of creating the Montreal chapter in 1982, which that year received the best chapter award out of 12 chapters. He mentioned chapters should take the opportunity to invite people traveling through the city/country. He also committed himself to start a new joint IT/ComSoc chapter in Victoria.

Martin Bossert (University of Ulm, Germany) represented the German chapter, which has more than 200 members. The chapter was created in 1995 in order to attract ISIT to Germany (ISIT'97 in Ulm). It organizes two conferences in Germany every year. These conferences are well attended with international participation.

Valdemar Rocha (Federal University of Pernambuco, Brazil) represented the Brazil chapter, which started a year ago and now has about 40 members. It hosts one annual meeting on telecommunications, which has one IT section. The chapter can receive support from the Brazilian government for speakers who visit at least three places.

Edward van der Meulen (University of Leuven, Belgium) represented the Benelux chapter, which comprised Belgium, The Netherlands and Luxemburg. It was the first chapter started in Benelux, in 1989. It organizes section meetings twice a year

as well as joint meetings with other groups. It cooperates with IEEE activities and national activities. It also hosts a two day meeting every year with printed proceedings, as well as a tutorial in January with emphasis on broader subjects, such as cryptography. This meeting receives the help of Philips and attracts more than 100 participants. The chapter also uses the IEEE Distinguished Speakers program in conjunction with the European Space Organization to invite outstanding visitors, such as Sergio Verdu or Ezio Biglieri. Edward van der Meulen suggested that the IT Society update the lists of its IEEE Distinguished Speakers.

Bahram Honary (Lancaster University, UK) represented the United Kingdom and Ireland chapter, which started in 2001.

## WORKSHOP REPORT:

## Concepts in Information Theory, A Tribute to Jim Massey

Breisach, Germany, June 26-28, 2002

*Han Vinck*

The German Chapter on Information Theory organized the "Second European Asian Workshop on Concepts in Information Theory". The workshop location was Breisach, a beautiful medieval village on the shore of the river Rhine. Overlooking the Rhine valley, the 50 participants enjoyed the relaxing atmosphere created by the organizers. The main goal of the meeting was to stimulate clear presentations on the principles of Information Theory. The idea for organizing this meeting was born while attending a panel discussion at the ISIT in Sorrento, 2000. There, Jim Massey emphasized the importance of having clear conference presentations and journal papers. The 32 speakers tried to avoid unnecessary details as much as possible, which gave a special touch to the meeting. The meeting showed that it is indeed possible to reduce lectures to the basic ideas without losing precision. All presentations are included in the workshop proceedings (108 pages). These can be ordered from Birgit Rieth (rieth@exp-math.uni-essen.de). The social program included a guided tour through the city of Breisach and an excursion to the 3rd largest winery in the world (125 million litre capacity). For the scientific program and more details regarding the workshop, please have a look at <http://www.exp-math.uni-essen.de/~vinck/call-june-2002.htm> and <http://www.exp-math.uni-essen.de/~meili/conferences/breisach/> for some pictures.



Han Vinck, Gerhard Kramer and Jossy Sayir paying their tribute to Jim Massey

The organizers chose to pay tribute in form of a song. A special thank you to Dick Blahut for motivating improvements to the final verse.

### Ode to Lady I.T. (Music to "Cockles and Mussels") Jossy Sayir and Gerhard Kramer

In Boston's gray harbor, that seeps of youth's ardor  
He first laid his eyes on sweet Lady I.T.  
She s'duced him with one glance, and kept him in  
Claude's trance  
Crying Coding and Crypto's a-live a-live O!

#### CHORUS

A-live a-live O! A-live a-live O!  
Crying Coding and Crypto's a-live, a-live O!  
She was a dear mistress, let never his wrist rest  
For in many a paper he chanted her praise  
"Seven papers!" he preaches, but one hundred he  
reaches  
Writing Coding and Crypto's a-live a-live O!  
She soon conquered deep space, but elsewhere made  
slow pace  
Could that be the end of sweet Lady I.T.?  
But Jim wheeled her barrow, through bands broad and  
narrow  
Crying Coding and Crypto's a-live a-live O!  
She had him enraptured, and thought he'd been  
captured  
When a fair Viking lady his passions set free  
They crossed the wide ocean, yet she sanction'd his  
notion  
To cry Coding & Crypto's a-live a-live O!  
His canine assistant's with him every instant  
He shares Jim's enthusiasm for Lady I.T.  
He's at every conf'ence, and barks with great  
conf' dence  
Meaning Coding and Crypto's a-live a-live O!  
Now we've gathered on Rhine's shore, all eager to  
explore  
The fund' mental concepts of Lady I.T.  
We'll glean wisdom mellow, and join that old fellow  
Crying Coding and Crypto's a-live a-live O!

**Attendees:** Thomas Cover, Michelle Effros, Tony Ephremides, Tom Fuja, Aaron Gulliver, Joachim Hagenauer, Hideki Imai, Ryuji Kohno, Steven McLaughlin, Urbashi Mitra, Vince Poor, Sergio Verdú, Han Vinck

The meeting was called to order at 9:00 AM by Society President Tom Fuja. The members of the Board were welcomed, and introduced themselves.

1. The Agenda was approved as distributed.
2. The minutes of the previous meeting in Cairns, Australia on September 5, 2001, were approved as distributed.
3. The President began his report with the following nominees:

IEEE Press Liaison  
Secretary

John Anderson  
Aaron Gulliver



preparing a proposal which outlines the criteria for the award for the next BOG meeting.

13. IEEE Headquarters decision to not provide full membership support to residents of Burma, Cuba, Iran, Libya and Sudan was discussed (see <http://www.ieeesanctions.org/>). An explanation of the IEEE position will be requested.

14. Tom Fuja thanked Sergio Verdú for making arrangements for the Board Meeting. He announced that the Annual Meeting of the Society will be held at the Hotel Alpha-Palmiers in Lausanne, Switzerland on Sunday, June 30, beginning at 12:00 PM (noon).

15. The meeting was adjourned at 2:10 PM.

## GOLOMB'S PUZZLE COLUMN™

### Placing Pentominoes on Boards — Solutions

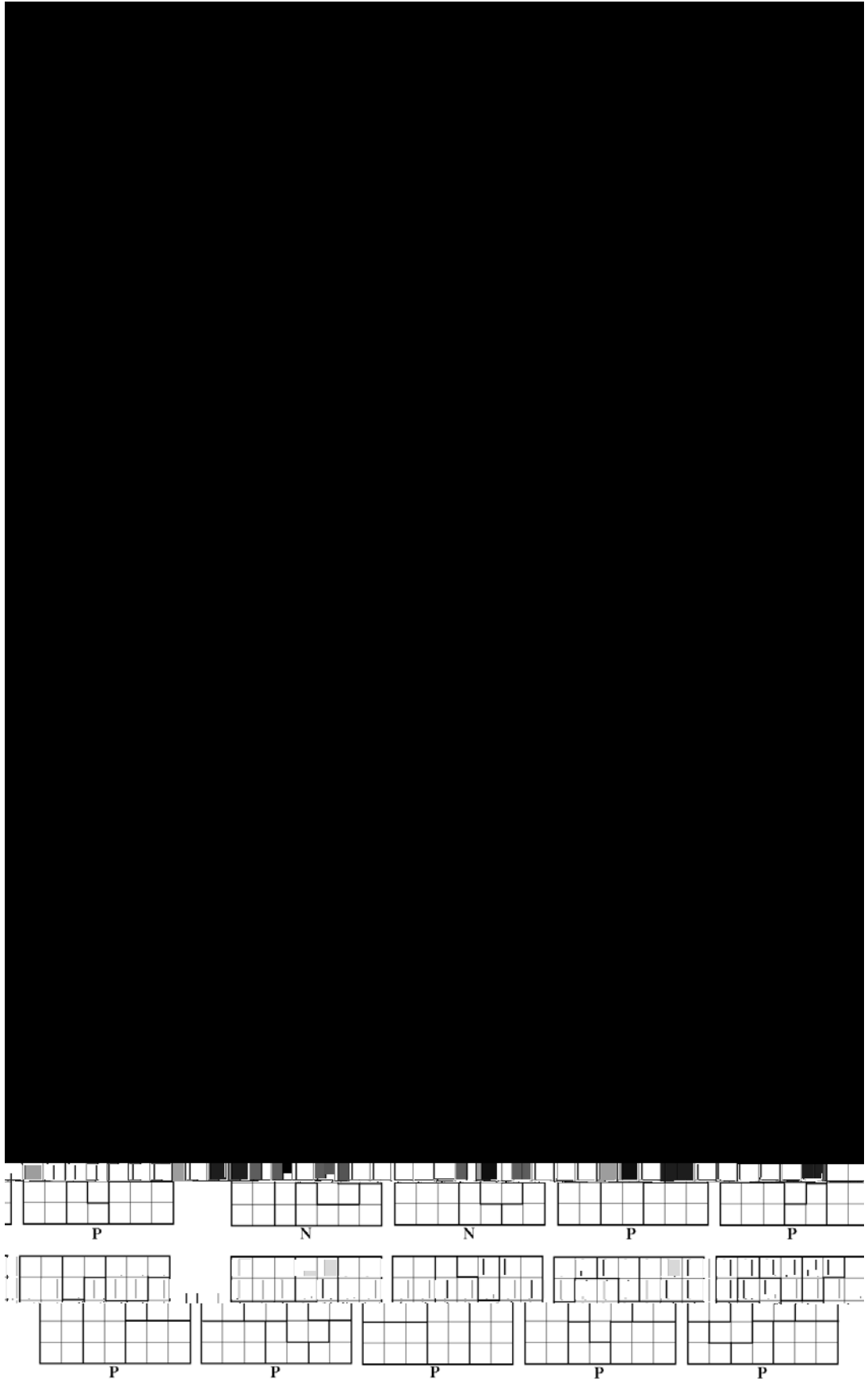
1. The first task was to find the inequivalent placements of a pentomino on a  $5 \times 7$  board such that the rest of the board

can be tiled with ten “right trominoes”  $\left( \begin{array}{c} \phantom{ } \\ \phantom{ } \\ \phantom{ } \end{array} \right)$  's

Note that a right tromino covers at most one of the twelve “dotted squares” on the  $5 \times 7$  board. Hence

the pentomino must cover at least two of the dotted squares in order for the rest to be tiled by ten right trominoes. (Each pentomino can be placed to cover two of the dotted squares, but only the I and the V are able to cover three.)

The  $2 \times 3$  rectangle,  $\left( \begin{array}{cc} \phantom{ } & \phantom{ } \\ \phantom{ } & \phantom{ } \end{array} \right)$ , can be tiled in two dif-







The IEEE Transactions on Information Theory is pleased to announce a special issue on the broad topic of space-time modulation, coding, signal design and its applications. Original theoretical and practical treatments of this emerging area are solicited. Tutorial papers that summarize a research sub-area and highlight outstanding research problems will also be considered.

It has been long known that multiple antennas can be used at a transmitter or receiver to boost system performance either through beamforming (line-of-sight environment) or diversity (fading environment). Recent information-theoretic and coding advances have renewed interest in the use of multiple-antennas because it is now known that wireless system capacity can be greatly improved without extra power or bandwidth, especially in a fading environment. Many so called space-time or multiple-input multiple-output (MIMO) techniques have emerged as candidates for realizing this high system capacity, and some of these techniques have recently been incorporated into third-generation cellular standards.

Further enriching the area are recent results showing that large gains in a multi-user environment are possible when the transmitter knows the channel, renewing interest in co-



access Joint source-channel coding

Fady Alajaji

Alajaji@enst.fr

algebraic geometry of

code Construction/multiscale

Laurence Berlandier

Danielle Chudz

Anne Dupré

Email: [lcw2003@enst.fr](mailto:lcw2003@enst.fr)

Phone: +33 1 4581 7681 7678

Fax: +33 1 4589 0020

ECOLE NATIONALE SUPÉRIEURE DES TELECOMMUNICATIONS  
40 RUE DE BRANTOME 75012 PARIS, FRANCE



1. 2002年1月1日起，凡在我国境内销售货物或者提供加工、修理修配劳务以及进口货物的单位和个人，除另有规定外，均应当依照《中华人民共和国增值税暂行条例》的规定缴纳增值税。

2. 增值税的纳税人是指在我国境内销售货物或者提供加工、修理修配劳务以及进口货物的单位和个人。

3. 增值税的征税范围包括：销售货物、提供加工、修理修配劳务、进口货物。

4. 增值税的税率分为基本税率和优惠税率。

5. 增值税的计税方法分为直接法和间接法。

6. 增值税的纳税期限分为按月、按季、按半年、按年。

7. 增值税的征收管理由税务机关负责。





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