IMS Presidential Address 2023

IMS: What does it stand for?
What could it stand for?

Joint Statistical Meetings 2023, Toronto

Peter Bühlmann

What is it?

Only a picture of IMS

I will show you a few more pictures and images of IMS...

I will show you a few more pictures and images of IMS...

... and what follows is only my own view and perspective (aka "picture") of IMS

it is perhaps an unusual name nowadays

but unusual can be good: distinguishing from "mainstream"

- ▶ "Institute"...
- ▶ "Mathematical Statistics"...
  no explicit mentioning of probability, data science

A bit of history leads to some explanation

from

Stephen Stigler (1996). The History of Statistics in 1933. Statistical Science.

Elyse Gustafson and Edsel Peña (2019): Institute of Mathematical Statistics (IMS).
Wiley StatsRef: Statistics Reference Online.

IMS was founded 5 years after the beginning of *The Annals of Mathematical Statistics* (1930)

THE ANNALS

of

MATHEMATICAL

STATISTICS

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First article by Willford King
Secretary-Treasurer of the ASA (and President of the ASA 1935)

THE ANNALS OF MATHEMATICAL STATISTICS

By

WILLFORD I. KING

For ninety-one years the American Statistical Association has held the van in matters statistical in the United States. At the time when our Association was founded, statistical method was an extremely simple science. In recent years, the technique has, however, been growing more and more complex. The *Journal of the American Statistical Association* has served all the members of the Association and an attempt has been made to cover, in its pages, all phases of statistical method. For some time past, however, it has been evident that the membership of our organization is tending to become divided into two groups — those familiar with advanced mathematics, and those who have not devoted themselves to this field. The mathematicians are, of course, interested in articles of a type which are not intelligible to the non-mathematical readers of our Journal. The Editor of our Journal has, then, found it a puzzling problem to satisfy both classes of readers.

Now a happy solution has appeared. The Association at this time has the pleasure of presenting to its mathematically inclined members the first issue of the ANNALS OF MATHEMATICAL STATISTICS, edited by Prof. Harry C. Carver of the University of Michigan. This Jour-

My personal opinion is that the advent of the ANNALS constitutes an important milestone in the history of our Association. I am sure that this new publication will be welcomed heartily, not only by the mathematically trained section of our membership, but also by the non-mathematical group, for the latter recognize that the more advanced phases of mathematics are rendering extremely valuable service in furthering the progress of statistical technique, thus aiding in the solution of problems of the greatest moment.

(King, 1930)

but then... things didn't work out!

- ▶ after some issues on "becoming divided into two groups"
  (those devoted to advanced mathematics and those who did not)

  Henry Carver, the first editor took over the Annals in January 1934 at his own expense and maintained it without institutional base

- ▶ Carver came up with the idea of an association of mathematical statisticians: it did not work within ASA and this triggered the official founding of the IMS in 1935

IMS founded on September 12, 1935, at Ann Arbor

Henry L. Rietz
(U Iowa, Iowa City)
first President of IMS

Harry C. Carver
(U Michigan, Ann Arbor)
main initiator

W.A. Shewhart as Vice-President
A.T. Craig as Secretary-Treasurer

and the founders chose the word "Institute"!

Merriam Webster:
institute:
an organization for the promotion of a cause (motive)

association:
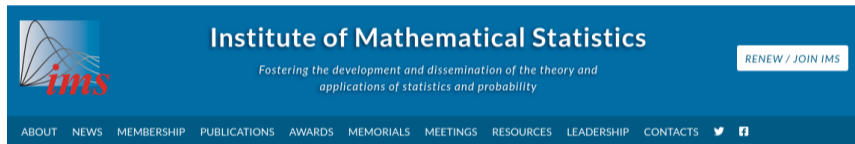an organization of persons having a common interest

$\rightsquigarrow$ "institute" is perhaps not such a bad name!

Historically: Institute of Mathematical Statistics "stands for"

Promotion of: "... the more advanced phases of mathematics are rendering extremely valuable service in furthering the progress of statistical technique, thus aiding in the solution of the greatest moment" (King, 1930)

IMS: What does it stand for today?

Today, in 2023:

Fostering the development and dissemination of the theory and applications of statistics and probability

Curriculum Vitae
Institute of Mathematical Statistics

Personal Data
4'670 members, from very many countries

Education
many thousands of graduate and postgraduate degrees!

Recognitions ↝ see next

"Positions"
simultaneously all over the world!

References (upon request)
ASA, IBS, SSC, ISI, RSS, ...
the others should say "What IMS stands for"!

relative to IMS' size with 4'670 members (2022), we do a lot!

1. Publications:

· Annals of Statistics
· Annals of Probability
· Annals of Applied Statistics
· Annals of Applied Probability
· Statistical Science
· IMS Monographs/Textbooks
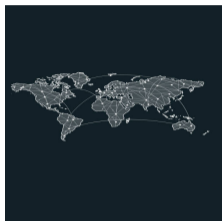· IMS Bulletin

co-sponsored

· ACM/IMS J. of Data Science
· Electr. Commun. in Probab.
· Electronic J. of Probability
· Electronic J. of Statistics
· J. Comp. and Graph. Stat.
· Probability Surveys
· Statistics Surveys

IMS is highly recognized for its publications!

2. Meetings and conferences

everywhere in the world: we have a truly global reach!

annual standalone: London, Vilnius, Sydney, Gothenburg, Rio de Janeiro, Banff, ...

Asia Pacific Rim Meeting: Melbourne, Singapore, Hong Kong, Taipei, Tsubuka, Seoul

World Congress (with Bernoulli): Toronto, Istanbul, Singapore, Barcelona, Guanajuato, Vienna, Chapel Hill, Uppsala, Tashkent

and many other meetings

3. Awards and honors

Awards & Named Lectures:
Wald, Blackwell, Le Cam, Neyman, Rietz, Grace Wahba, Schramm (joint with BS),
Doob (joint with BS), Medallion

IMS Fellows

Harry C. Carver Medal
Peter Gavin Hall IMS Early Career Prize
Tweedie New Researcher Award
IMS Lawrence D. Brown Ph.D. Student Award
IMS New Researcher Travel Award
IMS Hannan Graduate Student Travel Award

a portfolio of awards from early- to mid- and senior-career
relative to IMS' size of 4'670 members: we have many!

Early career researchers are of utmost importance!

4. IMS New Researchers Group

New Researchers Group Leadership

- President: Pragya Sur (Harvard University)
- Past President: Alexander Volfovsky (Duke University)
- Treasurer: Simon Mak (Duke University)
- New Researchers Conference chair for 2023: Linbo Wang (University of Toronto), Dehan Kong (University of Toronto), Pragya Sur (Harvard University)

it is IMS' core responsibility to support
the development, careers and research of the next generation

because

▶ we owe it to the next generation

▶ only the next generation will keep up with new developments at sufficient speed

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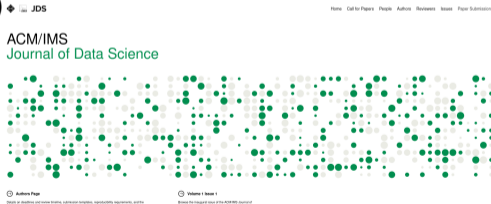the development, careers and research of the next generation

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5. Expansion in various directions over the years

- ▶ applied and interdisciplinary statistics:
  Annals of Applied Statistics (since 2007)

- ▶ ACM/IMS Journal of Data Science
  (brand-new, since 2023)

- International Congress of Statistics and Data Science (ICSDS; since 2022)

in Florence (2022)

- Industry Friends of IMS (brand-new, since 2023)
  to stimulate intellectual exchange between industry and academia

6. We have very many members who devote a huge amount of their time and passion for IMS endeavors

Welcome reception hosted by London School of Economics

IMS meeting in London (2022)

IMS can do all these things only with their volunteers!

Truly Amazing! Thank you!

Where does IMS stand within the community?

National statistical societies:

- ASA: $\approx$ 19'000 members
- RSS: $\approx$ 10'000 members
- ...

International statistical societies:

- ISI: $\approx$ 4'000 elected fellows
- IBS: $\approx$ 6'000 members (organized in 37 regions, 4 networks)
- ISBA: $\approx$ 900 members
- Bernoulli Society: $\approx$ 760 members
- IMS: 4'670 members

... and where do we stand in "data science"?

Computer and Data science ("regular" societies):

- ▶ ACM: Association for Computing Machinery
  $\approx 110'000$ members from more than 190 countries
- ▶ IEEE: $\approx 427'000$ members from more than 190 countries
  344 sections in ten geographic regions worldwide
- ▶ INFORMS: Operations Research & Analytics
  $\approx 13'000$ members from all continents

Machine learning societies:

built around major conferences as a society to run the conference

- ▶ The International Machine Learning Society
  runs the annual ICML conference
- ▶ Neural Information Processing Systems Foundation
  runs annual NeurIPS conference
- ▶ Association for Uncertainty in Artificial Intelligence
  runs annual UAI conference

IMS and other statistical societies:

- ▶ smaller and more homogeneous than the big CS/IEEE data science competitors
- ▶ yet much broader than running an ML conference

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$\rightsquigarrow$ an opportunity for IMS – and all other societies in stats!

IMS: What could it stand for?

<div align="center">

?

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We can always improve and develop great new projects....

obviously...

What is the role of the "M" ("Mathematical")?

Mathematical Statistics was a new wave ("fashionable") about 100 years ago
it brought rigor and success to statistical analysis

and later to data science and machine learning

What could the "M" stand for in the future?

1. Foundational work in statistics and data science

general statistical and data science principles, new frameworks and paradigms (computational, methodological), mathematical theory and insights,...

there are a lot of exciting and new problems

let us get inspired by interdisciplinary science, data science, machine learning, AI, industry problems, ...

neuroscience, astrophysics, personalized medicine, climate science,...

bias and fairness, data privacy, data integration and fusion,
scalability and performance, interpretability and explainability (aka "causal"),
adaptive and reinforcement learning, optimal transport in machine learning,...

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nearly non-science-fiction future:
quantum computing, a billion of human genomes sequenced,
human brain simulations and modeling 100 billion neurons,...
?,...

Let's go out and actively participate shaping the foundations in new data science problem domains!

... and critically debating new developments

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seize the opportunity!

https://www.cumanagement.com/blogs/2017/01/25/focus-opportunity-swot

2. Modern probability

I do not have the expertise to say much about it

probability is nowadays a central field in mathematics
(Fields Medals to "pure" probabilists in 2006, 2014, 2022)

could exposure to data science provide new developments in probability and mathematics?

for sure: we want to have probability on board in IMS!

3. Statistics remains connected to mathematics

3. Statistics remains connected to mathematics: Statisticians prove major conjectures in mathematics

2014: Proof of the Gaussian Correlation Conjecture

(and now "Gaussian Correlation inequality"):

"As he was brushing his teeth on the morning of July 17, 2014, Thomas Royen, a little-known retired German statistician, suddenly lit upon the proof of a famous conjecture at the intersection of geometry, probability theory and statistics that had eluded top experts for decades." (Quanta Magazine, 2017)

Thomas Royen
1979-1985: statistician for Hoechst AG (pharma)
1985-2010: University of Applied Sciences Bingen

2020: Proof of the Kannan-Lovász-Simonovits (KLS) conjecture

"Statistics Postdoc Tames Decades-Old Geometry Problem
To the surprise of experts in the field, a postdoctoral statistician has solved one of
the most important problems in high-dimensional convex geometry."

(Quanta Magazine, 2021)

Yuansi Chen
former PhD student of Bin Yu
currently at Duke University

Why were they (Thomas Royen, Yuansi Chen) interested in doing pure mathematics?
Did they see a connection to their statistical work?

It does open new paths!
e.g. the KLS conjecture has fundamental consequences for MCMC and stochastic
optimization in statistical modeling and data science

4. We may have different ways to interpret the "M"

and thus we may also associate with it

Multi-faceted

Multi-faceted

in terms of:

- areas, fields, approaches, methods, algorithms, mathematical theories, applications
- people with diverse background and strengths

we **have to** take a broad view to develop this further:

- theory is not better than applications
- applications are not more relevant or impactful than theory
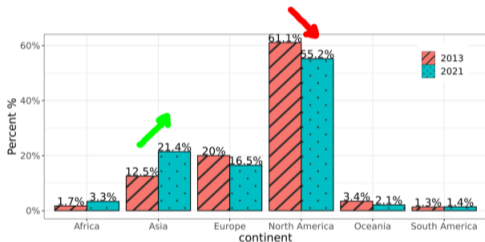- etc.

different facets of persons and of IMS members:
gender, personal background, scientific culture, scientific expertise, age group,
geographical location and origin, etc.

Assets and challenges to achieve a Multi-faceted IMS

1. Exceptionally well positioned to build further on global reach

IMS membership survey 2021:

IMS membership directory 2022:

Africa: 3%
Asia: 23%
Europe: 22%
North America: 48%
Oceania: 2%
South America: 2%

... and we have conferences all over the world

Multi-faceted should truly be global in 2023 and beyond

Can we give and receive from all 5 continents in the world? I very much wish so!

2. Long tradition and great expertise in mathematical foundations

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IMS Presidential Address 2014 by Bin Yu:
Let Us Own Data Science*
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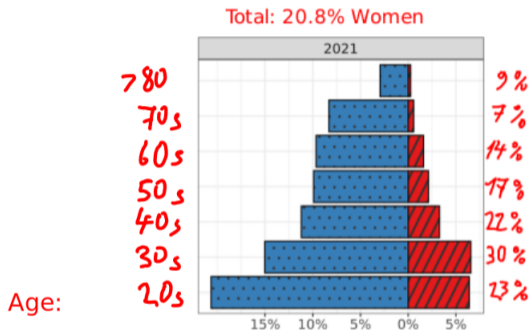of data science

⤳ Let Us Shape* the Foundations of Data Science
*"Shape" here does not exclude others

we are in an excellent position to do this – but we need to add this facet to
our thinking and to the IMS core portfolio of activities
(such as the new ICSDS, ACM/IMS Journal of Data Science, ...)

3. Demographics – one important aspect!

IMS membership survey 2021:

Total: 20.8% Women

Age	2021	
>80		9%
70s		7%
60s		14%
50s		17%
40s		22%
30s		30%
20s		23%

in 2023 and beyond: we must have more women in IMS

    Does a multi-facet culture help to achieve this goal? I very much think so!

Will you participate to make IMS more multi-faceted?

Come with us on the journey to shape IMS' future!

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IMS: truly **I**nternational, truly **M**ulti-faceted, truly **S**tatistics&Probability!

I count on your participation!

Behind the curtain of what IMS is standing for?

Elyse Gustafson

incredibly experienced, efficient, encouraging, supportive and kind!
and she likes working with everybody!

here with Regina Liu and Annie Qu who have initiated the
International Congress of Statistics and Data Science (ICSDS)

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Tati Howell

extremely skilled in communication on all levels, helpful, supportive and very kind!

Edsel Peña

very knowledgeable about IMS, always available, reliable, exact to the details and very kind!
Edsel is finishing his 6 years (2×3 years) term as IMS Executive Secretary.
Thank you for your long commitment and dedication for IMS!

Chris Burdzy

very knowledgeable and highly responsible about IMS, thinking logically,
exact to the details and giving constructive and honest advise!
Thank you for all your time and dedication for IMS as President-Elect, President
and Past President!

Michael Kosorok (President-Elect), Annie Qu (Program Secretary),
Jiashun Jin (Treasurer)

Patrick Kelly (IMS Production Editor), Laila Lunderman (Webmaster),
Geri and Krissi Mattson (Mattson Publishing),
Larissa Puryear (Dues and Subscriptions, LP Society Services)

and last but not least:

4'670 members!

a huge number of reviewers, associate and co-editors, committee members for many different tasks (meetings, awards, outreach, DEI, ...)

as IMS President I could see the real reality – that IMS crucially depends on the work from all these very many volunteers!

I am deeply impressed and grateful for all the excellent work you do for IMS!

Thank you!

You are warmly invited to the IMS reception!

new Fellows and Travel Award winners: take a group photo first

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