

I believe a better combinatorial and representation-theoretic understanding of the vertices should be possible. In particular, we have the following

Conjecture

For any partitions λ, μ, ν , the vertex is a polynomial in q .

Just one of many natural open questions

— INSIGHTS AS TO WHAT IS TRUE, OFTEN IN THE FORM OF A CONJECTURE

— HOLY GRAIL OF MATHEMATICS, THAT IS PROOF AND THE THEORIES AND TECHNIQUES THAT GO WITH THIS.

EXAMPLE:

THURSTON'S GEOMETRIZATION CONJECTURE. IT IS A UNIFYING AND COMPELLING STATEMENT BASED ON SPECIAL CASES AND TECHNIQUES... IT TYPIFIES WHAT WE RECOGNIZE AS A FUNDAMENTAL CONJECTURE THAT DRIVES A FIELD.

APPARENTLY IT IS DRIVEN INTERNALLY RATHER THAN BY APPLICATIONS

• THERE ARE SIMILAR CONJECTURES

TRUE, OFTEN IN THE FORM OF
A CONJECTURE

— HOLY GRAIL OF MATHEMATICS,
THAT IS PROOF AND THE THEORIES
AND TECHNIQUES THAT GO WITH THIS.

EXAMPLE:

THURSTON'S GEOMETRIZATION
CONJECTURE. IT IS A UNIFYING AND
COMPELLING STATEMENT BASED ON
SPECIAL CASES AND TECHNIQUES...
IT TYPIFIES WHAT WE RECOGNIZE AS
A FUNDAMENTAL CONJECTURE THAT
DRIVES A FIELD.

APPARENTLY IT IS DRIVEN
INTERNALLY RATHER THAN BY APPLICATIONS

- THERE ARE SIMILAR CONJECTURES
DRIVING OTHER FIELDS.

IED
PART.

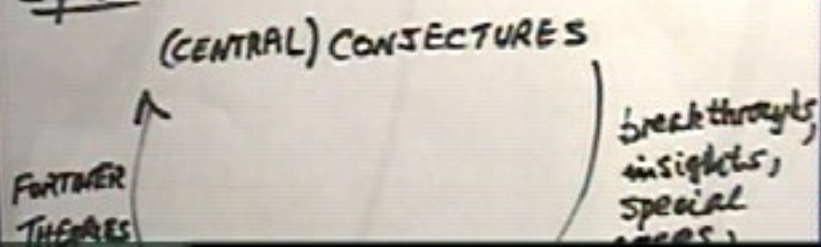
PROBLEM
IS NOT
IS PART OF
OF MATH

ION IS
BE
F US THINK
IT WHEN

—PROOF. IT IS PROOF THAT
DEFINES OUR SUBJECT. COULD ONE
CALL A MATHEMATICAL INVESTIGATION
IN WHICH PROOF IS OF NO INTEREST,
MATHEMATICS?

PERELMAN'S PROOF OF THURSTON'S
CONJECTURES IS AS GOOD AS IT GETS.
THIS IS A SINGULAR ACHIEVEMENT
(THOUGH NOT UNIQUE!) AND SHOWS THAT
MATHEMATICS IS THRIVING.

CYCLE:



IED
PART.

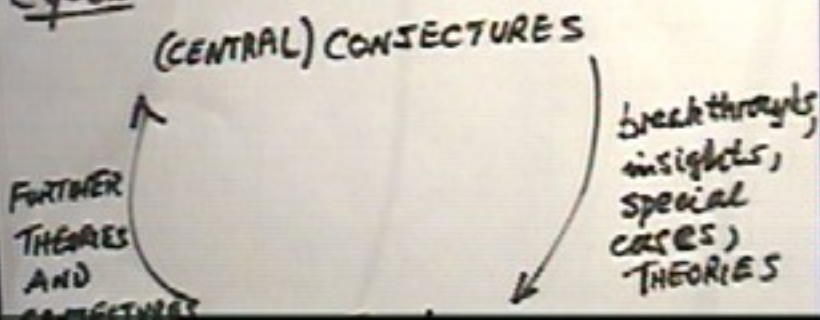
PROBLEM
IS NOT
IS PART OF
OF MATH

ION IS
BE
F US THINK
IT WHEN

DEFINES OUR SUBJECT. COULD
CALL A MATHEMATICAL INVESTIGATION
IN WHICH PROOF IS OF NO INTEREST,
MATHEMATICS?

PERELMAN'S PROOF OF THURSTON'S
CONJECTURES IS AS GOOD AS IT GETS.
THIS IS A SINGULAR ACHIEVEMENT
(THOUGH NOT UNIQUE!) AND SHOWS THAT
MATHEMATICS IS THRIVING.

CYCLE:



(4)
- IT MIGHT APPEAR THAT MATH IS DRIVEN PURELY INTERNALLY AND THAT ~~IT~~ CAN THRIVE WITHOUT CONNECTIONS TO OTHER FIELDS.

SURELY SUCH A SCENARIO IS A RECIPE FOR A STERILE SUBJECT.

I BELIEVE THAT PURE MATHEMATICS CONTINUOUSLY INCORPORATES

INPUT FROM OTHER DISCIPLINES AND FROM APPLICATIONS. THESE INFLUENCES ARE OFTEN INDIRECT AND SUBTLE AND ARE EASILY OVERLOOKED. FOR EXAMPLE PERELMAN'S WORK IS HEAVILY BASED ON HAMILTON'S RICCI FLOW WHICH IN TURN IS BASED ON

IS DRIVEN PURELY INTERNALLY AND
THAT ~~IT~~ CAN THRIVE WITHOUT
CONNECTIONS TO OTHER FIELDS.

SURELY SUCH A SCENARIO IS A
RECIPE FOR A STERILE SUBJECT.

I BELIEVE THAT PURE
MATHEMATICS CONTINUOUSLY INCORPORATES
INPUT FROM OTHER DISCIPLINES AND
FROM APPLICATIONS. THESE INFLUENCES
ARE OFTEN INDIRECT AND SUBTLE AND
ARE EASILY OVERLOOKED. FOR EXAMPLE
PERELMAN'S WORK IS HEAVILY BASED
ON HAMILTON'S RICCI FLOW WHICH
IN TURN IS VERY CLOSELY CONNECTED
TO A RIEMANNIAN VERSION OF
EINSTEIN'S G.E.H. JUST THE SAME

THAT ~~IT~~ CAN THRIVE WITHOUT
CONNECTIONS TO OTHER FIELDS.

SURELY SUCH A SCENARIO IS A
RECIPE FOR A STERILE SUBJECT.

I BELIEVE THAT PURE
MATHEMATICS CONTINUOUSLY INCORPORATES

INPUT FROM OTHER DISCIPLINES AND
FROM APPLICATIONS. THESE INFLUENCES
ARE OFTEN INDIRECT AND SUBTLE AND
ARE EASILY OVERLOOKED. FOR EXAMPLE
PERELMAN'S WORK IS HEAVILY BASED
ON HAMILTON'S RICCI FLOW WHICH
IN TURN IS VERY CLOSELY CONNECTED
TO A RIEMANNIAN VERSION OF
EINSTEIN'S EQNS. JUST THIS GIVES ONE
(AND GAVE HAMILTON) CONFIDENCE ABOUT

THAT WE CAN THRIVE WITHOUT
CONNECTIONS TO OTHER FIELDS.

SURELY SUCH A SCENARIO IS A
RECIPE FOR A STERILE SUBJECT.

I BELIEVE THAT PURE
MATHEMATICS CONTINUOUSLY INCORPORATES
INPUT FROM OTHER DISCIPLINES AND
FROM APPLICATIONS. THESE INFLUENCES
ARE OFTEN INDIRECT AND SUBTLE AND
ARE EASILY OVERLOOKED. FOR EXAMPLE
PERELMAN'S WORK IS HEAVILY BASED
ON HAMILTON'S RICCI FLOW WHICH
IN TURN IS VERY CLOSELY CONNECTED
TO A RIEMANNIAN VERSION OF
EINSTEIN'S EQNS. JUST THIS GIVES ONE
(AND GAVE HAMILTON) CONFIDENCE ABOUT NATURALITY

• MY POINT IS THAT PURE MATHEMATICS IS VERY RELIANT FOR ITS DEVELOPMENT ON ITS APPLICATIONS IN SCIENCE (THE CONVERSE IS ALSO TRUE OF COURSE).

(small)

GOOD APPLIED MATHEMATICS

BY ITS VERY NATURE, APPLIED MATHEMATICS LIES BETWEEN DISCIPLINES AND ONE FINDS DIFFERING VIEWS AS TO QUALITY AND IMPORTANCE.

• P. HALMOS (SEE HIS COLLECTED WORKS)

BLEM
TS. NOT
NT
IS THAT
OF
H

breakthroughs,
insights,
special
cases,
THEORIES

MY POINT IS THAT PURE
MATHEMATICS IS VERY RELIANT
FOR ITS DEVELOPMENT ON ITS
APPLICATIONS IN SCIENCE (THE
CONVERSE IS ALSO TRUE OF COURSE).

(small)

GOOD APPLIED MATHEMATICS

BY ITS VERY NATURE,
APPLIED MATHEMATICS LIES BETWEEN
DISCIPLINES AND ONE FINDS DIFFERING
VIEWS AS TO QUALITY AND IMPORTANCE.

• P. HALMOS (SEE HIS COLLECTED WORKS)

"APPLIED MATHEMATICS IS BAD
MATHEMATICS"

breakthroughs,
insights,
special
cases,
THEORIES

Second world of mathematics

outside academia,
in industry

→ Mathematics as
a technology

Is it pure or applied?

MATHEMATICS IS VERY RELIANT
FOR ITS DEVELOPMENT ON ITS
APPLICATIONS IN SCIENCE (THE
CONVERSE IS ALSO TRUE OF COURSE).

(small)

GOOD APPLIED MATHEMATICS

BY ITS VERY NATURE,
APPLIED MATHEMATICS LIES BETWEEN
DISCIPLINES AND ONE FINDS DIFFERING
VIEWS AS TO QUALITY AND IMPORTANCE.

• P. HALMOS (SEE HIS COLLECTED WORKS)

"APPLIED MATHEMATICS IS BAD
MATHEMATICS"

breakthroughs,
insights,
special
cases,
THEORIES

ON SOME BASIC ISSUES

- ONE BEING THAT HE ASSERTS THAT MATHEMATICS CAN EXIST WITHOUT APPLICATIONS TO OTHER FIELDS — (and not vice versa)
- I DON'T AGREE.

WEINAN E'S RESPONSE TO WHAT IS GOOD APPLIED MATH:

- 1). IT HAS TO BE RELEVANT TO APPLICATION AREAS, WHETHER THE APPLICATION AREA IS IN SCIENCE, ENGINEERING TECHNOLOGY OR INDUSTRY.

relevant application with a
solid scientific foundation. This
typically requires laying out the
mathematical foundation.

"Personally I am very worried
that math and applied math
are gradually drifting apart.
This is particularly a worry in
the areas I am working in"

Common ground:

In both pure and applied
math a key common goal is
that of understanding mathematics

relevant 71
solid scientific foundation. This
typically requires laying out the
mathematical foundation.

"Personally I am very worried
that math and applied math
are gradually drifting apart.
This is particularly a worry in
the areas I am working in"

Common ground:

In both pure and applied
math a key common goal is
that of understanding mathematical
structure

pure math is proof as compared with insight and explanation in applied math.

It is not clear to me that proof is valued (or if indeed this has been so in the past) that it will continue to be so in the future) in applications.

In an ideal world a key new insight might lead to constructing a proof and conversely a proof might lead to new insights for mathematical phenomena.

pure math is proof as compared with insight and explanation in applied math.

It is not clear to me that proof is valued (or if indeed this has been so in the past) that it will continue to be so in the future) in applications.

In an ideal world a key new insight might lead to constructing a proof and conversely a proof might lead to new insights for mathematical phenomena.

putting the
area on a
relation. This
out the
time.

worried
math
apart.
worry in
ing in"

applied
goal is

and its applications. However
This is changing. Many applications
today especially with computers
being an integral part of the activity
are to very complex problems. For
many sciences proof is not of
central importance. If an
algorithm works in practice is
this not good enough?

While the goals and requirements
of pure and applied math are
diverging, I think evolution will
take care of things. Still I
worry that young scientists
like E are worried.

Project W-foundation in 1999

What are the graduates in Math in
Germany intending to do?

Did their dreams come true until
today?

3000 graduates, of which
1600 did a diploma or master
(rest high school teacher)
600 returned questionnaires

Project W-foundation in 1999

What are the graduates in Math in
Germany intending to do?

Did their dreams come true until
today?

3000 graduates, of which
1600 did a diploma or master
(rest high school teacher)
600 returned questionnaires

Only 10% work in academia
but 80% work as
software designers, in R&D, in
banks and insurances, in consulting

Do they do Math?

Yes, but one third of them
or 25% of all graduates
Mathematics is the midwife, not

In the second world,
as many people do
mathematics as in
the first world

— but mainly applied math.

They cannot drift apart from
pure math, since there is very little
between the 2 worlds

This is bad:

- For the second world, since it would urgently need good universities, which deals with their problems
- For the first world, since 'Math as a Technology' offers a great number of challenges, add public prestige, money and attracts students

**Both worlds need
each other!**

- YES, PURE AND APPLIED MATH ARE DRIFTING APART.

- IN MY VIEW THIS IS A PROBLEM BUT PROBABLY ONE THAT IS NOT SO SERIOUS SINCE THIS IS PART OF A NATURAL EVOLUTION OF MATH AND ITS APPLICATIONS.

GOOD (PURE) MATH:

A FORMAL DEFINITION IS PROBLEMATIC AND WOULD BE CONTROVERSIAL — MOST OF US THINK THAT WE CAN RECOGNISE IT WHEN WE SEE IT.

700, THE MATHS ARE DRIFTING APART.

• IN MY VIEW THIS IS A PROBLEM BUT PROBABLY ONE THAT IS NOT SO SERIOUS SINCE THIS IS PART OF A NATURAL EVOLUTION OF MATH AND ITS APPLICATIONS.

GOOD (PURE) MATH:

A FORMAL DEFINITION IS PROBLEMATIC AND WOULD BE CONTROVERSIAL — MOST OF US THINK THAT WE CAN RECOGNISE IT WHEN WE SEE IT.