International Chinese Statistical Association

http://www.icsa.org

泛華統計協會

Features:

- Can Economists Forecast Accurately?
- Interview with a Pioneer in Bioengineering
- Statistical Issue: Multiplicity
- Bibliography of ICSA Candidates
- Meeting Announcements

Bulletin July 2003

Pen Ts'ao Kang Mu (The Great Herbal Catalog)
By: Li, Shizhen (1518-1593)

Li Shizhen is considered as the greatest naturalist in Chinese history. He spent forty years sifting through the vast array of herbal lore and compiled the book *Pen Ts'ao Kang Mu (The Great Herbal Catalog)*. It contains 1892 different herbs and is divided into 6 sections, 52 scrolls and 60 different categories. It has been used as a pharmacopoeia and it was also treatise on botany, zoology, mineralogy, and metallurgy. The book has been translated into several different languages around the world and reprinted frequently. Five of the original edition still exist today.

From the Editor

Kao-Tai Tsai, Ph.D.

If voluntary vote sampling gives any meaningful indications in statistics, we must say that the experimental January issue of the Bulletin was quite pleasing to many readers. We received quite a few emails and phone calls of comments on the January issue. We would like to offer our most sincere thanks to the friends who took time to provide their encouraging and constructive opinions. However, we would like to hear more voices from other fellow readers no matter how critical they may be. As stated in the last issue, we would like to make this an informative and intellectually beneficial publication to our readers. Your input is the most important ingredient to achieve this goal.

We are indeed living in a small world. We never imagined the production of the Bulletin could be affected by the SARS epidemic happening on the other side of the earth. Some of the traditional articles from the Applied Statistics Symposium in June are no longer available for publication due to the cancellation of the symposium. Fortunately enough, with the help of wonderful friends, we still managed to serve up a full plate of intellectual food for our readers.

We continue to fill the Bulletin with classical Chinese paintings, calligraphy, philosophy, and, especially, medicine. As stated in the interview article with Professor Fung, ancient Chinese were incredibly knowledgeable in the understanding and practice of herbal medicine. The book shown on the facing page is a wonderful example.

One thing yet to happen is the voluntary submission of interesting material for publication in the Bulletin. Needless to say, it is critically important to have new ideas in order to increase the variety of the contents and to advance the quality of our Bulletin to a higher level. Therefore, please send us interesting ideas from all corners of the world to benefit our fellow readers of the ICSA Bulletin.

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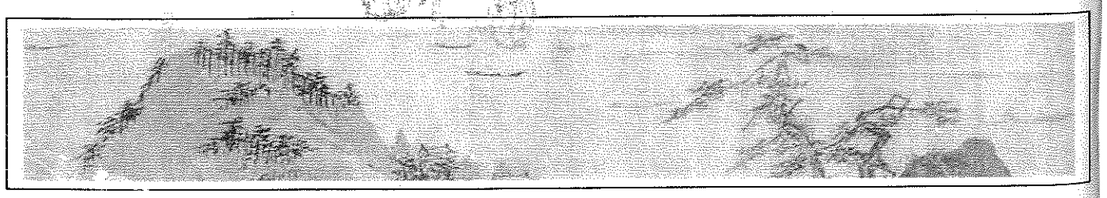

Committee Chairs
ICSA, 2003

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Rong Chen	Heping Zhang
Mei-Ling Lee	Frank Shen
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Yi Tsong
Strategic Committee:
William W. S. Wei

Submission Guidelines
ICSA Bulletin

Articles
The ICSA Bulletin welcomes the submission of articles by the members. Articles submitted should be written in traditional Chinese or English. The contents should be aimed at the general reading.

Articles can be submitted electronically or in papers. If submitted in papers, please leave ¾ inches of blank space on each margin of the letter size paper. The font size of 11 or 12 with Microsoft Word is preferred when typing.

Submission deadline for the January issue is December 15 and the deadline for the July issue is June 15. Articles received after the deadline will be published in the following issue of Bulletin.

Advertisements
The ICSA Bulletin welcomes the submission of advertisements related to the profession of Statistics. The fee for the whole page advertisement is US$300.00. Please contact the Editor for the fee schedule of advertisement with other sizes.

Questions
Please submit your questions to the Editor by email at tsai0123@yahoo.com.

For the complete list of Committee Members and terms, please go to the ICSA website: www.icsa.org.

Letter-to-the-Editor

[Email from Past President, Tim Chen]

Just received the ICSA Bulletin. You have done a very nice work. Now not only good content, but also beautifully artistic. There are two Tsai's as assistant editors. Are they your sons? Your whole family makes wonderful contribution to ICSA. Only a minor suggestion-- if for every painting and calligraphy, you can provide Chinese artist's name in Chinese as well as in English, it will be very much appreciated.

[Reply from the Editor]

Thank you for the good words. Yes, the other two Tsai are my sons. They helped to go over English, as they are ABCs with better English than their Dad. I was thinking about the Chinese names too. But to incorporate Chinese in the typing is not as easy as what I thought and that was the reason the Chinese names were not there.

[Email from Executive Director, Yi Tsong]

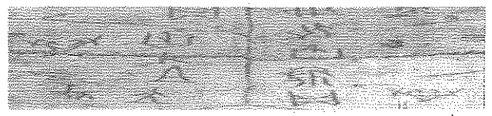
I received and read the Bulletin. It looks great. Is it also online with color? It definitely will attract membership beyond Chinese community. Congratulation to your "one-step" up idea.

[Email from Andy Tsao]

To say the least, the January issue of ICSA Bulletin opened my eyes! I appreciate your effort and enjoy the Chinese artistic pieces very much. I am looking forward to see more interesting ones in July issue.

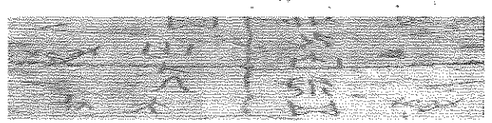
[Email from Sue-Jane Wang]

It was a great delight to read the issue (January 2003) of ICSA Bulletin that has presented another new fantastic look. I applaud Kao-Tai's diligence and innovation in getting a great start of his 3-year term.



[Email from Lee Huang]

I really enjoy reading the article by K Tsai for the "interview with a distinguished statistician... with TY Lee" It shows success does not come from luck alone. It takes hard work, positive attitude, network, and taking risks. I wish I had read this article when I started my career.



[Email from Wayne Weng]

I really enjoy reading the article "Interview with a Distinguished Statistician, TY Lee". Thank you for your diligent effort.

From the Editor:

Thank you for all the kind words. It is extremely encouraging to receive these comments. In addition to the comments shown above, there are many other kind emails and telephone calls. I am sorry not to be able to list them all. We hope to hear more in the future issues. Thanks you all again !

From the President

Zhiliang Ying, Ph.D.

Dear Fellow ICSA Members:

In the summer of 1987 at the Joint Statistical Meetings in San Francisco, a new professional organization, the International Chinese Statistical Association, was officially founded. History will come full circle this August when the JSM is held again in San Francisco and the ICSA celebrates its sixteenth anniversary.

For the sixteen years, the ICSA has witnessed tremendous expansion in terms of membership and professional activities. The First Applied Statistical Symposium was held in the summer of 1990 and has since become an annual event. The same year also saw the First ICSA International Conference in Hong Kong, which was followed by four more such conferences in the Far East. Launched jointly with the Academia Sinica in 1991 was its official journal, Statistica Sinica. Last, but not least, the ICSA Bulletin has steadfastly gone through repeated face-lifts, cumulating in its current version that is more than just a bulletin and is so much fun to read.

We are very much indebted to those senior members who founded the ICSA. It is after all their vision and courage that propelled the formation of our organization. We are especially grateful to our founding president, Professor George C. Tiao, who is celebrating his seventieth birthday this year. Let us salute him for his tremendous contributions to the ICSA and wish him all the best.

The road for ICSA has not always been a smooth one. We have been particularly hit hard by the unexpected SARS epidemic. The 2003 Applied Statistics Symposium was postponed to 2004 because of concerns for SARS. This is undoubtedly an extremely difficulty decision reached by the symposium Organizing Committee. It was painful and, perhaps, not without controversies. However, given the severity as well as the uncertainties of the SARS, the ICSA Board of Directors agreed with the Organizing Committee that the postponement was the most logical choice. We sincerely apologize to those who made plans to attend the symposium. We also hope that they will remain committed to attending the Symposium next year.

Preparation for such a symposium attended by hundreds of people is not a simple matter. From the scientific program to the local logistics, it takes well over a year's time with numerous e-mail exchanges, phone conversations and face-to-face meetings. The postponement entails an extra year of preparation. Please join me to thank the Symposium Committee, chaired by Nancy Lo and Gang Li, for their extraordinary courage and dedication.

Membership drive has always been a top priority for our organization and its importance cannot be overemphasized. In recent years, the Applied Statistics Symposium has become a major venue to retain current members and recruit new members. Consequently, we are facing an uphill battle this year in the absence of the symposium. It is an urgent task for all of us now to make the extra effort in membership recruitment. In the mean time, we would appreciate if current members could please make sure their renewal forms are completed.

On the other hand, preparation for the Sixth ICSA International Conference is on course. The conference will be held in the National University of Singapore on July 21-23, 2004 as originally scheduled. Please take a look at the second announcement of the conference in this issue and check the conference website for updated information. Also under planning in the Far East around the same period are additional statistical conferences by other organizations. So it will be a good time to visit the region.

Our organization needs active participation by the members. Let us know if you have new ideas

and suggestions on membership, election, webpage, symposium, conference, fund raising etc. We seek suggestions on how to better serve members and attract new members. We encourage collaboration with other professional organizations by co-sponsoring joint activities.

It is also again our election time. Please take a moment to read the descriptions of candidates and their statements. It is important that you exercise your rights and responsibilities by casting your ballots.

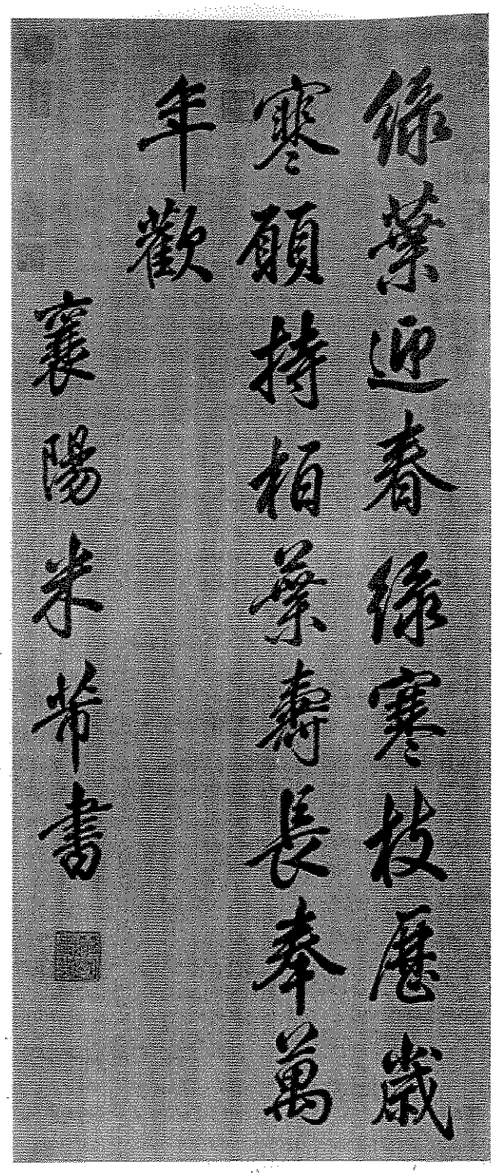
This year's JSM in San Francisco is only a few weeks away. Our colleagues in the Bay Area led by Professor Ying Lu of UC at San Francisco is working hard on local arrangements, including the ICSA booth and the Wednesday evening banquet featuring the renowned San Francisco Chinese cuisine. If you are to attend the JSM, be sure to stop by at the booth and get your banquet tickets. Please join us at the ICSA birthplace for a wonderful celebration!

Zhiliang Ying, President, ICSA

Zhiliang Ying, Ph.D., is a Professor of the Statistics Department, Columbia University, New York, New York, USA.
Email: zying@stat.columbia.edu

Classical Chinese Tapestry, Sung Dynasty (960-1279)

Rendered in a tapestry are four lines of five-character poetry and calligraphy by Mi Fu. The poetry praises the hardy cypress as a harbinger of the New Year and as a symbol of longevity. The rendering of calligraphy in tapestry is even more difficult than that of painting. In order to retain the flow of the original calligraphy, the threads must be changed often after a particular length. The steadiness and the tight threads exhibited here fully expressed the fluent brushwork.



Happy Seventieth Birthday, Professor Tiao !

Best wishes from the Bulletin Editorial Team

From the Executive Director, ICSA

Yi Tsong, Ph.D.

Dear friends:

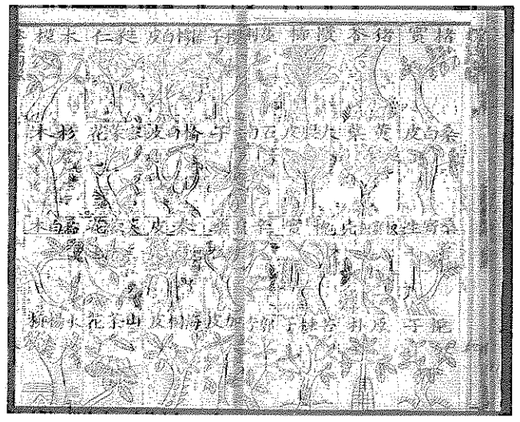
The first half the 2003 is very eventful. First, we have the Iraq War. Because of the security concern, international travels were restricted and we saw, in Washington area, many meetings were cancelled. As a matter of fact, I personally cancelled one FDA meeting with representatives of Pharmaceutical community in March because of travel concerns. We worried about the potential impact on ICSA Applied Statistics Symposium. Then came the SARS epidemic. I remember in late March, my wife requested me to be ready to cancel both the family and business trip to San Diego in case of worsening epidemic. By the time the Symposium co-chair Dr. Nancy Lo called me in early May, I already received quite a few inquiries about the emergency plan of 2003 ICSA Applied Statistics Symposium. Although a few alternative plans were discussed by the symposium committee and me, Nancy's decision to cancel the 2003 symposium is quite swift. It was actually the only right decision and her prompt act is courageous. Only those who has involved with the symposium planning can appreciate how much time and efforts are needed in planning such a symposium each year. The decision to double the efforts by cancellation and re-planning it for 2004 needs extreme courage. I want to take this opportunity to salute Drs. Nancy Lo, Gang Li and the 2003 Applied Statistics Symposium Committee for their courage to shoulder this tremendous responsibility.

Because of the cancellation of the symposium, ICSA Board of Directors won't be able to meet in person in June. We carried out the meeting using the e-mail medium in the two weeks from June 23rd to sixth of July. The candidates of the 2003 election were approved and hence announced in the current issue of ICSA Bulletin. You should receive the ballot before mid July. In a regular year, ballots of election are mailed out in the last week of June after symposium and the votes will be counted at JSM and results of election can be also announced. It took about six weeks to complete the whole process. This year, the time gap between the Board meeting and JSM is merely 4 weeks, we regret that the results will be announced on website instead of at the Membership Meeting at JSM.

Please remember to take time to visit ICSA web site frequently. You will find much timely and important information posted there.

Sincerely yours,
Yi Tsong

Yi Tsong, Ph.D. is a Mathematical Statistician at the US Food and Drug Administration, Rockville, MD, USA.
Email: tsong@cder.fda.gov.



A page of herbs from Pen Ts'ao Kang Mu

Reports From Committee Chairs

Program Committee

By: Naitee Ting, Ph.D.

Within this and the next few years, there will be many ICSA activities. As most of you are aware of, some activities are changed because concerns of recent events. One of the most important changes is the delay of the 2003 Applied Statistics Symposium. This Symposium was originally scheduled for June 22-24, 2003, taking place in San Diego, CA. Unfortunately, with the threat of SARS, this Symposium was postponed to June 6-9, 2004. On behalf of the Program Committee, we would like to apologize to all members who planned to attend the 2003 Symposium. We can fully appreciate the difficulties and disappointment caused by this decision. We are also grateful of your understanding. Please accept our apology.

Meanwhile, we would like to thank the 2003 Symposium Committee members for their hard work to plan, to prepare for the 2003 Symposium, and then to handle the aftermath. After all of these, they will have to work hard again for the Symposium next year. Every member in the Committee made a lot of effort for this event. In particular, the co-chairs Nancy Lo and Gang Li, together with the treasurer, Kathy Chi-Burris faced with a lot of very difficult tasks. We are really grateful for their patience, tolerance and their valuable contributions to our Association.

Preparations for the ICSA activities during the 2003 JSM (San Francisco, August 3-7) is in good progress. Dr. Ying Lu and the local committee members have been working hard to prepare for it. We hope all ICSA members participating the 2003 JSM will stop by the ICSA booth, and to join us for a delicious Chinese dinner on August 6.

Looking ahead in 2004, 2005, we have the following planned activities:

1. The 2004 Applied Statistics Symposium was originally planned to take place in Washington, D.C. With the change of the San Diego Symposium, the Washington D.C. Symposium will now be rescheduled for 2005.
2. ICSA activities for the 2004 JSM (Toronto, Canada) will be chaired by Professor Jiahua Chen.
3. The Sixth ICSA International Conference will be held in the National University of Singapore, July 21-23, 2004. The organizing committees are currently working on the scientific program as well as local logistics. Updated information can be found at the ICSA website (http://www.icsa.org/) and the NUS website (http://www.statistics.nus.edu.sg/).
4. The International Conference on Multiple Comparisons (MCP) plans their next meeting at Shanghai, China, and they are interested in co-sponsorship with ICSA. Some ICSA members have been involved in the planning stage and that the MCP committee has made important progress already. The original schedule was for summer of 2004. Now, also because of SARS, MCP will be in 2005. The MCP 2005 committee is chaired by Professor Jason Hsu.

Naitee Ting, Ph.D. is an Associate Director in Biostatistics, Pfizer Global Research & Development, New London, CT 06320, USA
Email: naitee_ting@groton.pfizer.com.

ICSA Book and Journal Donation Service

By: T. Timothy Chen, Ph.D.

Four years ago, Professor CP Han, then ICSA president, appointed me to be in charge of ICSA Book and Journal Donation Service. The succeeding presidents, Agnes Hsiung, Bill Wei, and Zhiliang Ying, continued to support this service. The purpose of providing this service is to fulfill the needs of university and department libraries in developing countries to expand their collections of statistical journals and books.

Adequate collection of journals and books is a prerequisite for good teaching and research. ICSA would like to help in building up their libraries and in facilitating their students and faculty members in study and research. ICSA has many senior members who are retiring, and they are eager to find good home for their books and journals. ICSA is providing match between needs and supplies and also covering the cost of postal expense in mailing them. The donors, out of their generosity, also contribute labor, mailing boxes, and other incidental expenses.

Since the inception of this service, ICSA has advertised it and announced the request for donations through ICSA Bulletins, ICSA listserv, and Biometric Bulletin (Vol. 18, No. 3, 2001). The responses were overwhelming. Since 2000, we have made 16 shipments to various universities and research institutions. The total mailing cost to ICSA is $3,105.38. The total weight is more than 3000 pounds. The total journal volume-year is over 700. The donors are International Biometric Society, Min-Te Chao, Rongdean Chen, T. Timothy Chen, Fan H. Kung, Pi-Erh Lin, Robert Ling, Duane Meeter, Edward Pun, Ching-Fan Sheu, Naitee Ting, and Zhiliang Ying. The journals donated include *American Statistician, Annals of Mathematical Statistics, Annals of Probability, Annals of Statistics, Biometrics, Biometrika, Controlled Clinical Trials, International Statistical Review, JASA, Statistica Sinica, Statistical Science,* and *Technometrics*.

The receiving universities and institutions include Beijing Normal University; Beijing Polytechnic University; Central China Normal University, Wuhan; Changsha Railway University; China Agricultural University, Beijing; Chinese Academy of Sciences, Beijing; Chongqing University; Fudan University, Shanghai; Kunming Medical College; Lanzhou University; Nanjing University; Nankai University, Tianjin; Northeast Normal University, Changchun; Northwest Normal University, Lanzhou; Peking University, Beijing; Renmin University, Beijing; Sichuan University, Chengdu; Southeast University, Nanjing; Sun Yet-sen University of Medical Science, Guangzhou; Tianjin University; Tsinghua University, Beijing; University of Science and Technology, Hefei; Wuyi University, Jiangmen, Guangdong; Yunnan University, Kunming; Zhejiang University, Hangzhou; Zhongshan University, Guangzhou; PSG Medical College, India; University of Karachi, Pakistan; and University of Ibadan, Nigeria.

ICSA book and journal donation service needs your continual support. If you have books and journals to donate, please contact me through my e-mail address t-chen-10@alumni.uchicago.edu or tar_timothy_chen@yahoo.com. If your university or institution is not on the list above, and you would like to receive ICSA donations, please contact me. We will contact you when there are new donations.

T. Timothy Chen, Ph.D. is President, Timothy Statistical Consulting, Arlington, Texas, USA, and doing post-graduate studies at Southwestern Baptist Theological Seminary, Fort Worth, Texas. He was ICSA President in 1999.
Email: tar_timothy_chen@yahoo.com.

Communication Committee

By: Don X. Sun, Ph.D.

As we rely more and more on electronic communication, I would like to invite you to send us your suggestions (email to admin@icsa.org) to improve our web services so that they can become more useful to our members.

Recently, we have added a section on "ICSA Frequently Asked Questions" (thanks to Dr. Zhao Jun). It answers many questions that some members may have, especially for new members. So I encourage you to take a look (http://icsa.org/ICSA_FAQ.html).

Job Listings and News sections are the most frequently updated areas in our web site, so please bookmark these pages and visit once a while to see new happenings.

Finally, I would like to remind you that our "Membership Only Area" (by clicking Membership) allows you to change membership information online. If you have not received login/password

information for your account yet, please contact Dr. Yi Tsong (tsong@cder.fda.gov).

Don X, Sun, Ph.D. is a Quantitative Analyst at Knight Securities, L.P., Jersey City, NJ, USA.
Email: dxsun@optonline.net.

Membership Committee

By: Jun Zhao, Ph.D.

The Membership Committee focuses on the recruitment of new members to the ICSA. In order to gain new members, we need to promote the ICSA organization, outreach to other technical areas, and most importantly, get support from all ICSA members. In the meantime, the ICSA website and the ICSA Bulletin are good places to promote the organization, and current members play an important role in new member recruitment.

Three items can be considered for our next step of work: 1) Recognition of membership of more than 10 years: thanks for their distinguished and faithful membership. 2) Student membership drive: new first time student members can join now at a discounted rate. 3) Current member referral program. I hope that in the next issue of the ICSA Bulletin, we can see not only the recognition of loyal members but also the list of new faces.

Jun Zhao, Ph.D. is a biostatistician at Organon Pharmaceuticals USA Inc, Roseland, NJ, USA.
Email: j.zhao@organonusa.com

Biometrics Section

By: Jen-pei Liu, Ph.D.

A Changing World Indeed !

As the outbreak of SARS (Severe Acute Respiratory Syndrome) swifts through the Southeast Asia, we suddenly realize that statistics of the SARS cases can be over-reported under-reported, or just unreported. As we have to measure our body temperature twice a day and report the measurements through web to our university or our government, we are also instantly aware that there are so many different ways and equipment in measuring body temperature with a difference that could exceed more than 5°C. Then I finally understood the true meaning of uncertainty in statistics. To better prepare for the members of the Biometrics Section of the ICSA to face the changing world, a draft questionnaire for the survey is prepared to know what we are, how we stand now, and where we are going. The draft questionnaire is now being under review. The final survey will be sent out to you in early July along with the election ballots. We do hope that each question in the survey will be correctly reported to minimize the uncertainty in our estimates. The results of the survey will be announced in the next issue of ICSA bulletin.

Jen-Pei Liu, Ph.D. is Professor of the Statistics Department, National Cheng-Kung University, Tainan, Taiwan.
Email: jpliu@email.stat.ncku.edu.tw

Extra! Extra! Extra!

By: Danyu Lin, Ph.D.

ISI (founded as the Institute for Scientific Information) has indexed scholarly literature in science and social science for over 40 years. Using this unique database, the ISI Web of Knowledge has recently created a website, ISIHighlyCited.com, to feature the most cited researchers in 21 scientific fields and to showcase their publications. In March of this year, ISI produced a list of 231 highly cited researchers in the field of mathematics, which includes statistics. A large number of these researchers are ICSA members. More information is available at the website: http://isihighlycited.com. Also, there is a story in the May/June, 2003 issue of IMS Bulletin.

Danyu Lin, Ph.D. is a Professor of the Statistics Department, University of North Carolina, Chapel Hills, North Caroline, USA.
Email: lin@bios.unc.edu

Report From Symposium Committee Chairs

Nancy Lo, Ph.D. & Gang Li, Ph.D.

Following is the report of the progress and the cancellation of the ICSA 2003 Applied Statistics Symposium and the initiation of the ICSA 2004 Applied Statistics Symposium

1. ICSA 2003 Symposium

The program includes over 30 sessions. Four student award winners were selected out of 13 participants. The awards will be presented at 2004 symposium. In additional to the selected student winners, the 2004 symposium program committee is accepting new applications for 2004 student awards and travel fellowship. All students are encouraged to apply.

2. Cancellation of ICSA 2003 Symposium

The ICSA 2003 Symposium was in full swing beginning in late April and early May when SARS hit the news and became a concern to some members of the local arrangement committee. In early May, Symposium committees made recommendations to the Board to cancel the symposium and postpone it to June 2004 after all possible options were carefully reviewed for the health consideration for all potential symposium attendees. The proposal was passed by the board and the news was posted on ICSA website on May 8th.

The Symposium committees refunded all the fees paid to the symposium directly before June 30, 2003, including registration fee, ICSA membership, short course, tour, dinner and housing at USD. A coupon was issued to each of symposium registrants for their travel losses.

3. 2004 Symposium

Now the dust is settled and we are thinking about 2004. Hopefully the program would remain the same. Of course some changes of the program are inevitable due to conflict of schedules or other reasons.

In spite of this disappointing news, we are glad to announce that the ICSA 2004 Applied Statistics Symposium will still be held in San Diego on June 6 - 9,2004, at the San Diego Marriott-La Jolla, 4240 La Jolla Village Dr. La Jolla CA. The theme of the symposium remains the same as planned for 2003. Please check the ICSA website http://www.icsa.org for future updates.

For speakers, who will not be able to attend the 2004 symposium, or, who wishes to speak about a different topic in the 2004 symposium, please contact Gang Li (gangli@sunlab.ph.ucla.edu) **as soon as possible,** no later than February 1, 2004 to facilitate the planning of 2004 symposium.

4. Acknowledgement

We would like to thank the following companies for their generous donation for a total of $26,500 dollars. Their donation will definitely ease the planning for 2004 symposium: Pfizer, IDEC, Ribapharm, Hoffmann-la Roche, Aventis, Allergan, Amgen, BRISTO-MYERS SQUIBB, Statplus, Janssen Research Foundation, and Merck.

We would like to thank all symposium committee members for their hard work during the past two years (one year to come) and we commend Kathy Chi-Burris, the treasurer, for her diligence and patience to deal with the cancellation as she had to answer all the questions regarding the refund, write refund checks and issue coupons. We would like to

thank Yi Tsong for taking active part in the formation of refund policy proposals.

5. Final words

We truly wished the 2003 symposium would have continued as planned and we hope you can understand the situation. Again, we are deeply sorry for any inconvenience caused by the cancellation of the 2003 Symposium. We are more than ever looking forward to your attendance in 2004.

Student Award Winners

By: Scholarship Subcommittee

ICSA 2003 Applied Statistical Symposium Student Award and Travel fellowship Winners were selected out of 13 participants. Because the ICSA 2003 Applied Statistical Symposium was cancelled, the awards will be presented at the 2004 symposium. Each winner will receive a certificate, a cash award of $400.00, and tuition-waiver for one short course of his/her choice.

The winners and their titles are (by alphabetic order):

Jun Dong, UCLA
"A functional logistic regression model for longitudinal data."

Tao Huang, University of North Carolina
"Profile likelihood inferences on semiparametric varying coefficient partially linear models."

Qi Jiang, Temple University
"Sample size determination in survival studies with informative noncompliance."

Ji Zhu, Stanford University
"Classification of gene microarrays by penalized logistic regression."

Congratulations to All !!!

Stay Tuned !
Applied Statistics
Symposium will be BACK
Next June !

From the Editors, Statistica Sinica

Hwai-Chung Ho, Ph.D. & Jane-Ling Wang, Ph.D.

Ten months have passed since we were appointed as co-editors of Statistica Sinica in August, 2002. As you might recall, a new website has been set up to receive online submissions (http://www.stat.sinica.edu.tw/statistica/). We strongly encourage authors to submit their papers directly to this Website.

During the period August 1, 2002 to May 31, 2003, the journal received 190 submissions. Among the 110 articles whose first-round reviews have been completed, 39 (35 per cent) were given the status of tentatively accepted or accepted, comparable to the average acceptance rate of recent years.

One of our immediate goals for the journal is to accelerate the review process. The online system certainly played a key role to shorten the review time. Our goal is to shorten the time to first review to within 3 months during 2003. The associate editors and referees have been extremely supportive to help us carry this plan through, and we owe them a hearty "Thank You". A large portion of the rejections occurred within 3 weeks, often with the help of an associate editor or a colleague. These are papers that did not go out for a full review for various reasons, poor presentation being a frequent cause. We strongly urge all authors to spend the time to polish their papers to make them as interesting and accessible as possible and at the same point as concise as possible before submitting them. Poorly written papers have an increased chance of either getting rejected immediately or else being subject to a delay in the review process. Reviewers also tend to get frustrated when a paper is poorly organized or unnecessarily lengthy, even if it may have substantial contents and scientific merits. Good writing also facilitates the dissemination of the results, and ultimately benefits both the authors and the journal. Spending the time and effort that it takes to enhance the writing and achieve a clear and concise presentation, is a very worthwhile and rewarding investment for an author.

Two special theme issues have been scheduled for 2004. One is on "Emerging Issues in Longitudinal Data Analysis" based on a Joint Summer Research Conference co-sponsored by the American Mathematical Society, the Institute of Mathematical Statistics and the Society of Industrial and Applied Mathematics. The conference took place at Mount Holyoke College in South Hadley, Massachusetts in Summer 2002. A second theme issue entitled "Bayesian Inference, Environmental statistics, Time Series Analysis, and Their Applications" is also underway. It will be formed by papers solicited from the participants of the NBER/NSF Time Series Conference that is going to be held in September 2003 to honor Prof. George Tiao's retirement.

On another front, as of the last issue (April 2003), the total number of subscribers of Statistica Sinica is 766, of which 259 pay the list price for subscription and the rest are ICSA members. Under the joint sponsorship of ICSA and the Institute of Statistical Science, Academia Sinica, Statistica Sinica has within thirteen years grown into one of the world's leading statistical journals. The support of ICSA members as authors, readers, and the referees has been tremendous. Your continued contribution, especially by sending your best manuscripts, is indispensable to the future success of the journal.

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Candidates of the President-2005, ICSA
Bibliography

CHEN, Jiahua

[PRESENT POSITION] Professor of the Department of Statistics and Actuarial Science, University of Waterloo, Canada. **[FORMER POSITIONS]** Researcher at the Institute of Systems Science, Academic Sinica, 1985-1986. **[DEGREES]** B.S. in Mathematics from the University of Science and Technology of China, 1982; M.S. in Statistics from the Institute of Systems Science, Academia Sinica, 1985; Ph.D. in Statistics from the University of Wisconsin-Madison, 1990. **[FIELD OF MAJOR STATISTICAL ACTIVITIES]** Dr. Chen's main research interests include experimental design, empirical likelihood methods, sampling survey, finite mixture models, and large sample theory. **[SELECTED PUBLICATIONS]** Dr. Chen has published more than 60 research papers in prestigious statistical journals including *Annals of Statistics*, *Biometrika*, *Canadian Journal of Statistics*, *JASA*, *JRSS*, *Statistica Sinica*, and *Technometrics*. Representative work may be seen from: "Some results on s^{n-k} fractional factorial designs of minimum aberration or optimal moments," *Annals of Statistics*, 1991; "Empirical likelihood in finite population and the use of auxiliary information," *Biometrika*, 1993; "Penalized likelihood ratio test for finite mixture models with multinomial observations," *Canadian Journal of Statistics*, 1995; "Fractional resolution and minimum aberration in blocked 2^{n-k} Designs," *Technometric*, 1997; "A pseudo empirical likelihood approach to the effective use of auxiliary information in complex surveys," *Statistica Sinica*, 1998; "Variance estimation under nearest neighbor imputation," *JASA*, 2001; "A modified likelihood ratio test for homogeneity in finite mixture models," *Journal of Royal Statistical Society, B*, 2002. **[ICSA ACTIVITIES AND OFFICES HELD]** Dr. CHEN is currently a member of the ICSA Board of Directors (2003-2005), and serves on the Membership Committee of ICSA. **[RELATED PROFESSIONAL ACTIVITIES]** Dr. Chen is a member of SSC, ICSA, IMS and ASA. He is an Associate Editor of the Canadian Journal of Statistics, and served on the Grant Selection Committee of the Natural Science and Engineering Research Council of Canada. **[STATEMENT]** My interest to run president of the ICSA is greatly inspired by the unparalleled success of the Association achieved in the past 16 years through the significant and indispensable contributions to the development of Statistics by the dedicating Chinese statisticians. If elected, I will strike to work on diversity and interaction within and outside the Association to ensure continuation and augmentation of our success and promote world recognition of our contributions and mutual enhancement with other statistical associations. Specifically, I would like to see further collaborations between senior researchers and junior researchers including promising graduate students, closer connections with the members in remote regions and less renowned and smaller institutions, more academic and social exchanges and associations with other statistical associations. As the e-world prevails, it becomes more important and meaningful than ever to make the ICSA such a diversified and interactive academic society with a multi-dimensional culture, in which we all prosper professionally.

ICSA has flourished with very successful members. We have witnessed three consecutive years of COPSS' award to the ICSA members in addition to many other awards. In general, we are probably one of the most successful groups in the North America. Yet important work of many other members is to be recognized. ICSA can help in many ways in this aspect.

Researchers in smaller or less renowned institutions or less connected researchers should be given more opportunities and encouragements. The ICSA can set up more incentives for these members, for example, create invited sessions in our conferences for them under direction of well-established researchers. We could also set up a BBS group on our web to beep out short communications. Helping students and new researchers has always been an important component of ICSA. With a huge talent pool to dip in, we should

set up a research network mainly for graduate students and new researchers. We can collect some concrete research problems from our members and post them for graduate students and new researchers.

LI, W.K.

[PRESENT POSITION] Chair Professor, Department of Statistics & Actuarial Science, since 2000, University of Hong Kong. **[FORMER POSITIONS]** Head, Department of Statistics, University of Hong Kong, 1997-1999 inclusive; Professor (Reader), 1995-2000, University of Hong Kong; Senior Lecturer, 1991-1995, University of Hong Kong; Lecturer, 1983-1990, University of Hong Kong; Lecturer, 1981-1983, National University of Singapore. **[DEGREES]** Ph.D., 1981, University of Western Ontario; M.A., 1976, York U. (Canada); B.Sc., 1975, York U. (Canada). **[FIELD OF MAJOR STATISTICAL ACTIVITIES]** Time Series Analysis. **[SELECTED PUBLICATIONS]** "An Adaptive Estimation of Optimal Regressor Subspace (with discussion)," 2002, J. Royal Stat. Soc. B; "Estimation for Partially Nonstationary Multivariate Autoregressive Models with Conditional Heteroscedasticity," 2001, Biometrika; "On a Mixture of Autoregressive Conditional Heteroscedastic Model," 2001, J. Amer. Stat. Assoc.; "On a Mixture Autoregressive Model," 2000, J. Royal Stat. Soc. B; "On Single-Index Coefficient Regression Models," 1999, J. Amer. Stat. Assoc.; "Limiting Distribution of Maximum Likelihood Estimators for Unstable ARMA Time Series with GARCH errors," 1998, Annals of Statistics; "On Fractionally Integrated Autoregressive Moving Average Time Series Models with Conditional Heteroscedasticity," 1997, J. Amer. Stat. Assoc.; "Testing Model Adequacy for Some Markov Regression Models for Time Series," 1991, Biometrika; "A Goodness of Fit Test in Robust Time Series Modelling," 1988, Biometrika; "Fractional Time Series Modelling," 1986, Biometrika; "Diagnostic Checking ARMA Time Series Models Using Squared-Residual Autocorrelations," 1983, J. Time Series Analysis; "Distribution of Residual Autocorrelations in Multivariate ARMA Time Series Models," 1981, J. Royal Stat. Soc. B. **[ICSA OFFICES & ACTIVITIES]** Program Committee (2002-2007); Chairman, Organizing Committee of the 5th ICSA International Conference, Hong Kong, (Aug. 2001). **[PROFESSIONAL ACTIVITIES]** President, Hong Kong Statistical Society (2000-2001, 2001-2002, 2002-2003). **[ASSOCIATE EDITORSHIP]** Statistica Sinica; Communication in Statistics; Applied Stochastic Models in Business and Industry. **[STATEMENT]** I am deeply honoured to be nominated as a candidate for the President of ICSA and would like to take this opportunity to thank the Nominating Committee for the nomination. The International Chinese Statistical Association is a prestigious academic and professional organization. I am very proud to be a life member of ICSA. I have witnessed the rapid growth of the Association since its inception and there is no doubt that our Association is well recognized by our professional peers as an important force and player in the statistical profession. One of the visions of the Association is to become a truly international academic organization. In this connection, we need to have more members who are non-Chinese. I would like to echo Professor William Wei, our Former President in 2002 that we should emphasize our international image and that there are many benefits of being a member of ICSA whether one is Chinese or not. In connection with this, there are ample opportunities, both academic and career-wise for the statistical profession in Asia and the Greater China region. Hong Kong is ideally situated geographically to facilitate the advancement of the statistical profession in the region. It can serve as the hub of the wheel where academic exchanges can easily be made within the Greater China region and beyond. It is my vision that Hong Kong can serve the Association very well in this region. The journal of the Association, Statistica Sinica, is already an influential and high impact journal in our profession. Thanks to the hardwork of all its editors present and past. It is my vision that the journal will go beyond its present achievement and attain even higher status in terms of its impact on the statistical community. Obviously, there are other works to be done. For instance, we need to improve our networking with other statistical societies, we need to improve our communication with members, we need to formulate a vision and missions of our Association and pass it onto all members and future generation of members. The role of the President of ICSA carries with it both honour and responsibilities and, if elected, I shall need your support in order to achieve the vision and missions of our Association.

Candidates of the Board of Directors
Bibliography

CHEN, Ming-Hui

[PRESENT POSITION] Associate Professor, Department of Statistics, University of Connecticut, since 2001. **[FORMER POSITIONS]** Associate Professor, July 1998 to June 2001, Assistant Professor, July 1993 to June 1998, Worcester Polytechnic Institute. **[DEGREES]** Ph.D., 1993, Statistics, M.S., 1991, Purdue University. M.S., 1985, Shanghai Jiao Tong University. B.S., 1983, Hangzhou University. **[FIELDS OF MAJOR STATISTICAL ACTIVITIES]** Bayesian Statistical Methodology, Bayesian Computation, Categorical Data Analysis, Missing Data Analysis, and Survival Analysis. **[PUBLICATIONS]** Coauthored three books: *Bayesian Survival Analysis* (with J. Ibrahim, D. Sinha), Springer, 2001. *Monte Carlo Methods in Bayesian Computation* (with Q. Shao, J. Ibrahim), Springer, 2000. *Applied Statistics for Engineers* (with J. Petruccelli, B. Nandram), Prentice-Hall, 1999. Published over 90 articles in mainstream statistical and medical journals, including Annals of Statistics, Journal of the American Statistical Association, Biometrika, Journal of the Royal Statistical Society, Series B, C, and D, Biometrics, Annals of the Institute of Statistical Mathematics, Journal of Computational and Graphical Statistics, Journal of Multivariate Analysis, Lifetime Data Analysis, Journal of Statistical Computation and Simulation, Statistica Sinica, Sankhya, Series A and B, Test, Journal of Statistical Planning and Inference, Journal of Agricultural, Biological and Environmental Statistics, Canadian Journal of Statistics, Statistical Science, Statistics in Medicine, Proceedings of the American Mathematical Society, Journal of Nonparametric Statistics, Journal of Urology, Journal of Clinical Oncology, Cancer, Int. J. Radiation Oncology Biology and Physics, and Urology, since 1993. **[ICSA ACTIVITIES]** Permanent Member of ICSA and organized an invited session for the ICSA 2003 Applied Statistics Symposium. **[RELATED PROFESSIONAL ACTIVITIES]** Elected member of ISI. Associate Editor, Lifetime Data Analysis, 2001-present. Received the Harold J. Gay Professorship in Mathematical Sciences, 1998-2000, Worcester Polytechnic Institute. Received research grants from NSF, NIH, and local industries (Tambrands and Veeder Root). Presented the short courses in Bayesian Survival Analysis at the 2002 ENAR meeting, Monte Carlo Methods in Bayesian Computation at the 2001 JSM, and Beyond MCMC Workshop at the SSC/WNAR/IMS 2001 conference. Co-organized the 17th and 10th New England Statistics Symposiums, 1996 and 2003. Member of the IMS Committee for New Researchers, 1997 to 1999.

FANG, Jiqian

[PRESENT POSITION] Chair professor, Department of Medical Statistics, School of Public Health, Sun Yat-Sen University, Guangzhou, China **[FORMER POSITIONS]** Director and Professor, Department of Medical Statistics, School of Public Health, Sun Yat-Sen University, Guangzhou, China, **1991-2000;** Director and Professor, Department of Biostatistics, Beijing Medical University, Beijing, China, **1985-1991 [DEGREES]** Ph.D., 1985, Biostatistics, University of California, Berkeley. M.S.,1961, Mathematics, Fudan University, Shanghai, China. **[FIELDS OF MAJOR STATISTICAL ACTIVITIES]** Stochastic modeling for life phenomenon; Sequential discriminant analysis; Statistical issues in assessment of quality of life. **[PUBLICATIONS]** "Statistical treatment of complicated censored data" 1977; "The sequential discriminant analysis", 1979; "Discrete-type sequential discriminant tree for multiple populations and its applications", 1980; "Rank statistics and multiple comparison in RxC contingency table", 1985; "A stochastic model for cell cycle", 1991; "A quasi linear regression model for data analysis of cross-over designed trial, 1994; "Models for latent period of cancer (I) (II)– Non-homogeneous Markov model", 1995; "Existence of memory in single ion channels", 1995 ; "Two-state Markov models for the memory in single ion channels and their applications", 1996; "Stochastic models for the

natural history of nasopharyngeal carcinoma", 1997; "The algorithm for segment length of DNA finger-printing", 2000; "Control of confounding in causal inference", 2001; **Textbooks and monographs:** "Computer and its Applications in Medical Field", 1981; "Life Table and its Applications", 1984; "Methods of Mathematical Statistics", 1987 and 1995; "Stochastic Processes and its Applications", 1987; "Medical Statistics and Computerized Experiment", 1997 and 2001; "Applied Statistical Methods" 1998; "Quality of Life, Methods for Assessment and Applications". 2000; "Advanced Medical Statistics" Chinese version, 2002; English version, 2003. **[RELATED PROFESSIONAL ACTIVITIES]** Secretary, Group China, International Biometric Society (1986-); Vice President, The Association of Health Statistics, China (1998-2003, 2003-).

JING, Bing-Yi

[PRESENT POSITION] Associate Professor, Department of Mathematics, Hong Kong University of Science and Technology. **[FORMER POSITION]** Research Associate, Center for Mathematics and its Applications, Australian National University. **[DEGREES]** Ph.D. in Statistics (1993), University of Sydney; B.Sc. in Mathematics (1985), University of Lanzhou, China. **[FIELDS OF MAJOR STATISTICAL ACTIVITIES]** Bootstrap, asymptotic expansions, limit theorems, *U*-statistics, asymptotic inference. **[SELECTED PUBLICATIONS]** Jing, B.-Y. and Robinson, J. (1994). Saddlepoint approximations for marginal and conditional probabilities of transformed variables. Annals of Statistics, vol. 22, 1115-1132. Jing, B.-Y., Feuerverger, A. and Robinson, J. (1994). On the bootstrap saddlepoint approximations, Biometrika, vol. 81, 211-215. Hall, P. and Jing, B.-Y. (1995). Uniform coverage bounds for confidence intervals and Berry-Esseen theorems for Edgeworth expansion. Annals of Statistics, vol. 23, 363-375. Hall, P., Horowitz, J. and Jing, B.-Y. (1995). On blocking rules for the bootstrap and dependent data. Biometrika, vol. 82, 561-74. Jing, B.-Y. and Wood, A. (1996). Exponential empirical likelihood is not Bartlett correctable. Annals of Statistics, vol. 24, 365-369. Hall, P. and Jing, B.-Y. (1996). On sample re-use methods for dependent data. JRSS, Series B, vol. 58, 727-737. Fisher, N., Hall, P., Jing, B.-Y. and Wood, A. (1996). Improved pivotal methods for constructing confidence regions with directional data. JASA, vol. 91, 1062-1070. Wang, Q.Y. and Jing, B.-Y. (1999). An exponential non-uniform Berry-Esseen bound for self-normalized sums. Annals of Probability, vol. 27, 2068-2088. Wang, Q.Y., Jing, B.-Y. and Zhao, L.C. (2000). The Berry-Esseen bound for studentized statistics. Annals of Probability, vol. 28, 511-535. Jing, B.-Y., Shao, Q.-M. and Wang, Q.Y. (2003). Self-normalized Cram´er-type large deviations for independent random variables. Annals of Probability, to appear. Jing, B.-Y. and Wang, Q.Y. (2003) Edgeworth expansions for *U*-statistics under minimal conditions. Annals of Statistics, vol. 31, to appear. **[PRESENT POSITION]** members of ICSA and IMS.

LIN, Xihong

[PRESENT POSITION] Professor, Department of Biostatistics, University of Michigan, Ann Arbor, MI. **[FORMER POSITION]** Associate Professor (1999-2002), Assistant Professor (1994-1999), Department of Biostatistics, University of Michigan, Ann Arbor, MI. **[DEGREE]** Ph.D in Biostatistics, University of Washington, 1994; M.S. in Statistics, University of Iowa, 1991; B.S. in Applied Mathematics, Tsinghua University, China, 1989. **[FIELDS OF MAJOR STATISTICAL ACTIVITIES]** Correlated, longitudinal and spatial data; Case-control data; Estimating equations; Random effects models; Frailty models; Semiparametric and nonparametric regression; Measurement error; Missing data; Multiple outcomes; Causal inference. **[PUBLICATIONS]** Dr. Lin has published over 60 papers in statistical and health science journals, including JASA, Biometrika, JRSSB, Biometrics, Statistics in Medicine, New England Journal of Medicine, American Journal of Epidemiology, American Journal of Human Genetics. Selected statistical publications: Lin, X. and Breslow, N. E. (1996). Bias correction in generalized linear mixed models with multiple components of dispersion, Journal of American Statistical Association, 91, 1007-1016; Lin X. (1997). Variance components testing in generalized linear models with random effects. Biometrika, 84, 309-326; Wang N., Lin X., Gutierrez R., and Carroll R. J. (1998). Bias analysis and SIMEX inference in generalized linear mixed measurement error models. Journal of the American Statistical Association, 93, 249-261. Lin, X. and Zhang, D. (1999). Inference in generalized additive mixed model using smoothing splines. Journal of the Royal Statistical Society, Series B, 61, 381-400; Lin, X. and Carroll, R. J. (2000). Nonparametric function estimation for clustered data when the predictor is measured without/with error. Journal of the American Statistical Association, 95,520-534; Lin, X., Ryan, L, Sammel, M., Zhang, D., Padungtod, C., Xu, X. (2000). A scaled linear mixed model for multiple continuous outcomes. Biometrics, 56, 593-601; Lin, X. and Carroll, R. J. (2001). Semiparametric regression for clustered data using generalized estimating equations, Journal of the American Statistical Association, 96, 1045-1056; Roy, J. and Lin, X. (2002) Analysis of multivariate longitudinal outcomes with non-Ignorable dropouts and missing covariates: changes in methadone treatment practices. Journal of the American Statistical Association, 97, 40-52; Welsh, A. H., Lin, X. and Carroll, R. J. (2002). Marginal longitudinal nonparametric regression: Locality and efficiency of spline and kernel methods, Journal of the American Statistical Association, 97, 482-493. Li, Y. and Lin, X. (2002). Functional inference in frailty measurement error models using the SIMEX approach. Journal of the American Statistical Association, in press. **[PROFESSIONAL SERVICES]** Permanent member, NIH SNEM-5 Study Section (2000-2006); RReviewer, NSF grants (1996-) ENAR Program Chair, 2000; Chair, ENAR Young Researcher Workshop, 2001; PI, NIH grant on Workshop for Junior Biostatisticans; Member, ENAR Nomination Committee, 2001-2003; Member, ENAR Regional Advisory Board, 2000-2003; Member, ENAR Student Award Committee, 2001-2002; NIH/NIHLB Data Safety and Monitoring Board; Co-organizer, AMS/IMS I Joint Summer Research Conference on Emerging Issues in Longitudinal Data. **[EDITORSHIP]** Co-ordinating Editor, Biometrics (2003-2006); Associate Editor, Biometrics (1997-2002); Associate Editor, JASA (1999-2002); Associate Editor, Biostatistics (2000-2002). Editor, Selected Topics in Biostatistics, Encyclopedia of Life Support Systems, 2001; Guest Editor, Statistica Sinica Special Issue on Emerging Issues in Longitudinal Data. **[ICSA ACTIVITIES]** Guest Editor, Statistica Sinica Special Issue on Emerging Issues in Longitudinal Data, 2003; Invited Session Organizer, ICSA Applied Statistics Symposium, 2001; Invited Session Speaker, ICSA Applied Statistics Symposium, 2000; Member, ICSA.

LU, Ying

[PRESENT POSITION]Associate Professor of Radiology, Department of Radiology; Director of Biostatistics Core, UCSF Comprehensive Cancer Center, University of California, San Francisco. **[FORMER POSITION]** Assistant Professor of Radiology, UCSF (1994-1998); Assistant Professor of Epidemiology, University of Miami School of Medicine, FL (1990-1994); Assistant Teacher, Shanghai Jiao Tong University (1984-1985). **[DEGREE]** Ph.D., Biostatistics, 1990, University of California, Berkeley; MS, Applied Mathematics, 1984, Shanghai Jiao Tong University; BS, 1982, Mathematics, Fudan University. **[FIELD OF MAJOR STATISTICAL ACTIVITY]** Research, Teaching, and Consulting in various statistical areas: Statistical methods for medical diagnosis; cancer clinical trials; Cost-effective diagnostic tests; Osteoporosis and Arthritis; Quality control and quality assurance; meta-analysis; stochastic process for chronic diseases; and statistical methods for animal carcinogenicity experiments. **[PUBLICATIONS]** To then end of 2002, he has 82 papers appeared in peer-reviewed journals (Statistics in Medicine, Radiology, Journal of Bone and Mineral Research, Osteoporosis International, Medical Decision Making, Biometrics, Mathematical Biosciences, Cancer, International Journal of Epidemiology, American Journal of Epidemiology, Academic Radiology, etc.); 7 in press; 5 comprehensive reviews and letters; 7 book chapters; and co-editor of one book. Representative statistical publications include Lu Y, Heller D., Zhao, S. ROC analysis for diagnostic examinations with uninterpretable cases, *Statistics in Medicine* 2002, 21:1849-1865; Lu Y, et al.. Comparative calibration without a gold standard. *Statistics in Medicine* 16:1889-1905, 1997; Lu Y, Bean JA. On the sample size for studies of bioequivalence based upon McNemar's test. *Statistics in Medicine* 14:1831-1839, 1995; Lu Y, Malani HM. Analysis of Animal Carcinogenicity Experiments with Multiple Tumor Types. *Biometrics* 51:73-86, 1995; Lu Y, Stitt FW. Using Markov processes to describe the prognosis of HIV-1 infection. *Medical Decision Making* 14:266-272, 1994; Lu Y, Malani HM. Estimating multiple tumor transition rates based on data from survival/sacrifice experiments. *Mathematical Biosciences* 122:95-125, 1994. **[ICSA ACTIVITIES]** Member of Program Committee of ICSA 2003 Applied Statistics Symposium.

[RELATED PROFESSIONAL ACTIVITIES] He was the president (1998-1999) and vice president for Biostatistics (1995-97) of SF Bay Area ASA Chapter; Member of International Committee for Standards in Bone Measurement (1995-2000). He also organized invited sessions for JSM (1997) and American Public Health Association Annual Meetings (1995, 1996).

LUI, Kung-Jong

[PRESENT POSITION] Professor and Graduate Advisor in Statistics, Department of Mathematics and Statistics, San Diego State University, San Diego, CA 92182-7720. **[FORMER POSITION]** Associate Professor, San Diego State University; Senior Statistician, Centers for Disease Control, Post Doctoral Scholar, UCLA. **[DEGREES]** Ph.D. in Biostatistics, 1982, M.S. in Biostatistics, 1979, and M.A. in Mathematics, 1977, all from UCLA; and B.S. in Mathematics, 1975, from Fu-Jen University, Taipei, Taiwan. **[PRIMARY RESEARCH]** Interval Estimation, Categorical Data Analysis, Statistical Methods in Epidemiology, Clinical Trials, Sample Size and Power Calculation, and Survey Sampling. **[SELECTED PUBLICATIONS]** Dr. Lui published over 100 papers in a variety of refereed journals. These include the publications in the last 3 years: Lui, K.-J. and Lin, C. D. (2003). Interval Estimation of Treatment Effects in Double Consent Randomized Design, Statistica Sinica, in press; Lui, K.-J. and Lin, C.-D. (2003). A Revisit on Comparing the Asymptotic Interval Estimators of Odds Ratio in a Single 2 x 2 Table, Biometrical Journal, in press. Lui, K.-J. (2002). Notes on Interval Estimation of the General Odds Ratio and the General Risk Difference for Paired-Sample Data, Biometrical Journal, 44, 957-968. Lui, K.-J. and Cumberland, W. G. (2002). Power and Sample Size Calculation for 2x2 tables under Multinomial sampling with random Loss, Test, in press. Lui, K.-J. (2002). Interval Estimation of Generalized Odds Ratio in Data with Repeated Measurements, Statistics in Medicine, 21, 3107-3117. Lui, K.-J. (2002). A Flexible Design for Multiple Armed Screening Trials, Statistics in Medicine (Letter to the Editor), 21, 625-627. Lui, K.-J. and Cumberland, W. G. (2001). A Test Procedure of Equivalence in Ordinal Data with Matched-Pairs, Biometrical Journal, 43, 977-983. Lui, K.-J. and Cumberland, W. G. (2001). Sample Size Determination for Equivalence Test Using Rate Ratio of Sensitivity and Specificity in Paired-Sample Data, Controlled Clinical Trials, 22, 373-389. Lui, K.-J. (2001). Interval Estimation of the Attributable Risk in Case Control Studies with Matched Pairs, Journal of Epidemiology and Community Health, 55, 885-890. Lui, K.-J. (2001). Confidence Intervals of the Attributable Risk under Cross-Sectional Sampling with Confounders, Biometrical Journal, 43, 767-779. (2001). A note on Interval Estimation of the Simple Difference in Data with Correlated Matched Pairs. Biometrical Journal, 43, 235-247. Lui, K.-J. (2001). Interval Estimation of Simple Difference in Dichotomous Data with Repeated Measurements, Biometrical Journal, 43, 845-861. Lui, K.-J. (2001). Estimation of Rate Ratio and Relative Difference in Matched-Pairs under Inverse Sampling, Environmetrics, 12, 539-546. Lui, K.-J. (2001). Notes on Testing equality in Dichotomous Data with Matched Pairs. Biometrical Journal, 43, 313-321. Lui, K.-J. (2001). Notes on Interval Estimation of the Attributable Risk in Cross-sectional Sampling, Statistics in Medicine, 20, 1797-1809. Lui, K.-J. and Kelly, C. (2000). A Revisit on Tests on the Homogeneity of Risk Difference, Biometrics, 56, 309-315. Lui, K.-J. and Kelly, C. (2000). Tests for Homogeneity of the Risk Ratio in a Series of 2x2 Tables, Statistics in Medicine, 19, 2919-2932. Lui, K.-J., Mayer, J. A., and Eckhardt, L. (2000). Confidence Intervals of Risk Ratio for Cluster Sampled Data Based on the Beta-Binomial Model, Statistics in Medicine, 19, 2933-2942. Lui, K.-J. (2000). A Note on the Log-Rank Test in Life Table with Correlated Observations, Biometrical Journal, 42, 457-470. Lui, K.-J. (2000). Notes on Life Table Analysis in Correlated Observations, Biometrical Journal, 42, 93-110. Lui, K.-J. (2000). Confidence interval of the Simple Difference between the Proportions of a Primary Infection and a Secondary Infection, Given the Primary Infection. Biometrical Journal, 42, 59-69. Lui, K.-J. (2000). A Note on Use of Inverse Sampling: Point Estimation between Successive Infections, Journal of Official Statistics (Statistics Sweden), 16, 31-37. Lui, K.-J. (2000). Asymptotic Conditional Test Procedure for Relative Difference under Inverse Sampling, Journal of Computational Statistics and Data Analysis, 34, 335-343. **[PROFESSIONAL ACTIVITIES]** Dr Lui is a fellow (elected) of the American Statistical Association, a life member of the ICSA, and a member of WNAR. He was a Program Chair (2001-2002) for the section of Statistics in Epidemiology, American Statistical Association. He has made numerous presentations at professional meetings, university, and research institutes. He has also served as referees for many statistical journals.

TAN, Lingshi

[PRESENT POSITION] Director/Team Leader of Global Biometrics at Pfizer Inc in New York, with biostatistics, programming and data management responsibilities for Australia, Asia, Middle East, Africa, and Latin America. **[FORMER POSITIONS]** Director, Associate director and Assistant Director, Biometrics, Pfizer Inc; Research Statistician, Schering-Plough Research Institute **[DEGREES]** Ph.D. in Biostatistics, 1993, University of Pittsburgh; M.A. in Applied Mathematics, 1987, University of Pittsburgh. **[FIELDS OF MAJOR STATISTICAL ACTIVITIES]** Clinical trials; Multivariate random effect; Time series. **[PUBLICATIONS]** J. L. Paradise, B. A. Elster, L. Tan. (1994). Evidence in Infants With Cleft Palate That Breast Milk Protects Against Otitis Media. Pediatrics Vol. 94 No.6; K. H. Chan, C. D. Bluestone, L. Tan, K. S. Reisinger, M. M. Blatter and P. A. Fall. (1993). Comparative study of sultamicillin and amoxicillin-clavulanate: treatment of acute otitis media. Pediatric Infections Disease Journal, Vol. 12, No. 1, 24-28; L. Tan. (1991). Summary of papers and discussions. Prepared for NSF-NBER Time Series conference, September 1991 **[SELECTED PRESENTATIONS]** L. Tan. (1994). A multivariate growth curve model with CAR(1) errors. Presented at the ENAR Spring 1994 (A recipient of the Travel Award from the Biometric Society). C. D. Sanders, S. Ho, L. Tan. (1994); Application of longitudinal data analysis methodology to account for dropouts. Presented at the ENAR Spring 1994. **[ICSA ACTIVITIES AND OFFICE SHELD]** Member of ICSA **[RELATED PROFESSIONAL ACTIVITIES]** Workshop co-chair of 'Biostatistics in Clinical Research for Drug Development and Evaluation', 2003, Beijing

YAO, Qiwei

[PRESENT POSITION] Professor of Statistics, London School of Economics and Political Science. **[FORMER POSITIONS]** Reader in Statistics, London School of Economics and Political Science. Lecturer and Senior Lecturer in Statistics, University of Kent at Canterbury. **[DEGREES]** PhD in Statistics, Wuhan University (1987), MSc (1981) and BSc(1984) in Applied Mathematics, Southeast University, China. **[FIELDS OF MAJOR STATISTICAL ACTIVITIES]** time series analysis, nonparametric regression, spatio-temporal modeling, change-point problems, statistical teaching and consulting. **[SELECTED PUBLICATIONS]** Yao,Q.(1993).Tests for change-points with epidemic alternatives. Biometrika, Vol.80, 179-91. Yao,Q. and Tong, H. (1994). On the subset selection in nonparametric stochastic regression. Statistica Sinica, Vol.4, 51-70. Yao,Q. and Tong, H. (1998). A bootstrap detection for operational determinism. Physica, Series D, Vol.115, 49-55. Polonik,W. and Yao, Q. (2000). Conditional minimum volume predictive regions for stochastic processes. Journal of the American Statistical Association, Vol.95, 509-19. Yao, Q., Tong, H. Finkenstaedt, B. and Stenseth, N.C. (2000). Common structure in panels of short ecological time series. Proceeding of the Royal Society (London), Series B, Vol.267, 2457-2467. Cai,Z., Yao, Q. and Zhang, W. (2001). Smoothing for discrete-valued time series. Journal of the Royal Statistical Society, Series B, Vol.63, 357-75. Hall, P. and Yao. Q. (2003). Inference for ARCH and GARCH models. Econometrica, Vol.71, 285-317. Fan,J. and Yao,Q. (2003). Nonlinear Time Series: Nonparametric and Parametric Methods. Springer, New York. **[ICSA ACTIVITIES AND OFFICES HELD]** ICSA permanent member. **[RELATED PROFESSIONAL ACTIVITIES]** Served as an editorial board member for Journal of the Royal Statistical Society, Series B, and Australian and New Zealand Journal of Statistics. Adjunct Professor of Guanghua School of Management of Peking University.

ZHANG, Ji

[PRESENT POSITION] Senior Director, Clinical Biostatistics and Research Decision Sciences, Merck Research Laboratories, 2001-present **[FORMER POSITIONS]** Director, Associate Director, Biometrician, Clinical Biostatistics, Merck Research Laboratories 1990-2001 **[DEGREES]** Ph.D. in Statistics, North Carolina State University, 1990; M.S. in Probability and Statistics, Peking University, 1985. **[FIELDS OF MAJOR STATISTICAL ACTIVITIES]** Robust methods, Multiplicity, Missing Data, QOL/symptom score development, pharmacogenomics, PK/PD modeling.

[PUBLICATIONS] 16 publications in various statistical journals including Statistics in Medicine, Pharmaceutical Statistics, Biometrics, Biometrika, JASA, Communications in Statistics, Controlled Clinical Trials, and DIA journal; 19 publications in various clinical/epidemiological journals including European Respiratory Journal, Am J Respir Crit Care Med, Clinical Therapeutics, Journal of Clinical Pharmacology, New England J Medicine, Thorax, and Journal of Allergy and Clinical Immunology. **[ICSA ACTIVITIES AND OFFICES HELD]** Participated in past symposiums, helped to organize a session, and presented an invited talk in 2000 (on QOL). **[RELATED PROFESSIONAL ACTIVITIES]** Active member in ASA and IBS, current executive committee member in Biopharm Section, ENAR education advisory committee; past RAB member, student award committee chair of ENAR; organizers/chairs of several sessions in JSM and ENAR meetings; Referee for journals including Communications in Statistics, JASA, Biometrics, Biometrical Journal, and Controlled Clinical Trials.

ZHAO, Hongyu

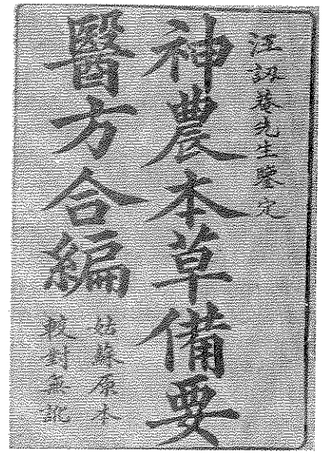
[PRESENT POSITION] Ira V. Hiscock Associate Professor of Public Health and Genetics, Division of Biostatistics, Yale University School of Medicine **[FORMER POSITIONS]** Mathematical Statistician (visiting), National Cancer Institute (2002); Assistant Professor, Division of Biostatistics, Yale University School of Medicine (1996 – 2000); Adjunct Assistant Professor to Assistant Professor in Residence, University of California at Los Angeles (1995 – 1996). **[DEGREES]** Ph.D., 1995, Statistics, University of California at Berkeley; B.S., 1990, Probability & Statistics, Peking University. **[FIELDS OF MAJOR STATISTICAL ACTIVITIES]** Applications of statistical and computational methods in genetics and molecular biology: statistical genetics; bioinformatics; pharmacogenomics; genetic epidemiology. **[PUBLICATIONS]** 58 papers in various statistical and scientific journals, including American Journal of Human Genetics, Genetics, Genetic Epidemiology, Biometrics, Journal of Computational Biology, Journal of American Statistical Association, Science, Proceedings of the National Academy of Sciences and others. Selected publications: H. Zhao, M. S. McPeek, and T. P. Speed. (1995) Statistical analysis of crossover interference using the chi-square model. *Genetics*, 139: 1045-1056; H. Zhao and T. P. Speed. (1996) On genetic map functions. *Genetics*, 142: 1369-1377; H. Zhao, H. Zhang, and J. I. Rotter. (1997) Cost-effective sib-pair designs in the mapping quantitative-trait loci. (1997) *American Journal of Human Genetics*, 60: 1211-1221; H. Zhao and T. P. Speed. (1998) Statistical analysis of half-tetrads. *Genetics*, 150: 473-485; H. Zhao, A. J. Pakstis, J. R. Kidd, and K. K. Kidd. (1999) Assessing linkage disequilibrium in a complex genetic system. *Annals of Human Genetics*, 63: 167-179; H. Zhao, S. Zhang, K. R. Merikangas, M. Trixler, D. Wildenaur, F. Sun, and K. K. Kidd. (2000) Transmission/disequilibrium tests using multiple tightly linked markers. *American Journal of Human Genetics*, 67: 936-946; H. Zhao, J. Li, and W. P. Robinson. (2001) Statistical analysis of uniparental disomy data using hidden Markov models. *Biometrics*, 57: 1074-1079; S. Zhang, K. K. Kidd, and H. Zhao. (2002) Detecting genetic association in case-control studies using similarity-based association tests. *Statistica Sinica*, 12: 337-359; S. Wang, K. K. Kidd, H. Zhao. (2003) On the use of DNA pooling to estimate haplotype frequencies. *Genetic Epidemiology*, 24: 74-82. **[PROFESSIONAL ACTIVITIES]** Ad hoc member and regular member, Social Sciences, Nursing, Epidemiology, and Methodology Study Section, National Institutes of Health (1999 – 2004); ad hoc grant reviewer for National Institutes of Health, National Science Foundation, U. S. Civilian Research and Development Foundation, the Royal Society of New Zealand, Michael Smith Foundation of Canada; Session chairs and organizers of ASA and other professional meetings; Data Safety and Monitoring Board, National Heart, Lung, and Blood Institute. **[EDITORSHIP]** Associate Editor, Journal of Agricultural, Biological, and Environmental Statistics (1998 – present), Biometrics (2002 – present), Pharmacogenomics (2002 – present), Statistical Applications in Molecular Biology and Genetics (2002 – present); referee for 39 journals.

ZHU, Guangrui Ray

[PRESENT POSITION] Director Global Biostatistics, Aventis Pharmaceuticals, Bridgewater, NJ. **[FORMER POSITIONS]** Statisticians at Pfizer, Schering-Plough, and US FDA since 1990. **[DEGREES]** Ph.D. in Statistics, 1992 Stanford University. **[FIELDS OF MAJOR STATISTICAL ACTIVITIES]** Clinical trial methodology: self-tuning clinical trial design, non-inferiority studies; Pharmacokinetics and Pharmacodynamics modeling: non-linear mixed effect models and population PK/PD; Adaptive non-linear estimation and prediction; Using bootstrap and non-linear mixed effect modeling to establish bio-equivalence based on PD markers for metered dose inhalers. **[SELECTED PUBLICATIONS]** "Statistics in Pharmacology and Pre-clinical Studies", a chapter in Advanced Medical Statistics, 2001, with T.L. Lai and M.C. Shih; "Predictors of an acute antidepressant response to fluoxetine and sertraline", International Clinical Psychopharmacology, 1999, with M.F. Flament, R. Lane and Z. Ying; "The effect of age on the clearance of felbamate: a retrospective analysis using non-linear mixed effects modeling", Therapeutic Drug Monitoring, 1997, with C. Banfield and P. Glue; "Adaptive Prediction in Non-linear Autoregressive Models and Control Systems", Statistica Sinica, 1991, with T.L. Lai. **[ICSA ACTIVITIES AND OFFICES HELD]** Organized and chaired a session of Population Pharmaco-Statistic Modeling in ICSA 1996 Applied Statistics Symposium. **[RELATED PROFESSIONAL ACTIVITIES]** Program committee member for a Workshop in Beijing, 2003 on "Biostatistics in Clinical Research for Drug Development and Evaluation"; DIA and ASA activities.

ZHU, Lixing

[PRESENT POSITION] Professor of Statistics, Academy of Mathematics and System Science, Chinese Academy of Sciences and Associate Professor, Department of Statistics and Actuarial Science, The University of Hong Kong. **[FORMER POSITIONS]** Associate Professor Academy of Mathematics and System Science, Chinese Academy of Sciences and Research Fellow, Department of Statistics, The University of Hong Kong. **[DEGREES]** PHD in Probability and Statistics Chinese Academy of Sciences(1990), MS in Statistics, University of Science and Technology of China (1985) and BS in Mathematics, Anhui University(1982). **[FIELDS OF MAJOR STATISTICAL ACTIVITIES]** Large scale dada analysis, Resampling techniques, regression analysis, empirical process theory. **[SELECTED PUBLICATIONS]** Dr. Zhu has published 90 papers including Zhu, Lixing and Ng Kai Wang (1995), Asymptotics of sliced inverse regression, *Statistica Sinica*. 5, 727-736. Zhu, Lixing and Fang Kai Tai (1996) Asymptotics for kernel estimates of sliced inverse regression, *Ann. Statist.* 24, 1053-1068. Stute, W., Thies, S. and Zhu, L. X. (1998) Model checks for regression: An innovation process approach, *Ann. Statist.*, 26, 1916-1934. Zhu, L. X. and Neuhaus, G.(2000) Nonparametric Monte Carlo tests for multivariate distributions. *Biometrika,* 87, 919-928. Xia, Y., Li, W. K. and Tong, H., Zhu, L. X. (2002)An adaptive estimation of optimal regression subspace, *Journal of Royal Statistical Society, Series B*, 64, 363-410. Read Paper (it was read in February meeting organized by Royal Statistical Society of Kingdom). **[HONORS]** *Humboldt Research Award* granted by Alexander-von Humboldt Foundation of Germany in 2000. He is the first such awardee in Natural Science and Engineering in Taiwan, Hong Kong and the mainland of China and the only winner in Statistics in Asia. **[ICSA ACTIVITIES AND OFFICES HELD]** Member of ICSA. **[RELATED PROFESSIONAL ACTIVITIES]** a standing member of the council of Statistics and Probability Society of China (1994--2002), a standing member of the editorial board for "Journal of Applied Probability and Statistics", an Associate Editor of "Acta Mathematica Applica Sinica" and Editor of "International Journal of Systems Science and Complexity".



(Classical Chinese herbal medicine recipes compiled by the legendary leader Shen-Long Shi.)

Interview with a Pioneer in Bioengineering

A Conversation with Professor Y.C. Fung

By: Li-Rong Lilly Cheng, Ph.D. and Koun-Ping Cheng, Ph.D.

Professor Yuan-Cheng Fung is a leading scientist in the field of bioengineering. His devoted research in this field covers the span of over four decades. His vision is to understand the world and life; his mission is to make contributions in the advancement of science; his passion is the ongoing quest of knowledge and the discovery of truth. Norman Cousins once described Dr. Jonas Salk, the famous developer of the polio vaccine, "You represent the perfect marriage of science and art as it is and as it should be." Professor Fung, likewise, represents the perfect marriage of a scholar and a gentleman as he is and as he should be. Professor Fung is a member of the National Academy of Sciences, National Academy of Engineering and Institute of Medicine. He received the National Medal of Science in 2001.

Would you please tell us about your personal journey to this country?

My journey to this country is actually quite an interesting story. During World War II, a group of American professors went to China and met with Mr. Li-Fu Chen, the Minister of Education at the time, in Szechuan Province. They asked him why there were no Chinese students going to study in the US. Mr. Chen informed them that the country was at war, and there was economic hardship. Mr. Chen was delighted to facilitate the study of students abroad if financial assistance could be secured.

After this group returned to the US, they secured 40 scholarships and offered them to Chinese students. When the good news arrived, the government held a nationwide examination to select the best students to go abroad to study. I was among this lucky group.

I arrived at California Institute of Technology in 1946. Upon arrival I learned that this specific scholarship was offered two years before and was not available. Fortunately, Professor Sechler, my mentor, informed me that although I missed the first quarter I could audit the classes and take the examinations as well. He also offered me a job to working in his laboratory. The best part of this offer was that the results could be counted toward my degree requirements if I passed the tests. At the end of the first year, I passed most tests without having even registered as a formal student. I was truly one of the fortunate ones! I also had the opportunity to meet other Chinese students on campus including Dr. Hue Sheng Tsien.

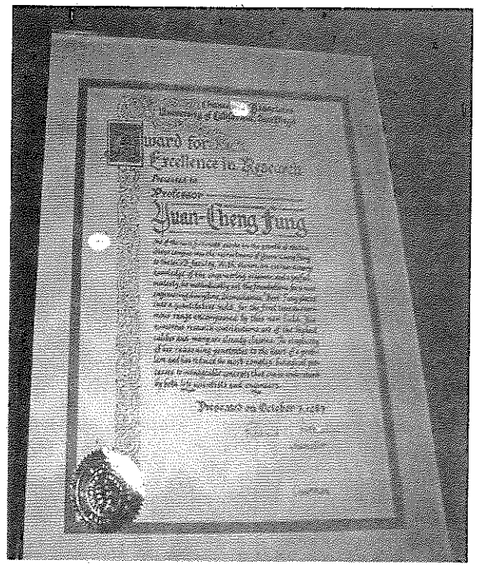
When you first came to the US, you studied aerospace engineering. How did you end up with bioengineering? What motivated you to switch your field?

One of the incidental reasons leading to my switch from aeronautics to bioengineering was my mother's eye disease. In 1957, she had glaucoma. I was so worried but I was not able to go back to China to take care of her. I was not even allowed to send money back to her to visit doctors. Finally, I came up with the idea of clipping all the medical briefs I could find about her disease and translating them into Chinese. She took them to a local doctor at my hometown. Fortunately, my mother's eye operation was successful. Many years later, when I went back to my hometown, this doctor even showed me

his collection of the material I sent back to him. From then on, I started to study biology and physiology myself. I started to realize the potential contribution of engineering to biology. That eventually became my major interest and set the agenda for my research.

Can you share the early days of biology research with us?

The most important person in biology in the western world was Aristotle. He did a great study of human anatomy. Since he was the teacher of Alexander the Great, he had the opportunities to go to wars with the King and studied the bodies of the wounded or dead soldiers. He studied the blood and the heart. He produced detailed pictures about human anatomy. However, he never realized the connection between the heart and lungs.



Not until about a thousand and five hundred years later, did Harvey make the connection between the heart and the lungs. Indeed, Harvey realized that two ounces of blood being pumped out of the heart during every heartbeat had to go somewhere and concluded that the blood went to the lungs from the heart.

How about the early history of biology research in China?

Chinese had a much earlier and much better understanding of blood circulation than other countries in the early days. Ancient Chinese conducted clinical trials to understand how herbal medicine worked in the human body thousands of years ago. The legendary Chinese leader, Shen-Long-Shi, and his cabinet members tested thousands of herbs to investigate the efficacy of the Chinese medicine. Even though the documentation was extensive, the classical Chinese medical documentations rarely had good graphical description of these findings.

As early as Yellow-Emperor (ca. 2697 B.C.), the Chinese Book-of-Internal-Medicine had already mentioned the interaction between the heart and lungs. That discovery was made several thousand years before the western world discovery.

During the Ming dynasty, Li Shizhen edited the classic "Pen Ts'ao Kang Mu" (The Great Herbal Catalog) which had monumental impact on the development and research in Chinese herbal medicine. Before his days, medical documents were very often fragmented and scattered with no systematic classifications and often inaccuracies. Li spent about forty years on his book that included 1,892 recipes of herbal medicines. This book was finished in 1593 and had been translated into several languages in Japan, the Netherlands, France, Germany, and Great Britain. Amazingly, the information he provided then was essentially all accurate.

In the early 1980s, you were trying to study the human pulse that is used in traditional Chinese medicine (ba mai). What did you learn?

Human pulse is a very complicated phenomenon. In China, the medical practitioners put three fingers around the wrist and try to diagnose the body's condition by feeling the pulse with the fingers. They believe that a matrix of six points

around the wrist can provide a synopsis of the health conditions of individuals. People with different health conditions will produce different types of pulse movements. We tried to build a mechanical device to mimic the functions of the human fingers as a diagnostic tool and to collect data for analysis. However, we found that the device was not as flexible as human fingers. For example, human fingers can adjust to the proper positions when a patient's hand moves; however, it is not easy for the mechanical device to adjust to that kind of movement. The device requires patients to stay still for the entire duration of applications.

However, the most difficult part is that the pulse signal-noise ratio is too small to make any concrete conclusions in this kind of study. As in any clinical trials, patient variations are so great, even a sophisticated statistical model cannot filter out a significant pattern of signal to overcome the noise. That really makes the detailed study more difficult.

How about today?

There are a good number of Chinese researchers in Asia working on Chinese medicine, including the method of diagnosis. Actually, there was a recent conference in Asia discussing the development of Chinese medicine and method of diagnosis. They hope to create some synergy by using the classical and more modern knowledge of Chinese medicine. Interestingly enough, the experts concluded that the book edited by Li Shizhen is amazingly useful and accurate. It really is a great treasure in Chinese medical research. However, because of the competition of funding and resources, the effort to sustain this line of research in America is somewhat difficult.

Looking back 10 or 20 years, could you share with us some of the great milestones in bioengineering that greatly enhanced human lives?

There are a lot of great developments through the effort of bioengineering to benefit human beings. Almost all the inventions of medical devices are through the joint effort of bioengineering and medicine. Examples include the heart-lung machine which enables patients to maintain the proper function of the body while they are undergoing major medical procedures, the artificial heart which enables patients with heart problems to continue their lives, the equipment and material to perform orthopedic surgeries, etc. There are really quite a lot if we think about it carefully.

By the understanding of the human anatomy and the special expertise of the engineering thinking, we can create something useful to enhance the quality of human life. For example, by studying the human blood cells, we discovered that the red blood cells were shaped like donuts. With this shape, the blood cell has zero inner pressure that makes it very easy and very flexible to travel anywhere in the body and, therefore, optimize its functions. This finding can potentially be used to develop other devices for other purposes which are not necessarily limited to medicine or biology. In addition, we also discovered that the shape of the white blood cells changed when the animal died. Up to today, this shape change still serves as the most clear cut boundary of life and death. If one can come up with a procedure to slow down or reverse this change, human life can potentially be prolonged. However, that may also delay someone from going to the heaven (laughs).

How about the future research in bioengineering?

It has been fifty year since people discovered the structure of the DNA molecule. The more recent biological research has very much been directed toward the function of DNA. Genomics research is the hot topic and is also the primary direction to go in these days. The success in this area will someday enable people to design individualized medicine with better treatment efficacy. At the

University of California, San Diego, we have very strong research programs in this area. In addition, we also have a booming biotechnology industry in Southern California that will only make the research in this area moving even faster and more productive.

However, the competition of research is extremely fierce. The sharing of results and the openness of discussions have recently been greatly reduced. Part of the reason is the governmental policy. Ever since the government permitted researchers to patent their findings in this area of science, researchers started to safeguard their research results with increased secrecy in hopes to reap the profits of their work someday. This is not helpful to the advancement of scientific research.

There are still lots of interesting research opportunities in this area. I strongly encourage people to pour more efforts into the research of this area through cross-disciplinary collaborations. When different people from different training backgrounds look at the same problem from different perspectives, the combination of their diverse expertise is the best way to move research ahead and make the most advances.

You are truly a pioneer, gentleman, and scholar. We are so privileged to talk to you. Could you share your personal philosophy with us?

In the classical Chinese book of Zhuang-Tse, there was a story about a butcher and how he dissected the cows. He was so proficient at his job and so skillful of his performance; whatever he did became an enjoyment for him. This is the Chinese philosophy for living a long life. I believe in it. In everything we do, we should go with the natural flow and not to force the issue. We need to be passionate about what we do and we will learn the enjoyment of our craft.

Special Feature Article:

Can Economists Forecast Accurately?

By: Gregory C. Chow, Ph.D.

Dr. Chow is a Professor of Economics at Princeton University. We are extremely honored to have him share with us about his broad experience in research. This article is based on his presentation on July 1, 2002 before a meeting of the members and guests of Academia Sinica in Taiwan. – *The Editor*

Can economists forecast accurately? My answer is yes. In this paper I will discuss when and how accurate economic forecasts can be made and generalize the method of forecasting for the prediction of non-repetitive or unique events. Skeptics have doubts that economists can predict. They point to the forecasting errors that economists have made. They can also point to different forecasts, and different opinions in general, from different economists. I will provide evidence below, however, that knowledge of economics is useful for making accurate forecasts. My general view can be illustrated by comparing economists with medical doctors. Both have knowledge to make forecasts, but they have different opinions on their respective subjects sometimes. Some make mistakes more often than others. The better economists or doctors are correct more often. Like economists who make inaccurate forecasts, doctors also make wrong diagnosis and prescribe wrong treatments.

The outline of this paper is the following.

1. Examples of Economic Forecasts by Quantitative Methods
2. What Kinds of Economic Events are Predictable?
3. Methods of Prediction: Quantitative and Qualitative
4. Examples of Predicting Unique Historical Events
5. Usefulness of Forecasting
6. Conclusions

1. Examples of Economic Forecasts by Quantitative Methods

It is convenient to draw examples of successful economic forecasts using standard quantitative methods from my own research experience.

Demand for automobiles in the US from 1958 to 1968.

For my PhD thesis at the University of Chicago I developed a theory of demand for durable goods based on the simple but essential idea that the theory of demand for non-durable goods is applicable to explaining the demand for the consumption, or the ownership, of durables in the long-run. The demand for purchase of new durable goods is derived from the need to adjust the amount of existing stock to the desired level based on the above demand for consumption. According to this theory when income changes the demand for stock or ownership changes. As in the case of demand for non-durables, the most important variables explaining the demand for ownership of automobiles are the relative price of automobiles and real income of the consumers. Using historical data from 1921 to 1953 in the United States, I estimated the effects of price and income on the demand for ownership. An important factor contributing to the accuracy of the estimates of these effects was my collection of data on actual transaction prices in used car markets as recorded in newspaper advertisements, rather than using official list prices which were inaccurate for the period of

World War II. After I completed my dissertation, others at the University of Chicago applied the same theory to explain the demand for other durables including non-farm housing, refrigerators, farm tractors and corporate investment goods with success. In 1958, Arnold Harberger, adviser of these theses, decided to incorporate them in a book, Harberger (1960). I was asked to contribute a chapter. Since my dissertation had already been published as a book, Chow (1957), I had to write a new essay for that volume. My essay was "Statistical demand functions for automobiles and their use for forecasting," Chow (1960).

Table 2 of Chow (1960, p. 164) provides the annual purchase of new car equivalents per 100 persons for the four years 1954-1957 to be 3.452, 3.730, 3.630, and 3.270 respectively. The corresponding errors of forecasts from my equation explaining annual purchase (based on data up to 1953) were -.0.044, 0.608, -0.087 and 0.226. These forecasting errors appear small. I then provided a statistical test to find out whether the four out-of sample observations are consistent with the assumption that the equation estimated by using data from 1922 to 1953 remained valid in 1954-1957. The results of applying this test was reported in Chow (1960a) and its statistical method more fully discussed in Chow (1960b) – the latter is now known as the Chow test.

Not only was the model capable of providing accurate forecasts of annual sales, it was also useful in forecasting long-term sales. In the late 1950's annual sales of new cars were in the order of five million, and many observers considered that this quantity would not increase substantially because the market was saturated. Writing in early 1958, I projected a reasonable per capita disposable income in the US for 1968, and applied the effect of income on automobile demand which had been estimated in Chow (1957, 1960a) to make a 10-year forecast for 1968. The resulting forecast, reported in Chow (1960a, p.173) was over 8 million cars, as compared with 5 million in 1958. The above forecast was considered very optimistic, but history showed that it was quite accurate. This forecast was based on economic theory and econometric analysis. The reason for success is that the effects of price and income on demand are stable economic parameters from the 20's to the 60's. The General Motors Corporation in its internally circulated documents prepared by Andrew Court also used my equation to forecast annual automobile sales with reasonably accurate results.

Demand for computers.

In the 1960's while working at the IBM Research Center in Yorktown Height, New York, I completed a study of the demand for computers, consisting of two main ideas. First, a Gompertz growth curve shows how the computer users adjust their computers to an equilibrium level. Second, the equilibrium level is constantly moved upward because the price of computers (adjusted for computing utility) is being reduced by some 20 percent per year. Combining these two concepts into an equation and using suitable data, I estimated a demand equation that was useful for forecasting, as reported in Chow (1967). IBM used it for several years and found the forecasts to be reasonably accurate, but the forecasts were circulated in internal corporate documents only.

Forecast of inflation in China.

In June 1985 I conducted a macro-economic workshop in China under the sponsorship of the Chinese State Education Commission. The workshop was held at the People's University (Renda) in Beijing and almost one hundred economics teachers and government researchers attended. At the beginning of the workshop, the office of Premier Zhao Ziyang contacted me to ask whether the 50 percent increase in currency in circulation in 1984 might cause serious inflation in China and whether I could provide a forecast of the rate of inflation in 1985. I formulated an equation to explain inflation in China based on two ideas. The first is the quantity theory of money, which suggests using the ratio M/GDP of the quantity of money M to

real GDP as the main variable to explain the price level p.

$$\ln p = a + b \ln (M/GDP) + u$$

where M is the quantity of currency in circulation as checking accounts were not used in China. The second idea is that in the short run there is a dynamic adjustment process that specifies how the change in the price level or the inflation rate, y(t) = ln p(t)-ln p(t-1), is affected by past inflation rate y(t-1) and by the change in the explanatory variable in the above equation, i.e., by x(t) = ln(M/GDP)(t) – ln(M/GDP)(t-1). The equation allowing for such a dynamic adjustment is estimated to be

$$y(t) = 0.00422 + 0.1430\, x(t) + 0.2176\, y(t-1) - 0.3086\, u(t-1)$$

as reported in equation (17) of Chow (1987). The third explanatory variable u(t-1) is the residual of the equilibrium relation between ln p and ln(M/GDP). It has a coefficient of – 0.3086, showing that if in the last year the level of ln p was above the norm, with u(t-1) being positive, it has an effect to depress y(t) = ln p(t) – ln p(t-1). This negative effect is the well-known error correction mechanism in the literature on cointegration. When a preliminary version of the above equation was used to forecast China's inflation rate in 1985, the result was no more than 9 percent. Premier Zhao was somewhat relieved by this result which later turned out to be correct. In 1984, money in circulation in Mainland China increased by 50 percent. The reason why its effect on inflation in 1985 was so small was that, according to the dynamic adjustment process of the second equation, inflation in 1985 is influenced by inertia, namely, past changes in the explanatory variable x which were small before 1984.

I don't know whether Premier Zhao or some of his economics staff got the idea from my study that a substantial increase in money supply would lead only to a moderate rate of inflation. If so, it would have been a very serious misinterpretation of my finding. In 1985, there was a large increase in money supply for only one previous year 1984, while the increases in the earlier years were small. But in 1986-88, money supplied continued to increase at a high rate, in the order of 30 to 35 percent per year. As a result inflation in the fall of 1988 reached about 30 percent per year. Serious inflation and corruption were considered two major factors contributing to discontent and demonstrations in Tiananmen Square in 1989.

The acceleration principle

As formulated in my demand equation for automobiles in the United States this principle was applied to explain the demand of investment goods in the US and in China. See Chow (1960a, 1967a, 1985a, p. 236, and 1985b). According to this principle the demand for the purchase of new durable consumer or investment goods depends not on the level but on the rate of change of income. The purchase of new automobiles is the change in the quantity of automobile ownership and hence depends on the rate of change in income. If income continues to increase but at a slower rate we will find the purchase of new durable goods to decrease, while the purchase or consumption or purchase of non-durables and services will continue to increase but at a slower rate. This principle was statistically confirmed by numerous studies using data of the US and the Chinese economy cited above. It can explain the reduction of consumption expenditures on durable goods in China in 1998. In 1998 China had a 7.8 percent growth in GDP, but this rate of increase was smaller than the rate in 1997, thus leading to a reduction in the purchase of consumer durables in 1998.

Forecast of China's GDP in 2020

The next example taken from Chow (2002a) is a forecast of the future and therefore cannot be considered successful at the present time, but I have full confidence in it because it satisfies the conditions for successful econometric predictions to be discussed below. The prediction is that total real output of China measured by 1998 US dollars (based on calculation of the World Bank, 2000, table 1, p. 230) will exceed that of the US by the year 2020. The future GDP of China can be forecast using a simple econometric model. The main equation is a Cobb-Douglas production function that specifies the relation between the total output Y and capital input K, labor input L and total factor productivity A.

$$Y = A K^b L^{1-b}$$

Assume further that the exponents of capital and labor inputs sum to one as indicated in the above equation and that total factor productivity A increases by a constant percentage α per year. The first assumption is supported by statistical evidence using output and income data in China and elsewhere. Under these two assumptions there are only two parameters to be estimated: the capital exponent b and the rate of increase α in total factor productivity.

Chinese output and input data from 1952 to 1998 are used to estimate these two parameters, giving approximately b= 0.6; α=0.027 (after 1979); and α=0 (before 1979). That is, one percent increase in capital input alone raises output by 0.6 percent; on average total output increases by 2.7 percent per year after 1979 even if the quantities of the inputs are constant. The accuracy of the estimate 0.6 was supported by three other pieces of evidence, (1) a study by Mankiw, Roemer and Weil (1992), (2) an estimate based on data for state enterprises in Chow (1985a, p. 125) and (3) an estimate of 0.4 for the labor exponent based on Buck (1930). In a competitive market economy, wage paid to a laborer equals the value of the marginal output which he/she can produce using his labor, with other inputs fixed. The marginal output is the partial derivative of Y with respect to L, which equals (1-b)Y/L by the above equation. Setting this equal to wage w, we have (1-b) = wL/Y, where wL/Y is the share of output paid to labor. Buck (1930) surveyed 2866 farms in 17 localities in 7 provinces in China and reported value added Y per farm to be 336.13 yuan and payment for labor to be 127.99. The ratio 127.99/336.13 is 0.38 for (1-b), very close to the value estimated by using the above production function. If the estimate of 0.6 for the exponent of capital is accurate, the only remaining parameter α, the annual rate of change in total factor productivity, can be accurately estimated by output and input data spanning over several decades from 1952 to 1998 since the problem of multicolinearity is avoided by using an accurate and independent estimate of the first parameter. Given the reliability of these two parameters I can be confident of my forecast of China's total output up to 2020 based on the above production function, combined with reasonable assumptions on the fraction of output devoted to the accumulation of capital, on the rate of growth of the labor force and on the possible reduction of the rate of increase in total factor productivity, all somewhat conservatively estimated to yield a low growth rate of total output for China for the above forecast for 2020.

In fact by projecting historical trends, I succeeded in forecasting, in late June 1989 right after the Tiananmen tragic incident, a continuation of rapid economic growth in China in the decade of the 1990's as recorded in an article reproduced in Chow (1994, chapter 7) .

Forecasting Taiwan's economic growth

A similar exercise using an aggregate production function to forecast Taiwan's economic growth from 2000 to 2010 is reported Chow and Lin (2002) using data from 1951 to 1999. I am less confident of the forecasts because my institutional knowledge of the Taiwan economy is very limited. The same analysis as reported in the previous example was applied to Taiwan mainly to provide a framework for economists to air their possible differences. For Taiwan, the two essential parameters b and α are estimated to be respectively 0.3 and 0.03. The value 0.3 for the exponent of capital is close to the value for the United States. China has a much larger value 0.6 because capital is relatively scarce and labor is abundant. As an economy develops and the amount of capital becomes large relative to the quantity of labor, the exponent of capital will

gradually decrease and the exponent of labor will gradually increase, as illustrated by the gradually increasing share of payment to labor from total income recorded in Chow and Lin (2002). Using this production function Chow and Lin (2002) forecast an average rate of growth of real GDP for Taiwan to be about 6 per cent per year from 2000 to 2010. Whether this forecast will turn out to be correct depends on whether (1) the two parameters b and α will remain constant and (2) the assumptions about the rate of growth of labor force and the rate of savings as a fraction of GDP are correct. One can easily question the validity of the forecast of 6 percent annual growth on average, in view of the slow growth of about only 3 percent in 2000-2002. There are valid reasons for this skepticism which will not be discussed here. This example illustrates that we cannot make accurate forecasts by projecting mechanically the relations estimated by past data. Parameters may change, and unexpected shocks could occur. For example, a reduction by 0.01 of the rate of annual growth of total factor productivity would reduce the forecast of a 6 percent growth rate to 5 percent. Institutional knowledge and good judgment are essential to making accurate forecasts.

2. What Kinds Of Economic Events Are Predictable?

Only some and not all economic events are predictable. The predictable events include those that obey some basic laws, as illustrated by the above examples. In addition unique and non-repetitive historical events can also be predicted if the factors affecting the event can be isolated and their influence on the outcome can be analyzed. The first kind of economic events can be predicted by the use of quantitative economic or econometric models. The second kind is predicted by economic as well as non-economic knowledge combined with sound judgment based on such knowledge.

Let me state a set of sufficient conditions for quantitative economic predictions to be accurate. The conditions include: (1) there is a random data generating process that will remain valid in the future; (2) the specification of this process by the economist is correct, and (3) the parameters are properly estimated using reasonably accurate data and appropriate econometric method. The assumption that certain economic data are generated by a repetitive random process is a bold one. It implies that future economic events are not significantly affected by unforeseen political or other circumstances but follow the same pattern probabilistically as in the past. Such a bold assumption is required to use econometric models. The second condition is most important. It is extremely difficult to specify correctly a quantitative economic model with constant parameters through time. If one variable is used as a predictor the relation may be stable, but if another is used it will not be. The third condition is also important. Inaccurate data or inappropriate method of estimation can spoil a well-specified model.

The above conditions imply that whether an economic event is predictable depends not only on the nature of the event but also on the person predicting it, just as whether a certain illness can be successfully treated depends on the skill of the physician. Economic prediction is an art as much as a science. It is an art to apply the appropriate economic laws. All trained economists have studied the basic textbooks and passed qualifying examinations. However only a few have the sound judgment to select the relevant part of economic theory to make an accurate analysis of the problem at hand. For example, what explains the Asian financial crisis in 1997-99? Was it due to an inherent weakness of the financial system of many Asian counties? In the West, such an alleged weakness is dubbed "phony capitalism." If this is the case a slow and incomplete recovery should be predicted because future growth would be limited by such fundamental weaknesses in economic institutions that cannot be changed easily. Was the crisis that first started in Thailand in 1997 the result of speculative bubbles similar in nature to those occurring in developed economies? If so, the affected Asian economies could be expected to recover fairly rapidly to their former growth paths in the same way that a developed economy

recovers from a bubble, provided that no other important factors came to intervene, such as a downturn of the U. S. economy.

3. Methods Of Prediction: Qualitative and Quantitative

Given the above conditions for accurate predictions, economic events can be predicted by the use of quantitative economic models. We will also consider the forecasting of non-repetitive or unique events. Such events can also be forecasted if the factors affecting the outcome and the manner they affect it are corrected specified by the use of relevant economic and non-economic knowledge combined with sound judgment. We can describe methods of prediction suitable for the two types of problems.

A) Formal and quantitative. The use of a formal model is required. One can select a small number of important variables to make the forecast and rely on a few parameters to characterize the interactions of these variables with the variable to be forecast. The value of the parameters could be estimated by econometric methods or determined by judgment based on prior knowledge of the forecaster. Some economists build large econometric models for forecasting. I do not have such competence; I am unable to specify so many equations correctly since there may be insufficient knowledge concerning some of the equations. The estimation of a large number of parameters may give rise to inaccurate estimates given a limited set of data. Furthermore, misspecification of some equations can affect the estimation accuracy of other equations and the predictive accuracy of the entire model. Hence I will leave to others to discuss how to forecast with models much larger than the one presented in Chow (1967a), while being content to answer the question raised in the title this paper by using the examples with which I am familiar.

B) Informal and qualitative. The use of econometric models for prediction assumes that the data are generated by a stochastic process that continues to generate data in the same manner as in the past. Therefore it is applicable only to repetitive economic events. Some economic events are not repetitive. One example is the introduction of economic reform in China in 1978. To forecast such events one cannot rely on an econometric model and statistical data to estimate its parameters, but the analytical framework is similar.

The method for forecasting non-repetitive or unique historical events is more general than econometric method. Both require the selection of important variables and the specification of how the variables affect the outcome. Econometrics is a special case when the variables can be conveniently measured numerically and when their effects can be formulated in a set of mathematical equations. For example, the degree of competence of certain political leaders and the quality of the Chinese workers and entrepreneurs affected the success of China's economic reform in the 1980's but these variables are difficult to quantify. By assigning numbers somewhat arbitrarily to these attributes may not improve forecast accuracy. The effects of these qualitative attributes or variables need not be embedded in mathematical equations. Specifying a set of mathematical equations may not be as effective as the use of judgment concerning the combined effects of the attributes as we shall demonstrate in an example below on predicting the future of Hong Kong. The computer has not yet surpassed the human brain in processing information for making important business and political predictions. Neither can the use of mathematics. However, two general steps in the use of econometrics for forecasting are applicable in general. First, select the major "variables" relevant to the historical situation at hand, even if these "variables," like the ability and character of certain political leaders, are not measured quantitatively. Second, specify how the variables acting together will affect the outcome to be predicted.

4. Examples Of Predicting Unique Economic Events In China

My first example is the prediction of the future of Hong Kong's economic system before its return to China in 1997. A pessimistic forecast was based on the judgment that the government in Beijing would interfere with the free-market system. This judgment could have been derived from the history of the PRC government in destroying the capitalist system in Shanghai in the early 1950s. An optimistic forecast could have been based on the judgment that the Beijing government would honor its commitment to the "one-country two systems" policy and allow Hong Kong to maintain its existing capitalist system. This judgment could be based on the more recent record of the PRC government in pursuing economic reform and in keeping its promises since reform started. The major determining variable in this case is the behavior of the Chinese government. One forecaster may assign a positive value and another may assign a negative value to this variable. Given its value one may make a corresponding optimistic or pessimistic prediction concerning the preservation of capitalism in Hong Kong.

When more variables are considered, the forecasting process becomes more complicated. One such variable is the opinion and reaction of the international community as perceived by the Chinese government in the event that it fails to fulfill its promise to preserve Hong Kong's capitalist economy. Another is the reaction of the people and government of Taiwan to such an event as perceived by the PRC government. A forecast based on a negative assessment of the PRC government would have to be modified if the reaction of the world community and of the Taiwan people is taken into account. To do so may turn a pessimistic forecast of Hong Hong's economic system to an optimistic one. Whether this will happen depends on how severe the negative judgment of the PRC government is to begin with, and how much weight is given to the world reaction or the Taiwan factor. A forecast can incorporate these factors without quantifying the negative value for the Chinese government, the weights it gives to world reaction and the Taiwan factor. All these factors can be incorporated into a forecast without the use of a set of mathematical equations. The forecaster simply examines these factors and weighs their influence using his judgment. A sound judgment in this case depends crucially on the forecaster's knowledge of the behavior of the Chinese government.

As a second example consider predicting the success of China's economic reform towards a more market-oriented economy which began in 1978. As demonstrated by the experience in Taiwan, Singapore, Hong Kong and South Korea, a functioning market economy that enables the citizens to make money by ingenuity and hard work, even though imperfect, together with sufficient high-quality human capital in the form of resourceful entrepreneurs and a hard-working labor force are sufficient conditions for rapid economic growth, provided that there is political stability. Knowing the above two sufficient conditions one should have predicted the success of China's economic reform at the beginning. However, most people, perhaps including the Chinese leaders, did not predict this outcome correctly because they did not understand the powerful force of a market economy or the high quality of the Chinese people. The powerful force of a market economy had to be demonstrated to the Chinese leaders by the rapid economic growth in China. So had the ability of the Chinese people to create wealth, even though this had been clearly demonstrated by their economic performance in several Southeast Asian economies.

The last example of a successful forecast is taken from Taiwan's experience. This forecast was made by using only qualitative and elementary economic analysis. I refer to a forecast of excess supply of rice in Taiwan in the late 1970s. At that time, the Taiwan government had a price support program for farmers producing rice. The farmers were guaranteed a minimum price at which they could sell rice to the government. As the world supply of rice began to increase several economists including the author suggested to the highest government authority to terminate the price support program but the suggestion was not accepted. A year later, the world price of rice continued to be

depressed. The Taiwan farmers could benefit from buying cheap rice from the world market and selling it at a higher guaranteed price to the government for a profit. As a result the government was forced to buy a very large quantity of rice, so large that much of it was piled up on high-school basketball courts, only to become rotten. This forecast was based simply on elementary economics: increase in world supply leads to a lower price; and a price differential under the price support program induces the farmers to buy low and sell high, forcing the government to purchase a large quantity of rice. Later the government had to change its support policy by allowing each farmer to sell only a fixed amount to the government at the guaranteed price, which amounted to providing a fixed subsidy to each farmer. This new policy limited the total amount that the government needed to buy and solved its huge financing and storage problems.

5. Usefulness of Forecasting

Economic forecasts are made partly to test whether certain economic theories or models are valid, but also to solve practical problems. Government policy makers, business executives and private individuals can all benefit from accurate economic forecasts. The two examples of forecasting automobile and computer demand benefited decision makers in the General Motors and IBM corporations. The third and fourth examples on forecasting inflation and the demand for durable goods are relevant for economic decision makers in China. Knowing the effects of increasing money supply on the inflation rate can help economic officials decide how rapidly the supply of money should be allowed to increase. If the slow-down in demand for consumer goods in 1998-1999 was due to the accelerations principle, the government should reconsider its ad hoc policies to influence stock prices in order to increase demand.

The two examples of forecasting future economic growth in Mainland China and in Taiwan are useful for decision makers on both sides of the Taiwan Strict. On the Taiwan side it is important to have a correct assessment of China's economic future no matter whether one likes its political institutions. Needless to say, understanding the economic fundamentals that may affect Taiwan's future is relevant for policy making by the government and the business community of Taiwan. The example of forecasting Hong Kong's economic system after 1997 could be used to form a judgment on whether Hong Kong stocks were undervalued. In 1989, the price earning ratio of Hong Kong stocks was about 11 while it was about 35 for Japanese stocks, when both economies were growing at about the same rate of 5 to 6 percent per year. The low price earning ratio for Hong Kong reflected the pessimism of the investors regarding Hong Kong's economic future, based on a negative assessment of the PRC government. If this negative assessment were unfounded, the prices of Hong Kong stocks would increase, as they actually did in the period up to July 1997, before the onset of the Asian financial crisis. An optimistic forecast of Hong Kong's economic future based on a correct assessment of the behavior of the Chinese government would have allowed an investor to profit handsomely. The last example on forecasting the excess supply of rice in Taiwan in the late 1970's, if taken seriously, could have prevented the need to spend government resources to purchase a large amount of rice, only to store it on high school basket ball courts to become rotten. It could also have saved the government from embarrassment in having to change the policy later.

6. Conclusions

In this paper, I have tried to answer the question, "What kinds of economic events are predictable and how to predict them?" Economic events are predictable if there exist valid economic principles governing them and if the forecaster has sufficient knowledge and sound judgment to apply the relevant economic laws, to select the important factors or variables and to specify the mechanism by which these factors influence the outcome. The factors and the mechanism may be specified quantitatively or qualitatively.

Quantitative variables and relations are suitable for repetitive economic events. In the case of predicting unique events, qualitative variables and relations can be specified and applied by the use of sound judgment. I have provided examples of predicting both repetitive and unique events mainly in economics, but the method is also applicable to predicting non-economic events such as the political future of Hong Kong or the political relation between mainland China and Taiwan as in Chow (2002b). Examples of successful forecasts have been given. Their usefulness to government officials, to business executives and individual citizens has been illustrated. Forecasting is an art as well as a science. Good judgment in this case is the hallmark of a good economist. It takes a good economist to be able to forecast accurately, just as it takes a good doctor to treat difficult illnesses successfully.

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Controversial Statistical Issue - Multiplicity

Special Topic Editor: Sue-Jane Wang, Ph.D.

Non-ignorable Multiplicity Issue

The multiplicity issues raised in the design and analysis of clinical trials are many; for example, which of the multiple treatment group(s) is (are) superior to the comparator, which of the multiple clinical endpoint(s) on which decisions about safety and efficacy will be made, how many interim analyses are planned, etc. How the treatment affects these endpoints either at the interim time or at the final analysis has a direct impact on the interpretation of and the decision criteria applied to the clinical trial results.

Analysis of multiple endpoints introduces a multiplicity problem with decision making. The chances of making false positive conclusions and the power of the study for the sample size chosen depend on the decision rules for assessing the clinical benefit of a therapeutic treatment, a medical device or a biologic product. In different disease areas, this multiplicity issue is dealt with from diverse perspectives, for instance, identification of primary and secondary endpoints, discussion of co-primary endpoints and definition of clinical benefit based on composite endpoints. The choice of method used to deal with the multiplicity issue usually accompanies with a cost associated with controlling of false positive errors either strongly or weakly.

With the completion of the human genome sequence and the increasing number of studies in gene expression and in DNA sequences, there is growing interest in the study of differential pharmacologic effects through more efficient consideration of the inter-individual variability to drug response and disease susceptibilities.

In gene expression studies, the multiple comparison issues for the analysis of hundreds or thousands of genes need to be properly considered. The issue can be addressed by the clear specification of its intended objective and hypothesis. Naive use of a significance test to identify the altered genes could falsely yield 100 apparent significant expression changes for a study of 10,000 genes at a 1% false positive rate when in truth none are present. The reporting of p-value in large-scale gene expression experiments requires sound justification of multiplicity adjustments.

In DNA clinical studies, the multiple testing issues are complicated by a number of tests performed per patient in addition to the usual clinical outcome endpoints. These tests may involve the number of alleles (or single nucleotide polymorphisms), the number of genotypes, the number of haplotypes, or the number of gene regions studied. The degree of complexity of the multiplicity issue depends on the level of detail of the DNA sequence evaluated. Multiplicity adjustment needs to be addressed if the number of candidate genes is used as the number of tests performed in testing the hypothesis that pharmacologic effect is impacted by genetic polymorphism.

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The views expressed in this article are not necessarily of the U.S. FDA.

The Multiplicity Issue in Hypothesis Tests

By: Peter H. Westfall, Ph.D.

Abstract: This article provides an overview of multiple testing issues, with emphasis on current problems.

1. Introduction

Through its relatively short duration as a unique field of study, the discipline of statistical science has experienced lively debates about philosophy and methodology. Most notable is the Bayes vs. frequentist debate, although other interesting debates have concerned permutation vs. super-population models, descriptive vs. inferential statistics, and hypothesis testing vs. confidence intervals. Our discipline is given vitality by these debates. We have been strengthened by them, and we have been stimulated to respond better to the needs of the scientific community.

The multiple comparisons issue is also controversial. It is obvious that decision errors are possible. It is also obvious that when more decisions are made, more decision errors will occur. But there are widely differing points of view on how to deal with this problem. Not only do Bayesians and frequentists propose different solutions, but there are also a variety of solutions within each of the Bayesian and frequentist paradigms.

From the frequentist standpoint, the controversy involves (a) whether one should control the frequency of type I decision errors; and if it is decided to control this frequency, (b) how should it be controlled (i.e., which error rate definition should be used, whether comparisonwise, familywise, or false discovery rate); and if it is decided that a particular error rate definition should be used, (c) which statistical method should be used to control it.

Bayesians have studied the problem less extensively, as they have historically claimed that it is not an issue (1). However, recent applications including seemingly positive subgroups in clinical trials (2) and the massive multiplicity inherent in genomics (3) have caused some Bayesians to re-consider multiplicity. From a Bayesian standpoint, important issues relating to multiple comparisons are (a) whether to include point masses in the priors, (b) prior selection in general, (c) how to deal with data dredging and model selection, especially problems of overfitting, and (d) decision theory and selection of loss functions for balancing both type I and type II errors.

Modern multiplicity problems involving huge data sets and data mining have forced closer scrutiny on all multiple comparisons procedures (MCPs), whether Bayesian or frequentist. One can find optimal procedures using decision theory, perhaps resolving the controversies once and for all. However, formal decision theory is sensitive to subjective priors and loss functions, and in my experience, scientists are hesitant to provide either. Further, scientists want statisticians to provide measures of evidence for guidance, not formal statistical dictums. Thus, MCPs that have reasonable interpretations from a variety of viewpoints, whether Bayesian, frequentist, or decision theoretic, as well as methods that provide measures of strength of evidence, will continue to be useful for the scientific community.

2. Bayes/Frequentist Correspondences

2.1 Bonferroni

The following concepts are elaborated upon in (4), (5), and (6). The classical frequentist method for controlling the familywise error rate (FWE) is Bonferroni's method, where p-values are compared to α/k, rather than to α. Equivalently, one may report the adjusted p-value $k \times p_i$, a measure of evidence about null hypothesis H_i.

The Bayesian "tests" H_i by calculating $P(H_i|Data)$, also providing a measure of evidence (7). To make these measures correspond in a loose sense, one requires (a) Bayesian priors with positive probabilities on point null hypotheses, and (b) that these probabilities increase with k. Both of these notions are controversial. However, (a) may be justified as an approximation to the true state of one's prior: if one thinks that the parameter is within a small range of the null value with probability 0.5, then the prior that puts 0.5 probability exactly on the null parameter value provides an excellent and computationally more convenient approximation (8). Point null priors have been resisted by many Bayesians, but modern studies in genetics, where many parameter are approximately null, has made this point of view more acceptable (9).

Although more controversial, one may justify (b) as follows: when calibrating prior probabilities on individual versus composite nulls, if the composite null is thought to have moderate probability (like 0.5), individual nulls must be assigned larger prior probabilities that depend on k. In some cases the Bayesian analyst will find this argument compelling, and in other cases s/he will not; see (10) for an example.

The persistence of the Bonferroni approach in the evaluation of clinical trials for pharmaceutical products may be justified from this Bayesian perspective. Regulatory agencies are often skeptical of Pharmaceutical companies' claims (6, 11). The skeptical reviewer may assign a moderate prior probability (e.g., 0.5) to the composite null hypothesis that the comparisons (e.g., between an active drug and a competitor drug) are null for all endpoints and/or subgroups. This forces prior probabilities for null hypotheses involving particular endpoints and/or subgroups to be higher than 0.5. There is a loose correspondence between the resulting posterior analyses for such individual nulls and the Bonferroni correction (4), which may account for the persistence of Bonferroni in the regulatory environment, despite its problematic conservativeness.

2.2 False Discovery Rate

Like FWE, the false discovery rate (FDR) is another frequentist measure. One can control the FDR at some pre-assigned level α by comparing p-values to an intermediate point α_k^*, where $\alpha/k \le \alpha_k^* \le \alpha$. Under reasonable conditions, as k increases, the critical point α_k^* converges to α^*, $0 \le \alpha^* \le \alpha$, depending upon the model. The resulting method has an empirical Bayes interpretation when using a model that allows positive probabilities on point nulls (9).

The usual FDR-controlling procedure circumvents controversy (b) shown in Section 2.1 because the data are used simultaneously to estimate the relative frequency of true nulls, and to provide posterior inferences. The procedure is more liberal when the estimated null probability is close to zero, and is more conservative (like Bonferroni) when the estimated null probability is close to 1.0.

Thus the FDR approach has better asymptotic (in k) properties than the Bonferroni method. Modern studies in genetics have values of k in the 10,000s or even 100,000s for a single experiment, and the Bonferroni method will find fewer and fewer significances as k grows. However, with the FDR approach, the larger the k, the better the stability of critical point α_k^*, under regularity conditions.

The properties of adaptivity, consistency, and reasonable interpretation from both Bayesian and frequentist standpoints, all have made FDR-controlling methods very popular for large multiplicity problems.

3. Data Dredging and Re-sampling

"Data dredging" includes problems of finding "significant" results after an essentially infinite

amount of manipulation of the data, as well as problems of model and variable selection. "Data mining" is essentially the same as "data dredging," but viewed in a more positive, discovery-oriented way. Both the Bayesian and frequentist paradigms have trouble with these areas. However, frequentist solutions, particularly resampling and cross-validation, are the current methods of choice for solving these complex problems, because they provide reasonable solutions that are both simple and robust.

A simple example is the treatment of the observed significance level of the univariate two-sample t-test using a linear discriminant function (LDF) calculated from 20 variables. In this case, the LDF is obtained after an essentially infinite amount of data snooping through 20-dimensional linear combination space, so the use of "k" in the previous sections does not apply. Not only is k infinite, but there is a very complex correlation structure among the infinite set of random variables, with essentially perfect correlations among many members of the set. It is straightforward to obtain a nonparametric significance level for the LDF via resampling (12, pp. 199-204); a corresponding Bayesian analysis is problematic (13).

A similar type of problem occurs in model selection, where the class of models that one might consider is often essentially infinite, with high correlations between model estimates. Efron (14) notes that frequentist resampling provides a simple solution to the problem of estimating model accuracy following model selection; the related cross-validation methodology is now standard practice in data mining (15).

Recent work has shown that, among classical, FWE-controlling methods, the resampling paradigm is recommended for the analysis with large multiplicity problems in gene expression (16). Reasons for this include (a) the methods are distribution-free, (b) they incorporate correlation information, (c) they adapt easily to the more powerful closed and stepwise testing procedures, and (d) they are computationally convenient. On the other hand, FWE-controlling procedures are arguably less useful than FDR-controlling procedures for massive multiplicity problems, as noted above.

4. Decision Theory

A unifying theory in multiple testing is minimization of decision losses. Costs of type I and type II errors differ; Waller and Duncan (17) developed MCPs to account for such decision costs. Recent papers (many under review at the time of writing this document) continue in this area, many with FDR-related methods.

None of the classical MCPs correspond exactly to formal decision theory procedures, for the simple reason that the formal decision rules depend upon prior and loss functions, and these functions are (when used correctly) entirely situation-specific. On the other hand, scientists in particular disciplines have historically found classical MCPs useful. If MCPs had no utility from a loss function standpoint, then these methods would have disappeared long ago, because scientists would have found them to provide consistently "wrong" results, and would have simply stopped using them. Therefore, it is logical to argue that classical MCPs have survived in certain disciplines because they correspond to reasonable decision rules.

For example, a scientific maxim is "extraordinary claims require extraordinary evidence." Thus, the "extraordinary evidence" required by the classical Bonferroni method is considered quite appropriate for studies of extra-sensory perception (ESP). From a decision theoretic standpoint, this is sensible because (a) a priori, one would place a rather large prior on the null hypothesis that ESP does not exist, and (b) the scientific maxim suggests that the loss corresponding to a type I error is much larger than the loss corresponding to a type II error.

These prior and loss constraints result in a decision procedure that corresponds to "extraordinary evidence," much like a Bonferroni correction.

By extension, in applications such as genetic testing where many of the items tested are essentially null, MCPs also have been found useful, because comparisonwise 0.05-level testing methods provide far too many significant results. However, the stringency of the Bonferroni solution has been found less useful than the FDR solution, arguably because the FDR solution implicitly corresponds better with reasonable priors and losses.

Finally, as noted in Section 2.1, one may argue that Bonferroni persists in the pharmaceutical regulatory environment because it corresponds implicitly to the reviewer's skeptical prior.

5. Conclusion

Spurred by problems of high dimensionality, there is a recent upsurge of interest in MCPs. Statisticians have re-evaluated the utility of existing methods, and have developed new methods, from Bayesian, frequentist, and hybrid points of view. While formal decision theory is the best conceptual paradigm for developing, evaluating, and comparing MCPs, methods that have reasonable interpretations from a variety of views, including frequentist, Bayesian, and decision theoretic, will remain useful to the scientific community.

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The Difficult & Ubiquitous Problems of Multiplicities

By: Donald A. Berry, Ph.D.

Most scientists are oblivious to problems of multiplicities. Yet they are ubiquitous. They are present in every statistical application. They may be hidden. And even if they're out in the open, recognizing them are but the first step in a difficult process of inference. Problems of multiplicities are the most difficult that we statisticians face. They threaten the validity of *every* statistical conclusion.

Some statisticians don't understand that the possibility of multiplicities may be a problem. Others recognize the problem and overreact. I'll suggest my approach below, but I don't claim that it is the best compromise.

Multiplicities humble us all. The way we deal with them separates good statisticians from the less-good. I have no qualms about my own abilities in this regard and unhesitatingly place myself in the less-good category. Too frequently I carry out statistical tests or make posterior probability calculations based on the "data" sitting in front of me. But the fact that these particular data are in front of me at all is part of the data! I usually ignore this critical information because I don't know what probability model to use for the process that brought the data to me. Therefore, multiplicities caveat all of my conclusions. The only favorable light I can shine on my ability to handle multiplicities is that I recognize their existence and their ubiquity.

My first exposure to multiplicities was in my first-grade class, which was my first time away from home. There were two redheads in the class. They were from different families and they were both very bright. I came to associate red hair with intelligence. It took several years of meeting redheads of normal intelligence and smart brunettes and blondes for me to come to understand that I had read too much into the early data. (Part of the reason I was slow to unlearn was that I did not know Bayes' theorem!)

The two brightest kids in any class are necessarily similar in some other way—perhaps in several other ways. Perhaps they are both girls, both boys, both tall, both short, extreme in height (one may be very tall and the other very short), both of the same nationality or religion or ethnic group, both overweight, both underweight, have similar hair color, have buck teeth, have freckles, speak with a lisp, can run fast, can't run fast, are handsome, are not handsome, etc. So I was doomed. I was bound to learn something that was wrong!

Doomed by silent multiplicities

All data analysis is subject to the doom of multiplicities. Most well understood are visible multiplicities. Examples are subgroup analyses and multiple comparisons of $k > 2$ treatment groups. I don't mean to suggest that these are easy to handle. But they pale in difficulty compared with silent multiplicities. The latter stem from aspects of the data that are hidden from the analyst. I distinguish two categories of silent multiplicities, depending on whether or not it is possible to bring them into the open.

Like most applied statisticians, I collaborate with scientists, especially physicians. They frequently ask me to analyze a data set they've sent to me on a spreadsheet. The data have usually been "cleaned." Perhaps the investigators have removed duplicates. Or averaged some observations. Or removed outliers. Or restricted to experimental units of most interest—perhaps based on a perusal of the data! Sometimes the most important statistical analyses have been carried out before I get to see the data. I have learned to handle this particular silent multiplicity by asking lots of questions. I enquire about aspects of the experiment all the way back to the time it was conceived. Especially important are methods of data collection and data processing. The answers are usually revealing. In the worst case they make clear that the data as presented are useless for inference.

Such types of silent multiplicities may be avoidable, depending on the circumstances. An extreme approach is for the statistician to run the experiment and coordinate the data collection. But this does not make good use of statisticians' abilities. And we'd get little else done. However, it is possible and wise for us to be involved in the data collection process and we can supervise some of the critical aspects of this process.

More difficult to handle—and perhaps even impossible to handle!—are aspects that have nothing to do with the experiment per se. An investigator conducts an experiment and for some reason doesn't like the results. You never get to see the data. Perhaps the investigator throws them out and so no one else gets to see them. The fact that you didn't see the results of a particular experiment is informative and should be included in future inferences that you might make. How on Earth to do that? Good luck in building a model based on things you haven't seen, and that might not even exist!

Statisticians handle this dilemma by becoming pessimists. It's an occupational hazard! Just as with publication bias, when we are given study results to analyze they tend to be positive. But because often there are likely to be negative studies of the question that never saw the light of day, the next study is likely to be negative—or at least less positive. (This effect is in addition to regression to the mean.) Our pessimism leads us to give greater credibility to the null hypothesis than would usually be appropriate. But some statisticians overreact.

Bayesian vs. frequentist approaches

Based on my observations of statisticians in action, frequentists are more likely to overreact in this regard. They tend to give too much credence to the null hypothesis. For example, a standard frequentist approach is to adjust inferences (such as Type I error rate) assuming that the null hypothesis is true. In the extreme when there are a large number of multiplicities, adjustments in Type I error rates make it nigh impossible to reject any of the various null hypotheses.

On the other hand, many Bayesians are naïve in handling multiplicities. In effect their approach gives too much credibility to alternative hypotheses. They calculate posterior probabilities based on the data. They assume some probability model for calculating the likelihood function. But this model usually ignores multiplicities—sometimes for good reason, as I mentioned above in the context of silent multiplicities.

Hierarchical Bayesian approach

If I had to choose between the conservatism and pessimism of the frequentist and the naiveté of the Bayesian, it would be a hard choice. I'd favor

one in some instances and the other in others. On balance I would choose the frequentist. The Bayesian naiveté leads to more serious errors. But there are compromises that dominate both extremes. One is hierarchical Bayes. Its application to multiplicities is described in some of the papers listed at the end of this note. The idea is to borrow across groups within each level of the hierarchy based on prior information and on the extent to which the data in the groups are concordant. A hierarchical Bayesian approach is superior to both the frequentist and naïve Bayesian approaches. But it is not perfect. Nothing is perfect.

The hierarchical Bayesian approach is especially helpful for handling inferences when the dimension of the visible multiplicities is huge. For example, genes on a cDNA microarray may number in the tens of thousands. And there are an estimated 10^{18} drug-like molecules and so the number of possibilities is effectively limitless in protein/drug interaction experiments. (Exploiting the elegance of hierarchical modeling is also important in designing such experiments.) Borrowing via modeling is critical. Understanding the biology or the chemistry or the other relevant science is essential for good modeling, of both the likelihood and the prior distribution.

Although the hierarchical Bayesian approach is an effective way to handle visible multiplicities, there is no panacea for silent multiplicities. Understanding and effectively addressing these require both experience and knowledge. Experience is necessary almost by definition for it teaches the range of possibilities that may be unseen in any particular experiment. The issue is what might have happened that is not stated and that is not obvious from the numerical results. Knowledge of the subject matter is necessary to place the experimental results in context.

In addition, knowledge of the subject matter is necessary for asking good questions of the investigator in the process of assessing whether there are unseen multiplicities. For example, I know that the culture in some laboratory sciences is to redo parts of experiments if the results don't seem to fit. The investigators tend to drop the anomalous observations and present me with those that "seem right." We statisticians understand that this can bias the results, and it always leads to underestimates of variability. But few scientists have our kind of training. Since I know that this kind of thing can happen, in any particular experiment I know to ask if it did happen.

Bottom line

Both frequentists and Bayesians have important contributions to make regarding problems of multiplicities. Neither group has an inside track to the answer. Frequentists and Bayesians working together is a promising way to make inroads into this knotty set of problems. But we will never be able to use a software package with default settings to resolve all problems of multiplicities. Each problem has unique aspects. Each requires understanding the substantive area of application. Two experiments with identical results may well lead to very different statistical conclusions.

Some of Berry's writings concerning multiplicities

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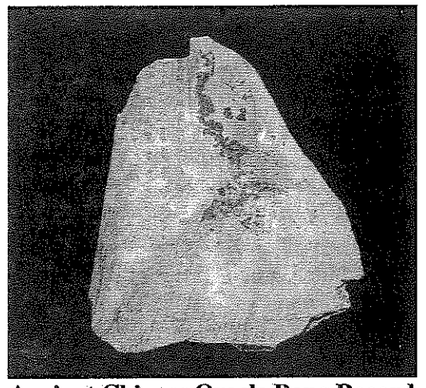

Ancient Chinese Oracle Bone Record of the Relationship With Other States

Statistical Inference of Multiplicity in Pharmaceutical Product Development

By: H.M. James Hung, Ph.D.

Multiple comparisons or multiple testing in general is undoubtedly one of the most controversial subjects in statistical applications. Literature on this subject is affluent. The multiplicity problems may arise when a single null hypothesis is tested by repeated significance tests or when a family of null hypotheses is tested. In many types of experiments the statistical inference on the study results is made, subjecting to the condition that the probability of falsely rejecting at least one null hypothesis is controlled at some desirable level (this is the notion of strong control of familywise type I error rate termed in Hochberg and Tamhane, 1987).

Proper control of type I errors is necessary to rule out any apparent positive statistical findings purely due to chance. A variety of statistical methods are available for controlling type I errors. Difficulty lies in the definition of proper control that is only meaningful in a relevant context. For instance, in a multiple treatment arms trial, the relevant context may be whether the experimental treatment is active or which dose is efficacious as compared to the control group. In the former context, it may be reasonable to control the type I error only associated with the global null hypothesis (the so-called weak control). For the latter context, strong control may be necessary. In a two arms trial, the effectiveness of the experimental treatment may be determined on the basis of more than one response variable. In this context, the relevant issue may pertain to that based on which variables the experimental treatment is more efficacious than the control. This issue arises frequently in the process of determining what to include in a drug label. Obviously, one

can always use the same type of mathematical description for all multiple hypotheses under testing. However, as many would agree, such a framework may miss out the essence of the context at issue. I would argue that it may severely constraint the power of statistics we need, sometimes urgently, to detect important signals for practical applications.

In development of a pharmaceutical product, multiple trials are often conducted. All the trials are relevant on their own rights, whether they are 'supportive' versus 'pivotal' or 'pilot' or 'confirmatory'. A frequently discussed requirement for the pharmaceutical product to be considered for marketing is that at least two trials demonstrate the evidence of clinical benefits with the product. The concept of reproducibility of a positive finding from a single trial is behind the requirement. Multiplicity in statistical inference based on totality of evidence from multiple studies is hardly considered. If a proper control of overall type I errors associated with the assessment of the multiple studies as a whole is mandated, then the number of clinical trials will most likely be reduced so that each study may have more alpha to spend. Will such a control serve the human welfare well? Reduction of unnecessary trials may save the costs of drug development or make people do a better trial. However, it will definitely limit the data that are direly needed to obtain knowledge of, e.g., how a drug product performs in different patient populations, and etc.

The problem of multiplicity is mostly discussed at the individual trial level. Without controlling the type I errors associated with the overall assessment of multiple studies, one can play a game of defining 'a trial'. For example, suppose that two studies are run in parallel to study a drug effect as compared to the same control on cardiovascular death or hospitalization - primary endpoint in the two complementary patient populations. The two studies constitute a 'program'. The primary objective of the 'program' is all-cause mortality to be tested pooling the two studies. What constitutes a trial? What are the type I errors needing control?

Another multiplicity problem arises when more than one drug is studied in a single trial. For example, in a 2×2 factorial trial, the therapeutic effect of each of the two drugs is studied independently in the presence of and in the absence of the other drug, based on the premise of no drug by drug interaction. If the studywise type I error rate is of concern, one would argue for the necessity of controlling the overall type I error rate associated with the joint null hypothesis of the two drugs. Does this make practical sense? Such a control will definitely fuel the argument for unfairness in that through the control each drug is given a smaller alpha level than it is usually given when the two drugs are tested in two separate trials. However, if there is a real drug by drug interaction, then the effect of each drug will be different between the patients receiving the other drug and the patients not receiving it. In this case, it may be necessary to require that a smaller alpha be used in testing each individual drug. The argument may be linked to multiplicity but admittedly unclear.

The term 'reversed multiplicity' has received much attention recently. This is the intersection-union problem known to statisticians; that is, each individual alternative hypothesis must be accepted. The examples are: (1) requiring each single endpoint to be statistically significant and (2) requiring a combination of multiple drugs to be more effective than each single drug given alone. In this context the parameter space of the global null hypothesis is not just a single point. In addition, noting that the rejection region of the global null hypothesis is intersection of the rejection regions of all the individual null hypotheses, what is the experimentwise or maximum familywise type I error rate?

Lastly, along with defining the relevant type I errors, the experimental design is also a crux of the matters discussed above. The amount of statistical information must be planned to study the main subfamilies of the hypotheses with sufficient statistical power; this issue has not drawn sufficient attention in practical applications. Without adequate planning, there is a high likelihood that many real important signals would be buried. On the other hand, it is unreasonable to expect that a multiple comparison procedure can be pre-specified to deal with surprises at the end of the trial. The need to inject flexibility into multiple comparison procedures has been recognized and the research has been active in this area for the last two decades.

Disclaimer

The views presented in this article do not represent those of the U.S. Food and Drug Administration.

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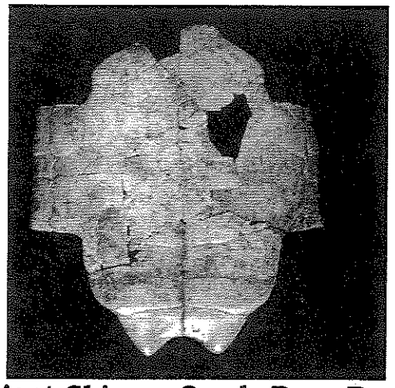

Ancient Chinese Oracle Bone Record of Military Campaign

How Many of the Rejected Hypotheses are False?

By: James J. Chen, Ph.D.

The common approach in simultaneous testing of multiple hypotheses is to control the faimilywise error rate (FWE), the probability of rejecting at least one true null hypothesis, regardless of the number of hypotheses tested. The FWE criterion becomes very stringent when the number of tests is large. Benjamini and Hochberg (1995) proposed controlling the false discovery rate (FDR), the expected proportion of errors among the rejected hypotheses, as an alternative to controlling the FWE for the multiple testing problem. From the FDR viewpoint, false rejection of 2 null hypotheses out of 10 rejected hypotheses is more serous than false rejection of 4 null hypotheses out of 100 rejected hypotheses. Recently, many studies have adopted the FDR criterion to the problem of testing of a very large number of hypotheses (e.g., Weller et al., 1998; Tusher et al., 2001).

Consider testing m null hypotheses, of which m_0 hypotheses are true null population and m_1 are from the alternative population. According to Benjamini and Hochberg (1995), the proportion of falsely rejected null hypotheses can be expressed by the random variable Q = V/R, where V is the number of false rejections and R > 0 is the number of rejections. Define Q = 0 when R = 0. Benjamini and Hochberg (1995) defined the FDR to be the expectation of Q. They also discussed three alternative FDR error measures. (1) The positive FDR: pFDR = E (V/R | R > 0). The pFDR is the FDR conditional on one or more rejections. (2) The marginal FDR: mFDR = E(V)/E(R). The mFDR is the expectation of the number of false rejections over the expected number of rejections. (3) The conditional FDR: cFDR = E (V | R = r)/r, provided that r>0, and cFDR=0 for r=0. The cFDR is the FDR conditional on the observed number of rejections R = r. When $m = m_0$, then pFDR = cFDR = mFDR = 1; but, FDR = P(R >

0) < 1. Benjamini and Hochberg (1995) discussed that all three alternative FDR error measures cannot be controlled when $m = m_0$. They worked with the FDR, and gave a simple procedure to control FDR by comparing the q-value = $(m/i)\ p_{(i)}$ to the desired FDR level q^*, where $p_{(i)}$ is the i-th ordered p-value. However, Zaykin et al. (1998) pointed out that conditional on at least one rejection occurred, the Benjamini and Hochberg (1995) procedure actually controls only at level $q^*/P(R>0)$ at the level greater than q^*; that is, the procedure results in controlling pFDR when a rejection occurs.

Storey (2002) argued that the pFDR is the more appropriate error measure since pFDR measures the rate that the discoveries are false, whereas FDR measures the rate that false discoveries occur.
When $m = m_0$, a false discovery rate should be 1 if a rejection has occurred. Therefore, the three alternative FDRs appear to be more appropriate error measures. As pFDR can not be controlled, Storey (2002) proposed an estimation approach by fixing the rejection region beforehand and estimating the pFDR. Let α be the comparison-wise error rate for each individual test among true null hypotheses. In the context of fixed rejection region approach, an individual hypothesis is rejected if its p-value is less than or equal to α. Once the rejection region is fixed at α, the positive FDR is

$$\mathrm{pFDR}(\alpha) = \sum_{i=1}^{m} \mathrm{cFDR} \times P(R = r \mid R > 0)$$

and the marginal FDR is $\mathrm{mFDR} = m_0\ \alpha\ /E(R)$. That is, both pFDR and mFDR are *unconditional* error probability measure irrespective of how many hypotheses are rejected.

The traditional multiple comparison approach focuses on controlling the FWE or FDR error rate. For the desired FDR level q^*, the Benjamini and Hochberg (1995) procedure estimates the rejection region needed so that $\mathrm{FDR} \le q^*$ on average. On the other hand, in the fixed rejection region approach, it first specifies α and then estimates FDR error rates. In either approach, the number of rejections is a random variable. The cFDR offers a third approach to multiple testing. Instead of fixed alpha, this approach fixes the number of rejection r and estimate cFDR. In practice, there probably is little difference either fixing α or fixing r, once the p-values are calculated. However, to specify α beforehand, an investigator generally needs a lot of experience with the data. For example, α= 0.001 may result in too many rejections in one type of experiments and too few rejections in another type. On the other hand, in situations such as microarray gene screening experiments in which a follow-up experiment can be conducted, an investigator should be willing to specify the number of rejections (genes) for further investigation.

The cFDR measures the error rate conditional on the number of rejections for the present experimental data. In the context of false discovery rate, an investigator is probably most interested in the error rate among the rejected hypotheses. For example, suppose 50 hypotheses are rejected, a natural follow-up question is "how many of the 100 rejected hypotheses are false?". This question can be answered directly with the cFDR error measure. By definition of cFDR, the expected number of false rejections is $(\mathrm{cFDR} \times r)$. The cFDR depends on the number of true hypothesis m_0 and the conditional distribution of V given R. The cFDR is the mean of the non-central hypergeometric distribution. Methods for estimating cFDR, pFDR, mFDR and FDR are given by Hsueh et al. (2003).

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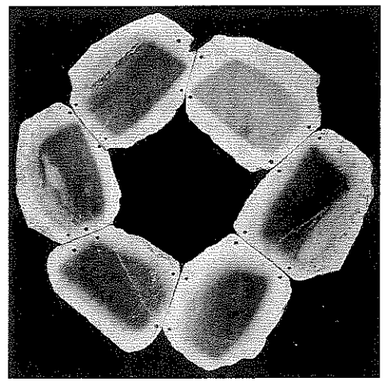

Chinese Jade Circle (2200-1800 B.C.)

Multiple Comparisons for Making Decisions

By: Jason C. Hsu, Ph.D.

Controversies in multiple comparisons primarily revolve around form of inference and control of error rate. By coupling the multiple comparison analysis with the intended purpose of the experiment, I believe these controversies can largely be resolved.

Let us consider the problem of making k comparisons. For convenience, one can think of these k comparisons as comparing the response under each of k doses with the response of a control group, or comparing the expression level under normal and disease conditions of each k genes.

1. Presence of effect versus magnitude of effect

One controversy in multiple comparisons is whether the form of inference should be in terms of *presence of effects*, or bounds on the *magnitude of the effects*. Statistical comparisons are often formulated as tests of no treatment effect. For example, in a dose-response study, one might test

H_{0i}: Dose i has no effect (1)

To be able to test such a null hypothesis, the only requirement is Fisher's randomization model holds, that is, the assignment of the treatment and control to patients (experimental units) is randomized. Under this model, the effect of the treatment or the control on *every* individual is the same, even though this effect may differ from individual to individual (p. 502, Rao 1973).

One reason for the popularity of testing the no-effect null hypotheses is they can be performed with no specification of dependency among the test statistics, or how non-null effects affect the responses. For example, in bioinformatics, one

can perform a permutation test of the null hypothesis

H_{0i}: Expression of gene i is the same under normal and disease conditions, $i \in I$ (2)

without specifying how the test statistics are distributed jointly, or how they are affected if any gene is differentially expressed. Permutation tests are indeed popular in bioinformatics.

However, testing the null hypothesis of no effect can only prove the presence of an effect. In and of itself, rejecting a null hypothesis of no effect does not even guarantee the effect is in the right direction. In dose-response studies, for example, it was not uncommon practice to infer dose m is effective if the null hypothesis

H_{0m}: Dose i has no effect for all i , $i = 1, \ldots, m$ (3)

is rejected against the alternative hypothesis

H_{am}: Dose m is effective (4)

However, there are easily constructed examples (cf. Bauer 1997 and Hsu and Berger 1999) in which a level-5% test for (3) can reject with almost any probability, despite the fact that dose m is ineffective. The reason for this phenomenon is the union of (3) and (4) is not the entire parameter space: one can reject a null hypothesis for the wrong reason.

There are also situations in which testing for the presence of effect is inadequate because proper decision-making involves the magnitude of the effect. Proving equivalence and non-inferiority in clinical trials (cf. ICH E10) are examples of making medical decisions based on clinically meaningful differences, as opposed to statistically significant differences.

To infer upon the magnitude of differences, one must specify a *model* which is more elaborate than the randomization model, connecting responses with *parameters* θ_i, $i = 1, \ldots, k$, be the differences or ratios of long run averages, or location shifts, or whatever. Even if only the presence of effects needs to be inferred, model-building is still useful if multiple testing is to be computationally feasible when k is large (as in bioinformatics). I will give more details in the next section.

Given a model specification, if the inference is presented as p-values only, then information on the magnitude of the parameters is lost. For example, two data sets can have the same p-value for testing the null hypothesis (2), with one data set giving a confidence interval of (0.01, 0.02) and the other giving a confidence interval of (1, 2). If θ_i is the base 10 logarithm of the ratio of gene expressions of the i^{th} gene under normal and disease conditions, then even though both data sets lead to a rejection of the null hypothesis of equality (2), only the confidence interval (1, 2) signifies a biologically meaningful differential expression of between 10 and 100 fold.

2. Choice of error rate

Another controversy in multiple comparisons is the choice of error rate.

In testing k hypotheses H_{0i}, $i = 1, \ldots, k$, suppose we let R_i be the indicator function of the rejection of the i^{th} hypothesis. Then, for any multiple testing procedure, one could in theory provide a complete description of the joint distribution of $R_1, \ldots, R_k$ as a function of θ_i, $i = 1, \ldots, k$, in the entire parameter space. This is impractical if $k > 2$. Different error rates summarize different aspects of this joint distribution.

Control of the Per Comparison Error Rate controls the maximum marginal probability that an individual null hypothesis H_{0i} is rejected when it is true.

Weak control of the Familywise Error Rate (called Experimentwise Error Rate in some traditional statistics books) controls the maximum probability of rejecting at least one null hypothesis H_{0i} when *all* H_{0i}, $i = 1, \ldots, k$, are true.

Strong control of the Familywise error rate (FWER) controls the maximum probability of rejecting any true null hypothesis, regardless of which subset H_{0i}, $i \in I$, of the null hypotheses happen to be true.

Control of the False Discovery Rate (FDR) controls the expected proportion of true null hypotheses rejected among all the hypotheses rejected.

When multiple comparisons are used to make decisions, I believe the control of an error rate is appropriate if it controls the probability of making an incorrect decision. In my experience, much of the controversy regarding which error rate to control can be resolved with this simple consideration.

For example, control of the Per Comparison Error Rate in executing a two one-sided t-test in a bioequivalence trial is appropriate because it controls the probability of making an incorrect decision. (cf. Berger and Hsu 1996)

Control of FDR is often insufficient to guard against making an incorrect decision, because one can inflate the level at which the k hypotheses of interest are tested by adding null hypotheses know to be false (cf. Finner and Roter 2002). Suppose a single null hypothesis is of interest. If three additional null hypotheses known to be false are added, then the null hypothesis of interest can in effect be tested at a level of 20% while controlling the FDR at 5%. Thus, in a Phase II dose-finding trial for example, one can inflate the chance that a non-effective low dose is declared effective while controlling the FDR, by designing the trial to sample at many high doses known to be effective.

Whether control of FWER or FDR is appropriate in the analysis of microarrays may depend on how the inference on differential gene expressions is used subsequently. In drug discovery, for example, genes are first screened for differential expressions under normal and diseased conditions. Subsequently, nucleotide sequences in the promoter regions of the genes selected in the first step are mined for unusually common sequences (motifs). Proteins (transcription factors) that bind to these motifs then become candidates for drug compounds, to intervene with the disease process. While less genes will be selected by controlling the FWER, one has confidence each gene selected is involved in the disease process. More genes will be selected by controlling the FDR, but one is only confident that a proportion of the genes selected are involved in the disease process. Controlling which error rate leads to more discoveries of useful transcription factors remains to be seen.

3. Shortcutting multiple testing

Implementing multiple testing when k is large requires taking some shortcuts. Certain conditions must hold for such shortcuts to be valid. Checking these conditions is easier if one takes a modeling approach. I will use the bioinformatics context to illustrate this.

For $i = 1, \ldots, k$, let θ_i represent the logarithm of the difference of the average expression levels of gene i under normal and diseased conditions. Consider testing the family of null hypotheses (2) of no differential expressions, now written as

H_{0i}: $\theta_i = 0$, $i = 1, \ldots, k$ (5)

For more than a decade, a cornerstone of multiple testing has been the closed-testing principle of Marcus, Peritz, and Gabriel (1976). In theory, multiplicity needs to be adjusted only to the extent that null hypotheses may be simultaneously true. Instead of adjusting for a multiplicity of k, closed testing lets data decide the extent of multiplicity adjustment. All else being equal, closed testing is more powerful than single-step testing.

It turns out that a concept more easily explained (and more powerful) than closed testing is the partitioning principle of Stefanson, Kim, and Hsu (1988) and Finner and Strassburger (2002), which proceeds as follows.

P1: Form the hypotheses

H_{PI}: $\theta_i = 0$ for $i \in I$ and $\theta_j \neq 0$ for $j \notin I$

for all possible $I \subseteq \{1, \ldots, k\}$, $I \neq \varnothing$

P2: Test each H_{PI} at level-α

P3: Infer $\theta_i \neq 0$ if all H_{PJ} with $i \in J$ are rejected

Since the null hypotheses H_{PI} are disjoint, at most one H_{PI} is true. Therefore, no multiplicity adjustment is needed in testing them to control the FWER. The reason why P3 is justified is H_{0i} is the union of all H_{PJ} with $i \in J$.

Closed testing would replace H_{PI} in P1 by

H_{CI}: $\theta_i = 0$ for $i \in I$

but otherwise proceeds exactly the same as partition testing.

To test each H_{PI}, *any* level-α test may be used. However, a direct implementation of partition testing requires testing potentially 2^k null hypotheses, clearly an impossibility if the number of genes k is but a handful.

Stepdown testing is a computational shortcut to partition testing, reducing the number of tests to be performed to at most k. A set of sufficient conditions for such shortcutting to be valid is as follows.

S1: Tests for all hypotheses are based on statistics T_i, $i = 1, \ldots, k$, whose values do not vary with H_{PI}

S2: The level-α test for H_{PI} is of the form of rejecting H_{PI} if $max_{i \in I} T_i > c_I$

S3: Critical values c_I have the property that if $J \subset I$ then $c_J \leq c_I$

If these conditions are satisfied, then partition testing has the following shortcut:

Let $[1], \ldots, [k]$ be the random indices such that $T_{[1]} < \ldots < T_{[k]}$.

Step 1: If $T_{[k]} > c_{\{[1], \ldots, [k]\}}$, then infer $\theta_{[k]} \neq 0$ and go to step 2; else stop.

Step 2: If $T_{[k-1]} > c_{\{[1], \ldots, [k-1]\}}$, then infer $\theta_{[k-1]} \neq 0$ and go to step 3; else stop.

...

Step k: If $T_{[1]} > c_{\{[1]\}}$, then infer $\theta_{[1]} \neq 0$ and stop; else stop.

Subtleties in conditions S1-S3 for shortcutting have not always been appreciated. For example, suppose the critical values c_I are computed so that the probability of $max_{i \in I} T_i > c_I$ is less than or equal to α when $H_{P\{1,\ldots,k\}}$: $\theta_1 = \ldots = \theta_k = 0$ is true, then the test for H_{PI} may or may not be a level-α test. This is because the distribution of T_i for $i \in I$ may depend on $\theta_j \neq 0$ for $j \notin I$. A level-α test for H_{PI} should satisfy

$$sup_{\theta \in \Theta(I)} P_\theta\{max_{i \in I} T_i > c_I\} \leq \alpha.$$

where $\Theta(I) = \{\theta_i = 0$ for $i \in I$ and $\theta_j \neq 0$ for $j \notin I\}$ and the supremum of this rejection probability may or may not occur at $\theta_1 = \ldots = \theta_k = 0$. These conditions are easier to check given a model connecting the observations with the parameters, harder with a model (such as the randomization model) which only describes the distribution of the observations under the null hypotheses. Outside the context of bioinformatics, there are in fact examples (cf. Hsu 1996) of methods, in use at one time, that violate these conditions. For this reason, I believe the impression that modeling is an unnecessary nuisance in multiple testing is somewhat illusory.

Stated in terms of adjusted p-values, a set of sufficient conditions for shortcutting which are similar (but not identical) to S1-S3, is given on p. 42 of the well-crafted book of Westfall and Young (1993).

4. Acknowledgements

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Multiplicity of Outcome Variables in Confirmatory Randomized Controlled Clinical Trials: Appropriate Hypothesis Testing

By: Ralph B. D'Agostino, Sr., Ph.D.
Joseph M Massaro, Ph.D.
Donald Cutlip, Ph.D.

Why is there a problem of multiplicity of outcome variables in clinical trials? Can statistical hypothesis testing procedures deal with the multiplicity? We have answers to the first question and opinions and suggestions for the second. First, clinical trials are expensive and the variety of research questions and anticipated outcomes are often ambiguous, even for confirmatory randomized controlled trials. We do not want to produce a null study and thus we collect multiple outcomes variables to cover all hypotheses, contingencies and eventualities. Further, after initial expenses are covered, we can collection yet another "possibly useful" endpoint variable or set of endpoints relatively cheaply, and so we do. These lead to collecting a large number of outcome variables, analyzing each with a high level of anticipation, and then

reporting mainly those outcome variables that produce the most favorable results. These realities produce the problem of multiplicity. And, without proper statistical control in hypothesis testing the consequences are that results are produced whose chief characteristic is lack of interpretability. What can be done? One approach is to condemn the practice and enumerate all the bad things that could exist. Another approach is to face the realities and suggest helpful strategies to deal with them. We chose the latter and now enumerate some helpful strategies.

Two sets of strategies exist; keep the number of important variables to a minimum and control the statistical error rate. In discussing the second set of strategies we address our second question raised above, namely can statistical hypothesis testing procedures deal with multiplicity of outcome variables?

Minimizing The Number Of Important Variables

The process begins by selecting a reasonable number of outcome variables relevant to the study objectives and then dividing them into primary and secondary (and tertiary) variables. The **primary variables** should relate directly to the study objectives. They should have established reliability and validity in the relevant field (Federal Register volume 63 (179) International Conference on Harmonization, Guidance on Clinical Trials). They should be sensitive to the treatments under investigation. The trial should be powered for these primary variables.

The ideal is to have one primary outcome variable, but this may be unrealistic. Multiple primary variables are common, and then require careful allocation of the Type I error (see below). Other approaches more useful than the multiple primary outcomes, when appropriate, create composite variables or scales of variables that summarize the pool of potential primary variables. An example of the former arises in cardiovascular trials where we combine outcomes such as cardiovascular mortality, myocardial infarction and ischemic stroke into a single composite. The latter arises, for example, in the arthritis field with scales such as the Arthritis Impact Scale. Global assessments are also useful summary primary variables and these can include subjective assessment. In all cases it is our belief that the key to a good clinical trial which deals best with the issue of multiplicity is to have a minimal number of primary outcomes.

Next in importance is to delineate carefully the secondary outcomes. They should relate to primary outcomes. The distinction between primary and secondary should be based on clinical and statistical criteria (for example, power). Further, all secondary variables should be sensitive to the treatments under investigation. A simple list of classes of secondary variables is as follows:

1. Variables that supply background and further understanding of the primary outcome (for example, in an pain study with primary outcome, "sum of pain relief over time" and secondary variables, "pain relief" for individual time points)
2. With a composite primary outcome, secondary outcomes are the individual components
3. Important outcomes, but study is underpowered for them (for example, mortality and Quality of Life)
4. Outcomes that supply information to understand the mechanism or processes by which the treatment work
5. Important variables that relate to sub-hypotheses (for example, in a cardiac study with diabetics, investigation of renal function is important)
6. Variables useful for exploratory analysis

Dealing With Multiplicity In Hypothesis Tests: Controlling The Statistical Error Rate

The type I error control pertains mainly to the primary outcome. For a single primary outcome we can allocate the entire study wise error rate to it. We can then perform, contingent on significance of the primary outcome, the statistical testing of the secondary variables. Often we can do this without over-concern for statistical error control. This is the case when the examination of the secondary variables is for further understanding of the primary outcome and also for establishing consistency of the secondary outcomes with the primary outcome. We can treat single primary composite variables and single primary scales in the same manner. Here we also examine the components of the composite and the items of the scale without alpha adjustment.

For multiple primary endpoints we have a number of possible situations and strategies. First, if all primary variables are of equal importance we can test each at the desired alpha level (for example. 0.05) and rejection of the null hypotheses must be attained for all primary outcomes. On the other hand, if we are willing to be satisfied with achieving significance on any one or subset of k variables, then a Bonferroni type allocation of alpha may be needed (Hochberg, Biometrika, 1997, 75, pages 800-802). Depending on the situation a closed test procedure may also work. Global statistical procedures, which test simultaneously if there is significance of the entire set of primary outcomes, could also be appropriate. These may, however, be of limited value if we then need to identify the individual "significant" variables. Again, we perform analysis on the secondary variables, after determining significance of the primary outcomes, for understanding the primary outcomes and consistency with them. We can extend this logic also to testing in subsets, namely to investigate consistency in the subsets with the analysis of the primary and secondary outcomes on the full analysis data set.

Error Control for Secondary Outcomes

The above clearly minimizes the need to control the error rate for the secondary variables. We predicated the above on the idea that the secondary variables are used mainly to understand, explain and elaborate on the primary outcomes. Consistency with the primary outcomes is the usual key. This, however, is not the only reason for examining the secondary variables. In some cases a set of the secondary variables may be of such importance that major conclusions will be made and reported if significance is established on them. For example, the secondary outcome of over-all mortality is often such a variable. Further, in a cardiovascular study on diabetics with primary outcomes such as coronary events, secondary outcomes on renal function may be extremely important secondary outcomes. The effect of the treatment on these variables ranks as a question of almost as much importance as that of the primary variables. In these cases the allocation of the Type I error rate to these secondary outcomes becomes extremely important. One approach is to first establish significance on the primary variables and then analyze these important secondary variables with a new type I error control and with the same care as we employed on the primary outcomes. Another approach advocated by Moye is to select a study wide type I error and allocate some of this to the primary variables and some to the important secondary variables. He calls this the Prospective Alpha Allocation Scheme (PAAS) (See Moye, LA, Statistics in Medicine 2000, 19, pages 767-779).

The above situation becomes very elaborate very quickly. One extension is to have discrete sets of variables where we assign error control to each set. Testing is done sequentially where we start analyzing the first set (primary variables) for significance. If it is achieved, we move to the second set. The third set is analyzed if we attain significance on the second set, etc. This is a gate keeping strategy outlined by D'Agostino, Massaro, Kwan and Cabal for multiple comparisons (Drug Information Journal 1993, 27, pages 625-641). Note the error rate for each

set could be 0.05. It is not necessarily sensible to keep the entire study-wide significance at a level as low as 0.05. The important point is the sequential aspect. In contrast, the PAAS system would apply here by assigning a portion of a pre-selected alpha to each of the sets or to variables in the sets.

Closing Comments

The above is a rapid tour through a very complex arena. Today's clinical trials are large with many hypotheses under investigation and a multiple of outcome variables. We are optimistic that we can have complicated multiplicity and good control of statistical error rates. We believe we can achieve careful delineation of study objectives, good selection of outcome variables, meaningful classification of these into categories of primary and secondary (and even further groupings), and appropriate allocation of statistical error rates. Formal existing statistical procedures do exist for dealing with the complexity of the multiplicity. New procedures are needed. Bayesian methods and computer intensive re-sampling methods will help beyond what we described above. Of utmost importance is pre-specification. For confirmatory studies we must know enough about what is to be expected, how to measure outcomes, how to rank the importance of outcome variables, how we should statistically test our data and how we should allocate potential error rates across our study. We must determine all of this before we look at the data. Otherwise we slip quickly into either primitive or elaborate multiplicity hypothesis testing procedures, both producing results that are simply uninterruptible.

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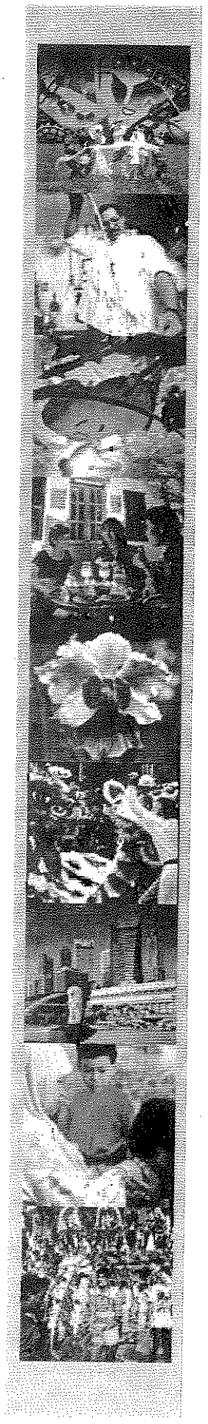

NUS National University of Singapore

International Chinese Statistical Association 泛華統計協會

The 6th ICSA International Conference, Singapore, July 21-23, 2004

Co-sponsored by the INSTITUTE OF MATHEMATICAL STATISTICS

The Sixth ICSA International Conference will proceed as scheduled at the National University of Singapore (NUS), Singapore, from July 21 to 23, 2004.

Registration forms together with the fees and abstracts should reach the local organizing committee by latest 31 March 2004. The registration fees are as follows:

	Before 31 March 2004	After 31 March 2004
Regular	U.S. $160	U.S. $190
Student (proof of status required)	U.S. $80	U.S. $95

The registration fee is inclusive of all conference materials, lunches and tea breaks, reception for the first night, dinner for the second night and transportation. It does not include cost of accommodation and local tours.

Participants will have to arrange for their own accommodations. The local organizing committee has negotiated special rates, just for the ICSA 2004 foreign participants, at the Hilton Singapore, Orchard Hotel, Orchard Parade Hotel and RELC International Hotel. Limited on-campus accommodation will be available on a first-come-first served basis.

The Programme Committee has been expanded and it now includes: Zhiliang Ying (Columbia University and Chair of this committee), Zhidong Bai (NUS), Jia-Hua Chen (University of Waterloo), Louis H. Y. Chen (NUS), Paul Cheung (Chief Statistician of Singapore), Jianqing Fan (University of North Carolina and Chinese University of Hong Kong), Xuming He (University of Illinois at Urbana-Champaign), Dennis Lin (Pennysylvania State University), Xiaoli Meng (Harvard University), Kai W. Ng (University of Hong Kong), Qi-man Shao (NUS and University of Oregon), Lingshi Tan (Pfizer Inc), Young Truong (NUS and University of North Carolina at Chapel Hill), Qiwei Yao (London School of Economics), Yi-ching Yao (Institute of Statistical Science, Academic Sinica) and Lincheng Zhao (University of Science and Technology of China)

More information on the conference, hotel accommodation, registration fees and submission of abstracts can be obtained from the NUS-ICSA 2004 website at http://www.stat.nus.edu.sg/ICSA.htm. Enquiries on the conference can be sent to:

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Regional Activities

Singapore Area

July 28 – August 31, 2003 – Stein's Method and Applications: a program in honor of Charles Stein
Location: Singapore

This is a program of the Institute for Mathematical Sciences at the National University of Singapore. The Organizing Committee comprises: *Co-chairs:* Andrew Barbour (University of Zürich) and Louis Chen (National University of Singapore); *Members:* Kwok-Pui Choi (National University of Singapore), Persi Diaconis (Stanford University), Larry Goldstein (University of Southern California) and Yosef Rinott (Hebrew University of Jerusalem). More information is available at http://www.ims.nus.edu.sg/Programs/stein/index.htm

Jan. 2 – 31, 2004 – Statistical Methods in Microarray Analysis
Location: Singapore

This is a program of the Institute for Mathematical Sciences at the National University of Singapore. It was originally scheduled to be held in June 2003 but was postponed due to unforeseen circumstances. The Organizing Committee comprises: *Chair:* Terry Speed (University of California at Berkeley and Walter & Eliza Hall Institute of Medical Research, Australia); *Co-chairs:* Ming-Ying Leung (University of Texas at San Antonio) and Louxin Zhang (National University of Singapore); *Members:* Anthony Kuk (National University of Singapore), Art Owen (Stanford University), Sylvia Richardson (Imperial College) and Wing Hung Wong (Harvard University). More information is available at http://www.ims.nus.edu.sg/Programs/microarray/index.htm

Regional Activities

C. Andy Tsao, Ph.D.

Taiwan Area

Due to SARS epidemics, most conferences and meetings have been cancelled or postponed. As now SARS seems to be contained, we wish our very best for these conferences.

1. **The 2003 Southern Taiwan Statistical Conference and Annual Meeting of Chinese Institute of Probability and Statistics.** June 26-27, 2003, Kaohsiung, Taiwan. URL: http://www.math.nuk.edu.tw/ssc2003/index.htm

2. **Applications of Statistics, Information Systems, and Computers in Natural Resources Monitoring and Management.** September 8-12, 2003, Taipei, Taiwan. Sponsored by the International Union of Forest Research Organizations (IUFRO) Research Group 4.11 URL: http://ccms.ntu.edu.tw/~btguan/

New Institutes and New Programs

1. Academia Sinica has started a Taiwan International Graduate Program (TIGP). Teamed up with local top universities, TIGP currently offers five programs (including bioinformatics) for 2003. All courses will be conducted in English and research grants are available for qualified students. URL:// http://www.sinica.edu.tw/~tigp/index.html

2. Institute of Statistics at National University of Kaohsiung is newly established and will be welcoming their new students in coming September. URL: http://www.stat.nuk.edu.tw/

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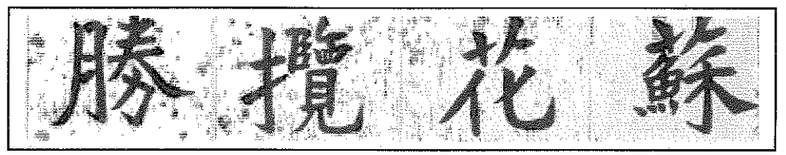
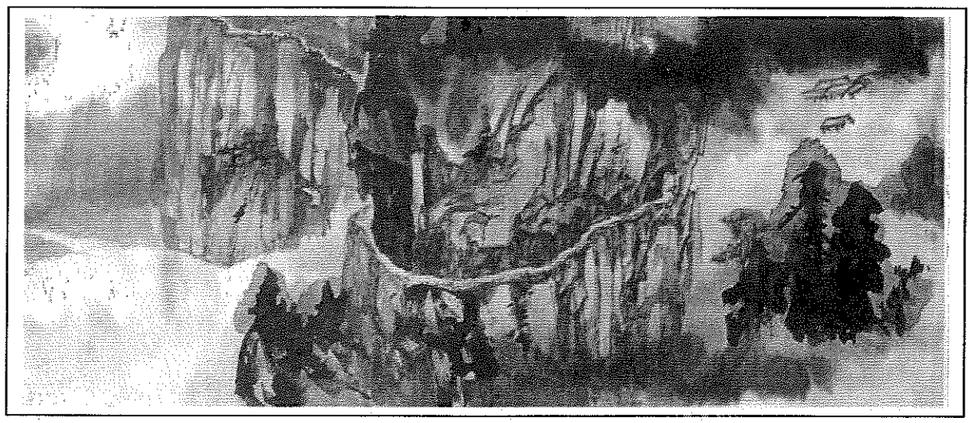


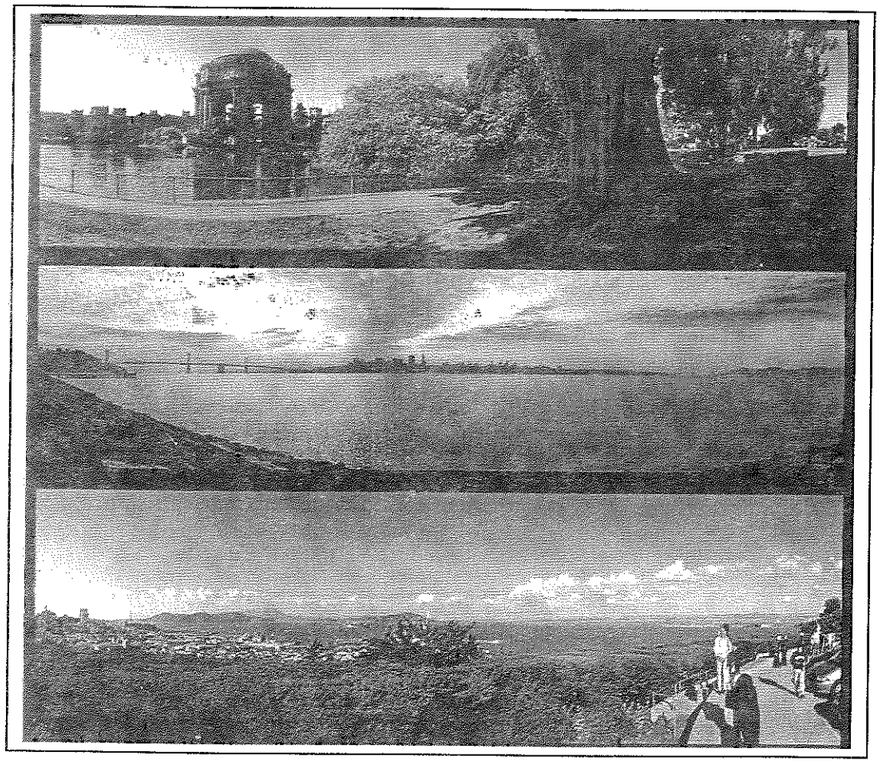


ICSA Annual Meeting in San Francisco

By: Annual Meeting Committee

On behalf of the annual meeting committee, welcome you to San Francisco! As usually, ICSA will have its annual meeting during JSM. This year has special significance: ICSA returns to its birthplace after 16 years. Our meeting is in the evening of Wednesday, August 6, in Fat East Café, a famous authentic Cantonese restaurant by the gate of the San Francisco China Town. It is in the walking distance from the Union Square and most hotels for JSM. Tickets can be purchased at ICSA booth in JSM and cost $35.00 per person. The information about this restaurant can be found at www.fareastcafesf.com.

San Francisco has many local attractions. There are also many attractions for one-day trip, including Marin Country (Muir Wood National Monument, 1 hour drive), Napa Valley (Wineries, 1.5 hour), Monterey Peninsula (Many activities and attractions, 1.5 hour), Lake Tahoe (3 hours), Yosemite National Park (3 hours), etc. There is a Chinese company that operates bus tours for those who don't want to drive www.todotravel.com.



ICSA 2004 APPLIED STATISTICS SYMPOSIUM

June 6-9, 2004 at San Diego, California, U.S.A.

Theme: Statistics in Bio-tech Research and Computing Intensive Methodologies

DATE: June 6 to 9, 2004. Short courses on Sunday, June 6, and technical sessions from Monday, June 7 to Wednesday, June 9.

LOCATION: The San Diego Marriott - La Jolla, 4240 La Jolla Village Dr., La Jolla CA 92037

DEADLINES:

February 28, 2004: Student Award and Travel Fellowships
March 31, 2004: Abstract submission
April 15, 2004: Early short course registration
May 1, 2004: Early Symposium registration (required for all speakers)

CALL FOR PAPERS: The program committee invites talks on all aspects of statistics. Abstracts are due March 31, 2004. Please submit abstracts to: Professor Gang Li, University of California at Los Angeles, email address: gangli@sunlab.ph.ucla.edu. The abstract should include the name, affiliation, mailing address, telephone number, fax number, and e-mail address of the author, and should not exceed 200 words.

ICSA STUDENT AWARDS AND TRAVEL FELLOWSHIPS: The deadline is February 28, 2004 (see a separate page in this issue for detailed information). For further questions, please contact Professor Kung Jong Lui, San Diego State University, kjl@rohan.sdsu.edu

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ICSA 2004 APPLIED STATISTICS SYMPOSIUM
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  Bradley Efron, Max H. Stein Professor of Humanities and Sciences, Stanford University; President-Elect, ASA.
  http://www-stat.stanford.edu/people/faculty/efron.html
  George Tiao, W. Allen Wallis Professor of Econometrics and Statistics, University of Chicago, http://gsb.uchicago.edu/fac/george.tiao

- **Plenary Sessions (June 7-9, 2004):**
  New Developments of Nonparametric Methods in Financial Economics, by Jianqing Fan

  Current Statistical Issues in Clinical Trials for Drug Development, by Tze Leung Lai

- **Banquet Speaker: Arlene S. Ash, Boston University.**

- **Short Courses (Sunday, June 6, 2004, 9:00AM-5:00PM. See later pages for details)**

	Topic	Instructor
1	Practical Guidance of Generalized Linear Mixed Models	Charles E. McCulloch, University of California, San Francisco
2	Tutorial on Statistical Bioinformatics	Charles (Chip) Lawrence, Wadsworth Center and Rensselaer Polytechnic Institute
3	Cancer Trials for Practitioners – Experimental Design and Efficacy Analysis	Kao-Tai Tsai, Aventis Pharmaceuticals
4	Bootstrap Methods: A Guide for Practitioners	Michael R. Chernick, Novo Nordisk Pharmaceuticals
5	Active Controlled Clinical Trials	Yi Tsong & Sue-Jane Wang, FDA

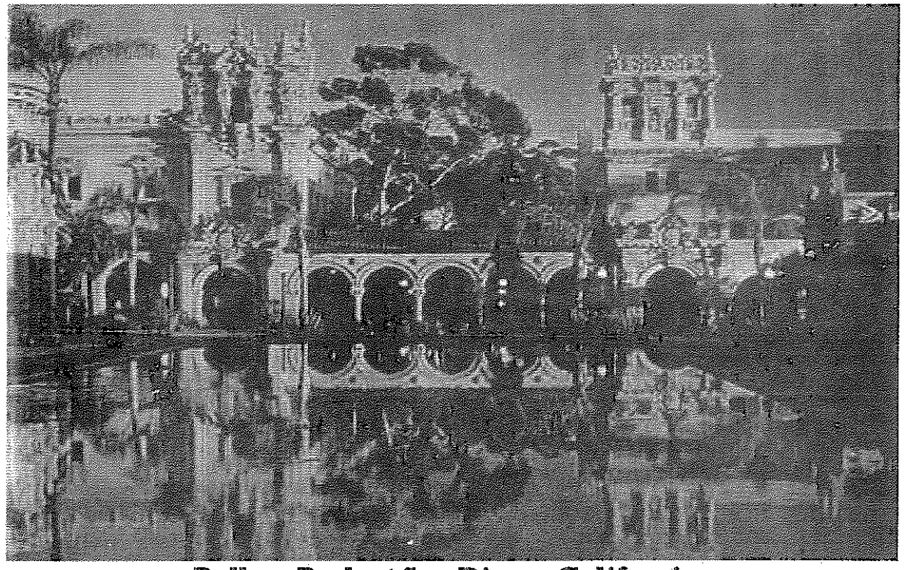
- **Invited Sessions (June 7-9, 2004, subject to change)**

	Session Topic	Organizer	Speakers
1	Statistical Applications in Business Research	Chih-Ling Tsai	Peter Lenk, University of Michigan Aaron Smith,UC-Davis Prasad A. Naik , UC-Davis
2	Issues of Active Controlled Clinical Trials	Yi Tsong	Steven Snapinn, Merck Ivan Chan, Merck Yong-Cheng Wang*, Gang Chen, and George Y. Chi, FDA
3	Statistics in Financial Econometrics	Jianqing Fan	Yongmiao Hong, Cornell University Per Mykland, University of Chicago Federico M. Bandi, University of Chicago

	Session Topic	Organizer	Speakers
4	Current Methodologies in Pharmaceutical Statistics	Kerry B. Hafner	Rafe Donahue, Glaxo Smith Kline Jimmy Wang, PRA International Charlie (Guoliang) Cao, Takeda Pharmaceuticals North America
5	Assessment of Measurement Agreement	Richard Runze Li and Annie Qu (Chair)	Lawrence I. K. Lin, Baxter Healthcare Corporation Runze Li and Mosuk Chow, Pennsylvania State University John Lu, National Institute of Standards and Technology
6	Recent Advances in Survival Analysis	Gang Li	Dorota Dabrowska, UCLA Wei Wang, Harvard University Ronghui Xu, Harvard University
7	Data Mining in Chemistry and Chinese Medicine	Kai-Tai Fang	Yizhen Liang, Central South China University, China Kai-Tai Fang, Hong Kong Baptist University, Hong Kong, China Aijun Zhang*, Wai-Yan Ha, Yu-Hui Hu, Ricky N.S. Wong and Kai-Tai Fang, Hong Kong Baptist University, Hong Kong, China
8	New Development in Medical Diagnostic and Screening Tests	Xiaohua Andrew Zhou and Kung-Jong Lui (Chair)	Margaret Pepe, University of Washington Vanja Dukic, University of Chicago Xiao-Hua Andrew Zhou, University of Washignton and VA Puget Sound Health Care System
9	Statistical Methods for AIDS Clinical Research	Hulin Wu	Zhezhen Jin, Columbia University Yangxin Huang* and Hulin Wu, Frontier Science & Technology Research Foundation Lang Wu, University of British Columbia
10	Design of Experiments	Ching-Shui Cheng	Weng Kee Wong, UCLA Hongquan Xu, UCLA Kenny Ye, SUNY at Stony Brook
11	Design and Analysis of Dose Response Studies	Naitee Ting and Tao Wang (Chair)	Douglas M Potter, University of Pittsburgh Cancer Institute Dr. Jason Hsu, Ohio State University Naitee Ting, Pfizer Global Research & Development
12	Statistical Applications in Accounting, Economics and Finance	Ruey S. Tsay	Michael C. Davis* and James Hamilton, Univ. of Missouri and UC San Diego Jimmy Ye, Baruch College Ruey S. Tsay, University of Chicago
13	Empirical Likelihood and Its Applications	Songxi Chen	Songxi Chen, National University of Singapore Gang Li, UCLA Ian McKeague, Florida State University Jin Qin, Memorial Sloan-Kettering Cancer Center

	Session Topic	Organizer	Speakers
14	Computing Intensive Methodologies in Bayesian Statistics	Minghui Chen	Jun Liu, Harvard University Steve MacEachern, Ohio State University Ming-Hui Chen, University of Connecticut
15	Bayesian Inference and Graphic Methods for Complex Data Analysis	Xiaoli Meng	Iain Pardoe, University of Oregon Cavan Reilly, University of Minnesota Xiao-Li Meng, Harvard University
16	New Development in Quality Improvements	Smiley W. Cheng	Gemai Chen and Lingyun Zhang, University of Calgary Maria Tong, Sanford Papermate Corporation Youn-Min Chou, University of Texas at San Antonio
17	Statistical Methods for the Analysis of DNA and Tissue Microarray Data	Steve Horvath	Xinping Cui, UC Riverside Steve Horvath, UCLA Jim Veitch, Corimbia, Inc.
18	Environmental and Ecological Study	Dongchu Sun	Ling Chen, Florida International University Chong Z. He, University of Missouri-Columbia Hoon Kim, California State Polytechnic University
19	Aspects of Clinical Trials	Grace Yang	Jian-Lun Xu and Richard Fagerstrom, Philip Prorok and Barnett Kramer George YH Chi, FDA Kai-Fun Yu and Aiui Liu, NIH
20	Bioengineering and Statistics	Nancy Lo	Yihua Zhao, UCSD John Shyy, UC Riverside Amy Sung, UCSD
21	New Developments in Longitudinal Data Analysis	Annie Qu	Ying Qing Chen, UC Berkeley Wei Pan, University of Minnesota Annie Qu, Oregon State University Peter Song, University of Michigan
22	Adaptive Design for Clinical Trials	JianWen Cai	Yu Shen, MD Anderson Cancer Center Qing Liu, Johnson & Johnson Peter Thall, MD Anderson Cancer Center
23	Sequential Clinical Trials	Peng Huang	Aiyi Liu, NIH H.M. James Hung, FDA Peng Huang, Medical University of South Carolina Sue Jane Wang, FDA
24	Statistics for Natural Resources	Nancy Lo	Steven K. Thompson, Penn State University Mark Maunder, IATTC Din Chen, International Pacific Halibut Commission
25	Design and Analysis of Cardiovascular Clinical Trials	H.M. James Hung	H.M. James Hung, CDER, FDA Gordon Lan, Aventis Pharmaceuticals Steve Snapinn, Merck Research Lab
26	Biostatistical Research in Mainland China	Ji-Qian Fang and Ying Lu (Chair)	Feng Chen, Nan Jing Medical University Hua Jin, South China Normal University Cai Xia Li, Zhongshang University

	Session Topic	Organizer	Speakers
27	Intensive Computing in Genetic Applications	Frank Shen	Nanxiang Ge and Liu Hong, Aventis Pharmaceutical Co. Lue-Ping Zhao, Fred-Hutchinson Cancer Research Center Heping Zhang, Yale University
28	Better Writing Skills for Success	Weng Kee Wong	Xiao-Li Meng, Havard University Don Ylvisaker, UCLA
29	Applied and Interdisciplinary Research: Case Studies by Local Statisticians (*Jointly sponsored by the San Diego Chapter of American Statistical Association*)	Duane Steffey, Jacinte Jean (Chair)	Joey Lin, SDSU Reena Deutsch, UCSD Mikhail Golovnya, Salford Systems
30	Recent Advances in Drug Discovery and Development	C. F. Jeff Wu and Eric Yan (Chair)	Greg Dyson, U of Michigan Xiaoli Shirley Hou, Merck Research Labs Sergei Leonov, GlaxoSmithkline
31	Statistical Methods with its application to public health	Chinsan Lee	Chinsan Lee, National Sun Yat-Sen University, Taiwan Huey-miin Hsueh, National Chengchi University, Taiwan Yunchan Chi and Mei-Chi Huang, National Cheng-Kung University, Taiwan



Balboa Park at San Diego, California

ICSA Student Awards & Travel Fellowships

The 13th Annual ICSA Applied Statistics Symposium will be held on June 6-9, 2004 at the San Diego Marriott- La Jolla, La Jolla, CA. The Program Committee will again sponsor the Student Awards and Travel Fellowships. The main purpose of the award is to encourage student members of ICSA to participate and present their research work at this annual meeting.

Qualifications: The student must be an ICSA member (or join at the time of manuscript submission), a degree candidate in any term during 2004 at an accredited institute and be able to register and present the work at the 2004 symposium.

Manuscripts should be prepared double spaced using Biometrics or JASA guidelines for authors. They must be no more than 20 pages in length exclusive of tables and figures. Use one-inch margins and no smaller than 12 point type. The work must be that of the student and be relevant to applications in a variety of fields including biomedicine, business, etc. The manuscript may be co-authored with a faculty adviser and/or a small number of collaborators, although the student must be the first author.

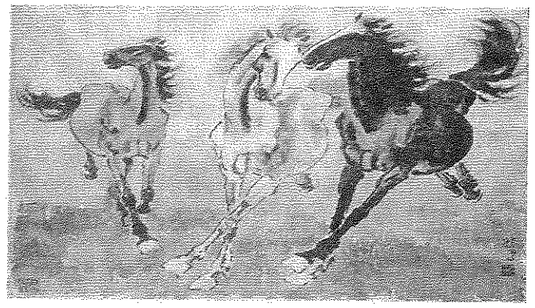
Review and Selection Process: Three review members of the Award Committee, appointed by the Chair of the Committee, will receive blinded copies of the submitted manuscripts from the Committee Chair and review them based on the following criteria: The manuscript should be well motivated by an application relevant to the specific field(s). The methodology developed should be applicable to the motivating problem. Inclusion of an application of the proposed methodology to a particular study will be favorably considered. Clarity of presentation in writing will be considered as well. Up to 3 travel award winners will be selected by the Awards Committee chaired by Prof. Kung-Jong Lui. All winners will each receive a certificate, $400, and tuition for one short course of their choice. The winners will be notified by April 15, 2004.

Submission of Manuscripts: Manuscripts should be received and postmarked no later than February 28, 2004. The submission should include: (1) A cover letter, (2) One complete title page with author(s), institutional affiliation, mailing address, phone/fax numbers and e-mail address, (3) Five copies of the manuscripts with only a title, but no information on authors or affiliation, on the first page, (4) Two copies of abstract, (5) Two copies of the ICSA membership application for non-members.

Membership forms can be downloaded from http://www.icsa.org

Note: All student winners of 2003 and 2004 will be acknowledged at 2004 symposium.

All materials should be mailed to:
Professor Kung-Jong Lui
(kjl@rohan.sdsu.edu)
Department of Mathematics and Statistics
San Diego State University
San Diego, CA 92182-7720



International Chinese Statistical Association

泛華統計協會

Membership Application & Renewal Form

Name	(Last)	(Middle)	(First)
(English)			
(Chinese)			
Address			
Office	Address:		
	City:		
	State:	Zip Code:	Country:
	Email:	Telephone:	FAX:
Home	Address:		
	City:		
	State:	Zip Code:	Country:
	Email:	Telephone:	FAX:
Education			
	Degree:	Year Graduated:	
	University:		
Professional Occupation & Title			
	Occupation:	Title:	
Membership Fees			
	Regular (US$40)		
	Student (US$20)		
	Permanent (US$400)		
	Spouse (50%)		
	Donations		
	Total Amount Paid: US$		
Statistical Area of Interest (circle all applicable):			
	A: Agriculture	B: Business / Economics	
	C: Computing / Graphics	D: Education	
	E: Engineering	F: Health Sciences	
	G: Probability	H: Social Sciences	
	I: Biostatistics	N: Theory & Methodology	

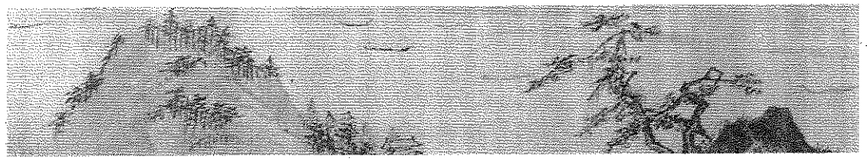
Please Make Check Payable to: I.C.S.A. Mail This Form & Fees to:
ICSA c/o Yi Tsong, Ph.D. 13215 Lazy Glen Lane, Herndon, VA 20171

International Chinese Statistical Association
Profit & Loss
January 1, 2003 through June 30, 2003

Ordinary Income/Expense	
Income	
Advertisement	400.00
Unrestricted Contributions Income	110.00
Membership Dues	6,340.00
Total Income	**6,850.00**
Expense	
Bank Service Charges	0.40
Casual Labor	29.00
Contributions to ASA	500.00
Internet Registration	157.55
Miscellaneous	469.39
Postage and Delivery	
Announcement	504.76
Book/Journal Donation	707.00
Bulletin	2,220.02
Total Postage and Delivery	3,431.78
Printing and Reproduction	
Jan. Bulletin	4,200.00
Total Printing and Reproduction	4,200.00
Professional Fees for Tax filing	320.00
Web Page Hosting	1,200.00
Total Expense	**10,308.12**
Net Ordinary Income	-3,458.12
Other Income/Expense	
Interest Income	85.52
Net Other Income/Expense	85.62
Net Income	**-3,372.50**

International Chinese Statistical Association
Balance Sheet
As of June 30, 2003

Assets	
Checking	5,637.03
Savings-CD	31,583.32
Savings-Money Market	33,972.17
Total Assets	**71,192.52**
Liabilities & Equity	
Equity	
Opening Balance 1/1/03	74,565.12
Net Income	-3,372.60
Total Equity	71,192.52
Total Liabilities & Equity	**71,192.52**



Calendar of Meetings

July 24-26, 2003 - First Joint ISBA-IMS Meeting
Location: Intercontinental Hotel, Isla Verde, San Juan, Puerto Rico. More information at: http://www.cnnet.clu.edu/math/IMS-ISBA-PR2003/

July 29 - August2, 2003 – IMS New Researchers Conference
Location: University of California, Davis. Information available at: http://www-rohan.sdsu.edu/~ralevine/NRC/

Dec. 18-20, 2003 Bernoulli Society East Asian and Pacific Regional Conference
Location: Hong Kong.

The Bernoulli Society East Asian and Pacific Regional (EAPR) Conference 2003 will be held at The Hong Kong University of Science and Technology (HKUST) on 18-20 December 2003. The conference is organized by HKUST under the auspices of the East Asian and Pacific Regional Committee of the Bernoulli Society. Keynote speakers are David Aldous, Friedrich Gotze, Zhi-ming Ma, Wing Hung Wong and C. F. Jeff Wu. Authors are now invited to submit contributed papers through email to eapr2003@ust.hk in either Latex or Microsoft Word formats. The deadline of the submission is 30 September 2003. For more information about the EAPR conference, please visit *www.bm.ust.hk/~eapr2003*.

July 21-23, 2004 - The Sixth ICSA International Conference
Location: Singapore.
More information available at: Zhiliang Ying zying@stat.columbia.edu.

July 26-30, 2004, IMS Annual Meeting/ 6th Bernoulli World Congress
Location: Barcelona, Spain
http://www.imub.ub.es/events/wc2004/

The program covers a wide range of topics in statistics and probability, presenting recent developments and the state of the art in a variety of modern research topics and in applications such as mathematical finance and statistical bioinformatics. The program include up to twelve Special Invited Lectures given by leading specialists, thirty-five Invited Paper Sessions and a large number of contributed talks. David Nualart is the Chairman of the Organizing Committee and Wilfrid Kendall is the Chairman of the Scientific Committee.

August 6-7, 2004, New Directions in Probability Theory
Location: Fields Institute, Toronto, Canada
http://www.imstat.org/meetings/NDPT/default.htm

The meeting is co-sponsored by the Institute of Mathematical Statistics (IMS) and the Fields Institute for Research in Mathematical Sciences. It will be held at the Fields Institute.

It is intended for a general probability audience interested in recent developments in probability theory. The topics of the session are Random Walks with Self-Repulsion, Random Matrices, Random Media, Super-processes, and Markov Chains with Algorithms. There will be no registration fee for the meeting. However, space at the Fields Institute is limited and early registration is recommended.

A section of the "Preface of Lanting" Calligraphy by Wang Hsi-chih (303-361)

Our Sincere Thanks!

The Editorial Team

As we stated on the first page of this issue, the January issue was an experiment; we are so grateful to the good friends who sent us their feedback around the world. Some of the feedback is displayed on the "Letter To The Editor" page. We encourage you to take a look. Hopefully, you may have something to comment also.

As in the last issue, many good friends have taken time from their busy schedules to write for the Bulletin, especially the Committee Chairs, the Editors of the Statistica Sinica, the Special Topic Editor, the friends who report the regional activities, and Li-Rong & Koun-Ping Cheng for interviewing Professor Fung.

We especially appreciate Professor Chow and Professor Fung's generous support. Professor Chow set an unprecedented speed record in sending us his article. His paper of forecast arrived in less than one day after our conversation at Princeton University. That event moved my heart deeply.

Professor Fung cancelled all his other activities so that we might conduct the interview with him. The planned 2-hour interview around noon turned into eight hours of most enjoyable conversation, lasting until late in the evening. This experience can be best described as "Showering in the Spring Breeze". It is also wonderful to know that UCSD dedicated the auditorium of their Bioengineering Building to Professor Fung. Professor Fung, you really make us all proud!

We would also like to express our thanks towards Professor T.L. Lai in advance for arranging the Special Feature articles for the next two issues. It is unbelievable for such a busy person to pour in so much patronage in these issues of the Bulletin. We are definitely the most fortunate editorial team in the world.

Lastly, we would like to thank Bob Lippman for translating the poem shown on the inside back cover. The world would be a utopia if we could be friends all around the world.

We hope we all can follow the paradigms set by these leaders and make ICSA the best that it can be.

Outer And Inner Bound By A Close Friend,

The Most Distant Place Is Like A Neighbor.