

University of Delaware 特拉华大学

We all should be proud of
我们都应该感到骄傲

We are small but good

Xiang-Gen Xia (夏香根)
2016.12

iPhone, iPad,..

- What really made smartphones popular?
What is the most noticeable change in technology in the last decade?
 - Apple's iPhone and iPad
- One key technology is related to UoD
 - *“The iPhone, that allows youth everywhere to protect their secret lives from their helicopter parents, would not have been possible without the engineering solutions of Professors John Elias and Wayne Westerman of the University of Delaware who developed multi-touch sensing capabilities”* --- Steve Jobs' biography

Internet Pioneers

- In the last century, Prof. David Farber, when he was in Univ. of Delaware, he was one of the few pioneers in building US internet on campus
 - Pioneer's Circle of Internet Hall of Fame
- Prof. David Mills, time synchronization and internet pioneer

Prof. Guang Rong Gao's Students

- The First Search Engine was built by Alan Emtage, one of Prof. Gao's former students in McGill Univ.
- The first internet in China, RenRen Net (人人网) was built by Xin Wang, Prof. Gao's former student in University of Delaware

Prof. Len Cimini

- The first one applied OFDM to wireless communications in the 80's and now OFDM is used everywhere in people's daily life

2010 Nobel Prize Winner in
Chemistry Richard F. Heck

and

US Vice President Joe Biden

Xiang-Gen Xia's Group

name a few contributions that may exist for long time

- Xia Filters/Pulses
- Vector OFDM for single antenna systems
- Discrete Chirp-Fourier Transform (DCFT), 新名词
- Generalized and robust Chinese remainder theorems, and applications in SAR imaging of moving targets
- Vector/matrix-valued wavelets, multi-wavelet prefilterings
- The first watermark in wavelet transform domain
- Results in joint time-frequency analysis

- **Some of the most celebrating results in space-time coding**
 - Orthogonal space-time block code (OSTBC) rate upper bound $\frac{3}{4}$
 - Systematic designs of OSTBC with the highest rates
 - Optimal rotations of QOSTBC
 - Algebraic and Optimal cyclotomic space-time codes
 - The best known/optimal unitary space-time codes
 - Space-time codes with simplified receivers开了新方向
 - The first space-time codes for relay channels to achieve asynchronous full cooperative diversity
 - Shift full rank matrices
 - Simple Alamouti coded system

They not only have values in engineering but also are new in mathematics, 这些结果在数学上都是新的

When you work hard, anything is possible to you after 20 years

只要努力,大家都有成功的机会

Aug. 11, 1942.

H. K. MARKEY ET AL

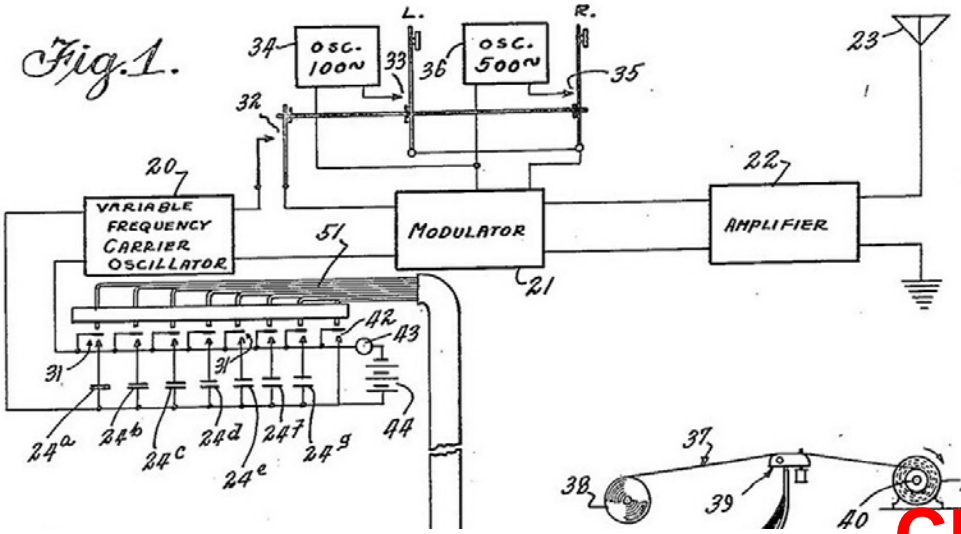
2,492,587

SECRET COMMUNICATION SYSTEM

Filed June 10, 1941

2 Sheets-Sheet 1

Patent



Wireless goddess

CDMA is based on the famous star actress Hedy Lamarr's invention of frequency hopping spread spectrum communications

(88 frequencies, using piano role unpredictably change the signal, 88 black and white keys on a keyboard)

to protect the allies wireless signals for radio-controlled torpedoes to avoid jamming, thus improve the hitting rate

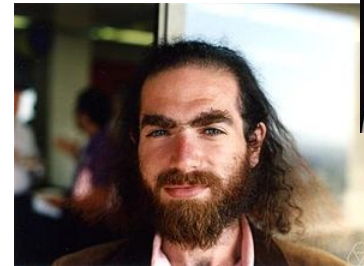
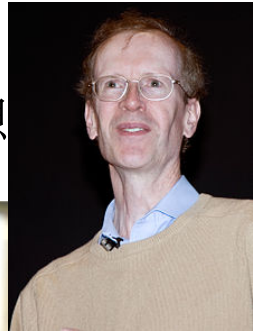


frequency-hopping with Helwig Kiesler, aka Hedy Lamarr
Ele Willoughby 2014



张益唐

- 1) 2013年还是Univ. of New Hampshire代课老师
- 2) 2013年58岁时做出了著名古老的国际数学难题“孪生素数猜想”的最重大的一步
- 3) 博士毕业后没找到合适的工作，在餐馆打工，送外卖等
- 4) 成为最近几十年全世界数学界最传奇的三位人物之一
 - 90年代普林斯顿大学的 Andrew Wiles 证明了费尔马大定理 (Fermat's Last Theorem), 消失了7年
 - 2000年代俄罗斯的 Grigori Perelman证明了庞加莱猜想 (Poincare Conjecture)
 - 拒绝领Fields和100万美金的Clay等大奖



共勉:

- 1) 做学问一定要安定，安心，坚持，不放弃
- 2) 永远不要低估自己，真不知道20年后，或许是你自己，或许是你身边的人已做出惊人的成绩

“If you feel you cannot get helped by your school’s name, you help your school name”

by Xiang-Gen Xia

读博士的目的

- 喜欢做研究,喜欢写论文
- 找到更好更稳定的工作,更能做自己喜欢做的事情
- 想让自己为后人留下点什么,也算没白来一趟这个世界

怎样做论文

做论文的题目

- 要做全世界没人明白或没想到的题目

发表论文的目的

- 首先是让自己把问题搞明白
- 其次是不光让自己明白,还要再让别人明白

写和发表论文---三要和三不要

- 三要
 - 要喜欢做论文,想让同行知道你承认你
 - 要喜欢问问题
 - 要喜欢自己写的论文
 - 把写的东西放在手边不停地读
- 三不要
 - 不要只为发论文而发论文
 - 不要有侥幸心理
 - 不要无谓的耽搁和压仓

学生和老师

- 互等, 互信, 互赢

Fair, Mutual Trust, and Win Win

Our daily life has changed by electronics

- I came to USA in 1988 and I do not feel anything else (clothing, food, housing, transportation衣食住行) but our electronics, such as computers, phones, internet, is changed/improved over the past 28 years
- Among all the electronics, computers and digital communications have changed the fastest.

The Most Noticeable Things in Digital Communications in the Past

Communications is always one of the most important tasks among any animals.

- Channel Coding (Always the most impacted, 海底捞针)
 - Shannon's Channel Coding Theorem and Capacity (如来佛)
 - Reed-Solomon Codes (BCH Codes) (孙悟空)
 - Viterbi Decoding
 - Trellis Coded Modulation (TCM)
 - Turbo Codes (LDPC Codes, Iterative Decoding)

The Most Noticeable Things in Communications in the Past

- Source Coding (Compression, 精益求精)
 - Shannon's Source Coding (both lossless and lossy) Theorem
 - Lossless Coding
 - Huffman Coding
 - Lempel-Ziv-Welch Algorithm
 - Lossy Coding
 - DCT, DWT

The Most Noticeable Things in Communications in the Past

- Systems: Modulations (排兵布阵)
 - CDMA
 - OFDM
 - MIMO: This is natural and not surprising

The Most Noticeable Things in Communications in the Past

- Systems: Receiver and Signal Processing (画蛇点睛)
 - Matched Filtering
 - Decision Feedback Equalizer (DFE)

The Most Noticeable Things in Communications in the Past

- Techniques/Skills (鲁班在世)
 - Synchronization (Phase Locked Loop)

希望大家继续努力

- 一定要把研究放在每天最重要的位置
- 如对自己的研究有高要求的话 (why not? you should never under-estimate yourself), 一天花在你的研究上的时间应不低于10小时
- 我帮努力的人推荐时,说好话从不吝啬
- 祝大家在新学年里取得好成果