

Best regards  
Chern

## Hassler Whitney

March 23, 1907 – May 10, 1989

Hassler Whitney was born in New York City to a family with a tradition of contributions to world knowledge. His father was a state supreme court judge; his mother was an artist, who was also active in politics. A grandfather, William D. Whitney, was a linguist and sanskrit scholar and another grandfather, Simon Newcomb, was an astronomer. A great grandfather surveyed the Atlantic coastline for Thomas Jefferson and a great uncle was the first to survey Mount Whitney.

Whitney attended Yale University and received a baccalaureate degree in physics in 1928 and in music in 1929. He earned a Ph.D. in mathematics at Harvard University in 1932. From 1932 to 1952 he taught at Harvard. He moved to the Institute for Advanced Study in 1952, where he retired in 1977.

Whitney was a topologist of great originality. His contributions were broad and could be roughly divided into the following areas:

1) **Differential topology.** Nineteenth century mathematics was mainly mathematical analysis. At the turn of the century the importance of topology began to be recognized. It proceeded in two directions: (1) point-set topology, where the spaces are very general; (2) combinatorial topology, where the spaces are locally polyhedral. Differentiation does not seem to play a role. In fact, there was, as there is now, a sentiment against the calculus. A common interesting saying was: "Whenever I see a derivative it gives me nausea."<sup>1</sup> In such an atmosphere Whitney created differential topology which became a most active mathematical area in recent times.

2) **Cup products.** A fundamental problem in combinatorial topology is to define topological invariants of manifolds. The most elementary among these are the Betti numbers, based on the boundary relation. It was Emmy Noether who observed that these can be built into an algebraic structure: the homology groups of all dimensions. A much deeper concept is the introduction of a multiplication based on intersection theory.

It is remarkable that the dual of the homology groups, the cohomology groups, has most beautiful properties. Using the cup product introduced by

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<sup>1</sup>Edgar R. Lorch, "Mathematics at Columbia during adolescence", *A Century of Mathematics in America*, vol. III, page 153, American Mathematical Society, 1989. I also heard similar statements from other sources.

Whitney, the direct sum of the cohomology groups has a ring structure and becomes the cohomology ring. This can be defined for spaces more general than manifolds. If there is a continuous mapping  $f : X \rightarrow Y$ , it induces a ring homomorphism  $f^* : H^*(Y) \rightarrow H^*(X)$ , where  $H^*(X)$  and  $H^*(Y)$  are the cohomology rings of the spaces  $X$  and  $Y$  respectively.

Cohomology groups are useful in the applications of topology. They are closely related to multiple integration. Whitney wrote a book on integration which is full of original geometrical ideas but unappreciated by the analysts.

From Betti numbers to the cohomology ring was a great development in topology. Whitney's cup products made a crucial contribution.

3) **Sphere bundles.** This is perhaps the contribution for which Whitney is best known, even the name originating from him. It is a remarkable fact that a family of spheres which is locally a topological product may not be a global product. The first invariants of such a phenomenon are the so-called Stiefel-Whitney characteristic classes. They were discovered almost simultaneously by Whitney and E. Stiefel, the latter in his thesis written under the supervision of Heinz Hopf. Stiefel restricted himself to the tangent bundle of a manifold and drew beautiful conclusions, including the theorem that a closed orientable 3-dimensional manifold is parallelizable. Whitney saw the merit of the general notion of a sphere bundle over any space. In particular, this leads to algebraic operations on bundles. The description of the characteristic classes of the sum of two sphere bundles is the important Whitney duality theorem. Whitney's original proof covers the general case of local coefficients. It was very long and was never published. (I can still remember when he showed me the proof on a snowy Sunday when I visited his home near Watertown; it was like a book. The first proof, for an important special case, was given by Wu Wen-Tsun; cf. *Annals of Mathematics*, vol. 49 (1948), 641-653.)

Fiber bundles have since become a fundamental notion in topology.

4) **Stratified manifolds and singularities.** Whitney realized that the notion of a smooth manifold is not broad enough. For example, a cube is not a smooth manifold and algebraic varieties generally allow singularities. He introduced the notion of a stratification of a manifold. Personally it is my feeling that stratified manifolds will be the main object in differential geometry. They already play an important role in McPherson's theory of preverse sheaves.

5) **Miscellaneous.** Whitney liked mathematical problems and was able to come up with ingenious solutions. An example was his characterization of the closed 2-cell. I think it is not unfair to say that he has worked on the four-color problem. He realized its difficulty. He was happy with the computer proof by W. Haken and K. Appel.

Another result is the Graustein-Whitney theorem on the regular homotopy of closed curves in the plane, an elementary result leading to much development.

In his last years he devoted much time to the mathematical education of children, arousing their interest by asking challenging questions.

As mentioned in the beginning he had a degree in music. He was an accomplished violin and viola player.

Whitney received the National Medal of Science in 1976, the Wolf Prize in 1982, and the Steele Prize of the American Mathematical Society in 1985.

In an article<sup>2</sup> on the occasion of the Centennial of the American Mathematical Society Whitney gave a report on the Topology Conference in 1935 in Moscow. The article is both personal and mathematical and is full of interesting facts and anecdotes. Being an avid mountaineer himself, it recounted how he met J. Alexander and G. de Rham in the Swiss mountains. He was a member of the Geneva section of the Swiss Alpine Club. On August 20, 1989, his ashes were placed at the summit of the Swiss mountain Dent Blanche by Oscar Burlet, a mathematician and a member of the Swiss Alpine Club.

Shiing-Shen Chern  
Department of Mathematics  
University of California  
Berkeley, California 94720

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<sup>2</sup>Hassler Whitney, Moscow 1935, "Topology moving toward America," *A Century of Mathematics in America*, vol. I, pages 97-117. There was an error on page 117: the simple proof of the duality theorem was given by Wu Wen-Tsun, cf. text.



A PRIVATE COMMUNICATION

# Letter to Members

NATIONAL ACADEMY OF SCIENCES

VOLUME 23 • NUMBER 1

FEBRUARY 1993

## Of General Interest

### REPORT ON CONGRESS

*The Academy's charter summons it, "whenever called upon," to respond to requests from "any department of the Government [to] investigate, examine, experiment, and report upon any subject of science or art ...."*

The National Academy of Sciences and its affiliate organizations are familiar institutions to the members of Congress. During the 102nd Congress, the NAS, NAE, IOM, or NRC were mentioned in approximately 200 bills. At adjournment in October 1992, Congress had enacted 25 laws that defined various roles for the Academy complex, including about 40 separate studies. Among them are the following:

**Alcohol, Drug Abuse, and Mental Health Administration Reorganization Act** — four studies: anti-addiction medications; fetal alcohol effect; evaluation of

#### *Regional Meetings 1993*

|                   |                                  |
|-------------------|----------------------------------|
| February 5 .....  | Irvine, California               |
| February 16 ..... | Tallahassee, Florida             |
|                   | (Joint meeting with IOM members) |
| February 22 ..... | San Francisco, California        |
|                   | (Joint meeting with IOM members) |
| March 4 .....     | Cambridge, Massachusetts         |
| March 5 .....     | New York, New York               |

Anthropological Study of Play (president, 1979-80), Northeastern Anthropological Association (president 1974-75), Society for Cross-Cultural Research (president, 1965-67), American Ethnological Society (president, 1960), Linguistic Society of America, and the Royal Anthropological Institute.

Roberts' wrote numerous scholarly papers for a wide range of sociological publications and for other specialized journals such as the *Annals of Tourism Research*, *Traffic Engineering*, *Leisure Sciences*, and *Naval War College Review*.

University of Pittsburgh President Wesley Posvar said, "John Roberts served this university and its students with consistent brilliance and enthusiasm. As a teacher and scientist he displayed an extraordinary intellectual curiosity both in scope and depth. Through his magnificent work as a cross-cultural anthropologist he illuminated the common bonds that link diverse human societies."

He will be greatly missed.

We resolve in the minutes of this meeting that we were fortunate to have known John Milton Roberts and to have counted him a member of our Academy fellowship for eight years. We further resolve that a copy of this resolution be presented to his wife, Marilyn Roberts, as a symbol of our sympathy and very great regard.

#### HASSLER WHITNEY

The Council of the National Academy of Sciences, meeting on June 19, 1992, expressed the sorrow of the membership at the death of Hassler Whitney on May 10, 1989, at the age of 82.

Hassler Whitney was a leading world figure in mathematics and made important contributions to geometry and the teaching of mathematics. The influence of his ideas on differential topology, graph theory, manifolds, integration theory, and analytic varieties was pervasive and profound.

Called "a prophet on educational issues" by Princeton colleague and fellow NAS member William Thurston, Whitney spent the last 20 years of his life working to improve the teaching of mathematics. He was deeply concerned that what he termed "math anxiety" was causing children to shy away from mathematics or merely to memorize solutions to particular problems rather than learning to think them through creatively. He thought the system of testing also was at fault with teachers under pressure to raise scores on narrowly defined and misconceived tests. He worked extensively on teacher training and on writing guides for teachers.

Born in New York City on March 23, 1907, Whitney came into a family with a tradition of contributions to world knowledge. His father was a state supreme court judge; his mother was an artist, who was also active in politics. Two grandfathers were members of the National Academy of Sciences: William D. Whitney, a linguist and Sanskrit scholar, and Simon Newcomb, an astronomer. A great grandfather surveyed the Atlantic coastline for Thomas Jefferson and a great uncle was the first to survey Mount Whitney.

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Whitney attended Yale University and received a baccalaureate degree in physics in 1928 and in music in 1929. He earned a Ph.D. in mathematics at Harvard University in 1932, while serving as an instructor in mathematics there and as a National Research Council fellow and lecturer at Princeton University. Yale awarded him an Sc.D. in 1947.

From 1933 to 1952, he taught at Harvard, first as instructor and later as a full professor. His association with the Institute for Advanced Study at Princeton began as a professor in 1952 and continued until he retired in 1977. At times

during this period he was a member of mathematics panels of the National Defense Research Committee and the National Science Foundation and served as president of the International Commission on Mathematics Education.

He received the National Medal of Science in 1976 for founding the discipline of differential topology; the Wolf Prize (for mathematics) from the Wolf Foundation in 1982; and the Steele Prize from the American Mathematical Society in 1985.

Whitney was elected to membership in the National Academy of Sciences in 1945 at the age of 38 and served on its Committee on Support of Research in Mathematical Sciences in the mid-1960s. He was also a member of the American Mathematical Society (vice president, 1948-50), the National Council of Teachers of Mathematics, the American Philosophical Society, and the Swiss Mathematical Society.

He wrote more than 75 mathematical papers and was editor of *American Journal of Mathematics* and *Mathematical Reviews*. His two graduate-level texts, *Geometric Integration Theory* (1957) and *Complex Analytic Varieties* (1972), were major contributions to mathematics.

Music and mountain-climbing were his pastimes. He was an accomplished violin and viola player. As a member of the Swiss Alpine Society, he climbed most of the peaks in Switzerland. Whether music, mathematics, or mountaineering, Hassler Whitney pursued his enjoyments with passion. He was active until the end, running several miles every other day.

He will be greatly missed.

We resolve in the minutes of this meeting that we were fortunate to have known Hassler Whitney and to have counted him a member of our Academy fellowship for 44 years. We further resolve that a copy of this resolution be presented to his wife, Barbara Whitney, as a symbol of our sympathy and very great regard.

THE INSTITUTE FOR ADVANCED STUDY  
PRINCETON, NEW JERSEY 08540

OFFICE OF THE DIRECTOR

HASSLER WHITNEY

Hassler Whitney was born in New York in 1907. He attended Yale University, receiving a Ph.B. in 1928 and a Mus.B. in 1929. In 1932 he completed the doctoral program in mathematics at Harvard.

He was an Instructor in Mathematics at Harvard in 1930-31. The following year he was a National Research Council Fellow at Princeton. He then spent two full decades at Harvard, advancing to Professor in 1946.

In 1952 he was appointed Professor at the Institute for Advanced Study.

Even after he became a Professor Emeritus in 1977 he continued to be recognized publicly for his work. In November 1977 he was awarded the National Medal of Science. In 1981 he was elected a Foreign Associate of the French Academy of Sciences.

In 1983 he received the Wolf Foundation Prize for Mathematics in a ceremony at the Knesset of the State of Israel in Jerusalem.

May 1, 1989

Sources: IAS files

## HASSLER WHITNEY

Professor Whitney was born in New York, N. Y. in 1907. He attended Yale University and received a Ph. B. in 1928 and a Mus. B. in 1929. In 1932 he received the Ph. D. at Harvard, and in 1947 an honorary Sc. D. from Yale.

He was an Instructor in Mathematics at Harvard in 1930-31. In 1931-32 he was a National Research Council Fellow at Princeton. From 1932 to 1952 he was at Harvard, serving as a National Research Council Fellow and Lecturer in 1932-33, Instructor 1933-35, Assistant Professor 1935-40, Associate Professor 1940-46 and as Professor in 1946-52. Since that time he has been a Professor at the Institute for Advanced Study.

Professor Whitney was a member of the Mathematics Panel of the National Defense Research Committee from 1943 to 1945. He is a member of the National Academy of Science, of the American Mathematical Society (in which he was vice-president from 1948-50), and of the American Philosophical Society. He has also served on the editorial boards of several mathematical journals.

Professor Whitney became a Professor Emeritus at the Institute in June of 1977. On November 22, 1977 he was awarded the National Medal of Science for founding the field of differential topology.

## THE INSTITUTE FOR ADVANCED STUDY

FOR RELEASE: September 19, 1985

FOR ADDITIONAL INFORMATION:

Dr. Harry Woolf, Director

(609) 734-8200

Princeton, New Jersey -- Hassler Whitney, Professor Emeritus of the Institute for Advanced Study, has been awarded the "1985 Steele Prize for cumulative influence" by the American Mathematical Society for his fundamental work on geometric problems. The Society noted in their citation that "Whitney combined unusual but fruitful viewpoints with great technical prowess in his research. The ideas and methods he pioneered in the general theory of manifolds, in the study of differentiable functions on closed sets, in geometric integration theory, in the geometry of the tangents to a singular analytic space, and elsewhere, have become a part of the very fabric of these subjects and have had a profound influence on later work in these areas." Professor Whitney noted that his sojourn at the Institute for Advanced Study has been a major factor in the latter part of this work.

Born in New York City in 1907, Professor Whitney attended Yale University where he received a Ph.B. degree in 1928 and a Mus.B. in 1929. In 1932 he received a Ph.D. at Harvard, and in 1947 an honorary Sc.D. from Yale. He was an Instructor in Mathematics at Harvard in 1930-31, and in 1931-32 a National Research Council Fellow at Princeton. From 1932 to 1952 he was at Harvard, where he held positions of National Research Council Fellow, Lecturer, Instructor, Assistant and Associate Professor, until becoming Full Professor in 1946. Since 1952 he has been a Professor in the School of Mathematics at the Institute for Advanced Study, and Professor Emeritus since his retirement in 1977.

In 1977, Professor Whitney was awarded the National Medal of Science for founding the field of differential topology, and in 1982 he received the distinguished Wolf Foundation prize for mathematics. Among his other honors and distinctions, Professor Whitney is a member of the National Academy of Sciences, the American Mathematical Society (in which he served as vice-president in 1948-50), and a member of the American Philosophical Society. He also holds honorary memberships in a number of foreign societies and has served on the editorial boards of several mathematical journals.

From its earliest years, when the Faculty included Albert Einstein, Oswald Veblen, Marston Morse, John von Neumann, and Hermann Weyl, the Institute's School of Mathematics has been internationally recognized as one of the world's major centers of research in pure mathematics.

Founded in 1930, the Institute for Advanced Study is a completely independent research institution, consisting of the Schools of Mathematics, Historical Studies, Natural Sciences, and Social Science. Each School has a small permanent faculty, and some 150 fellowships are awarded each year to visiting members from other universities and research institutions throughout the world.

## THE INSTITUTE FOR ADVANCED STUDY

FOR RELEASE: Tuesday, February 8, 1983

FOR ADDITIONAL INFORMATION:

Harry Woolf, Director  
(609) 734-8200

Princeton, New Jersey -- Hassler Whitney of the Institute for Advanced Study has been awarded the 1982 Wolf Foundation prize for mathematics, for his "outstanding contributions in this field to the benefit of mankind". He shares the \$100,000 prize with Professor Krein of the USSR and will receive the award at a ceremony at the Knesset of the State of Israel, in Jerusalem, in May 1983.

The Wolf Foundation prizes were established in 1975 by the late Ricardo Wolf, a noted chemist, inventor, diplomat, and philanthropist, and his family. Five awards are made in scientific fields and one in arts (music).

Professor Whitney received the prize with the following citation: "His innovative ideas have been the seed from which contemporary work in combinatorics, topology and differential geometry have grown to maturity. Matroids, differentiable manifolds, fiber bundles, characteristic classes, classifying spaces, stratifications, rational homotopy are only some of the concepts that trace their parentage to Whitney. His work inaugurates the style of geometric and combinatorial reasoning that has become the standard for the second half of the Twentieth Century."

Professor Whitney was born in New York City in 1907. He attend Yale University and received a Ph.B. in 1928 and a Mus.B. in 1929. In 1932 he received the Ph.D. at Harvard, and in 1947 an honorary Sc.D. from Yale. He was an Instructor in Mathematics at Harvard in 1930-31. In 1931-32 he was a National Research Council Fellow at Princeton. From 1932 to 1952 he was at Harvard, serving as a National Research Council Fellow and Lecturer in 1932-33, Instructor 1933-35, Assistant Professor 1935-40, Associate Professor 1940-46 and as Professor in 1946-52. Since that time he has been a Professor at the Institute for Advanced Study.

Professor Whitney was a member of the Mathematics Panel of the National Defense Research Committee from 1943 to 1945. He is a member of the National Academy of Sciences, of the American Mathematical Society (in which he was vice-president from 1948-50), and of the American Philosophical Society. He has also served on the editorial boards of several mathematical journals.

Professor Whitney became a Professor Emeritus at the Institute in June of 1977. On November 22, 1977 he was awarded the National Medal of Science for founding the field of differential topology, and in 1981 was elected a Foreign Associate of the French Academy of Sciences.

- 2 -

Founded in 1930, the Institute for Advanced Study is a completely independent research institution, consisting of the Schools of Mathematics, Historical Studies, Natural Sciences, and Social Science. Each School has a small permanent faculty, and some 180 fellowships are awarded each year to visiting members from other universities and research institutions. In 1981-82, visiting members came from 21 countries and returned to more than 100 colleges and universities throughout the world.

From its earliest years, when the Faculty included Albert Einstein, Oswald Veblen, Marston Morse, John von Neumann, and Hermann Weyl, the Institute's School of Mathematics has been internationally recognized as one of the world's major centers of research in pure mathematics. A previous winner of the Wolf prize in the Institute's School of Mathematics was Andre Weil in 1979. Freeman J. Dyson, a professor in the Institute's School of Natural Sciences, received the award in 1981.

January 25, 1982

Professor Hassler Whitney  
School of Mathematics  
Institute for Advanced Study

Dear Halls:

Just a short note to tell you how pleased  
I was to learn that you had been elected a  
Foreign Associate of the French Academy of  
Sciences.

Our warmest congratulations to you.

Sincerely yours,

Harry Woolf

*as of Jan 1981*

*listed in 1980-81  
A R*

THE INSTITUTE FOR ADVANCED STUDY

HARRY WOOLF  
Director

29 May 1983

Dear Hass,

Your letter and check arrived during a brief interval I have in the office between trips, but rather than wait until a later date, when I return, in order to acknowledge your gift, I'm writing immediately. Thank you so very much indeed for your generosity and thoughtfulness. The money shall be divided into the thousands as you request, and help us enormously to further guarantee the life of the Institute for men like you who have yet to come.

Cordially and gratefully yours  
Harry

*cc. Allen Rowe  
P. H. Johnson*

THE INSTITUTE FOR ADVANCED STUDY

PRINCETON, NEW JERSEY 08540

Telephone 609-734-8000

May 27, 1983

SCHOOL OF MATHEMATICS

Harry Woolf, Director  
Institute for Advanced Study  
Princeton, NJ

Dear Harry:

Enclosed please find a check for \$3000, as a gift to the Institute, which I would like divided equally between the Einstein Fund, the Oppenheimer Fund, and the Morse Fund.

With my best regards and best wishes for the future of the Institute,

*Hassler Whitney*  
Hassler Whitney

*check to B.O. (\$3000)  
27 May 1983*

HASSLER WHITNEY

May 27, 1983

NUMBER

415

955-303  
312

PAY TO THE  
ORDER OF

Institute for Advanced Study  
Three Thousands

\$3000.00

DOLLARS

**PRINCETON BANK**

PRINCETON BANK AND TRUST COMPANY  
Princeton, NJ 08540

MEMO

IAS, gift

Hassler Whitney

⑆031203038⑆

⑆320933908⑆

DELUXE CHECK PRINTERS CO.

February 9, 1983

Dr. Yaron Gruder  
Director General  
Wolf Foundation  
p.o.b. 398  
Herzlia bet 46103  
Israel

Dear Dr. Gruder:

Thank you very much for the courtesy of your letter of 30 January 1983, informing us that our colleague Hassler Whitney shared the 1982 Wolf Prize in Mathematics. We are again honored by your selection of a member of the Institute for Advanced Study for so distinguished an award.

Good luck to you and yours in all your endeavors.

Sincerely yours,

Harry Woolf



## Wolf Foundation · קרן וולף

to promote science and art for the benefit of mankind · לקידום המדע והאמנות לטובת האנושות

### THE "WOLF FOUNDATION" PRIZE IN MATHEMATICS FOR 1982

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The Prize Committee for Mathematics has unanimously chosen the following two Wolf Prize winners to equally share the 1982 award:

Prof. Hassler WHITNEY  
Institute for Advanced Study  
Princeton, New Jersey, U.S.A.

for his fundamental work in algebraic topology, differential geometry and differential topology;

and

Prof. Mark Grigor'evich KREIN  
Institute of Physical Chemistry of the  
Ukrainian S.S.R. Academy of Sciences  
Odessa, U.S.S.R.

for his fundamental contributions to functional analysis and its applications.

HASSLER WHITNEY (born 1907 - U.S.A.) His innovative ideas have been the seed from which contemporary work in combinatorics, topology and differential geometry have grown to maturity. Matroids, differentiable manifolds, fiber bundles, characteristic classes, classifying spaces, stratifications, rational homotopy are only some of the concepts that trace their parentage to Whitney. His work inaugurates the style of geometric and combinatorial reasoning that has become the standard for the second half of the Twentieth Century.

MARK GRIGOR'EVICH KREIN (born 1907 - U.S.S.R.) His work is the culmination of the noble line of research began by Chebyshev, Stieltjes, S. Bernstein and Markov and continued by F. Riesz, Banach and Szegő. Krein brought the full force of mathematical analysis to bear on problems of function theory, operator theory, probability and mathematical physics. His contributions led to important developments in the applications of mathematics to different fields ranging from theoretical mechanics to electrical engineering. His style in mathematics and his personal leadership and integrity have set standards of excellence.

January 1983

# news

חדשות  
ברטון חאלפרן  
יוזם ציבור

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6 MEGIDDO STREET • TEL-AVIV 64387 • Tel 245 095 / 236 675

FOR IMMEDIATE RELEASE  
28 January 1983

## AMERICAN AND RUSSIAN MATHEMATICIANS SHARE 1982 WOLF FOUNDATION PRIZE

HERZLIYA, Israel - The 1982 Wolf Foundation Prize in Mathematics will be presented to an American and a Russian, both noted innovators for half a century in advancing mathematical analysis. Professor Hassler Whitney of the Institute for Advanced Study of Princeton, N.J., and Professor Mark Grigor'evich Krein of the Institute of Physical Chemistry of the Ukrainian S.S.R. Academy of Sciences, Odessa were chosen to share the \$100,000 international award, it was announced here this week.

Professor Whitney was honored for his work in algebraic and differential topology and differential geometry, and Professor Krein, for his "fundamental contributions to functional analysis and its applications."

Professor Krein is the third Russian scientist to be honored by the Israel-based Wolf Foundation. Two other mathematicians, both of Moscow State University, were co-prize winners; Professors I. M. Gelfand and Andre N. Kolmogorov, who shared the 1978 and 1980 Wolf Prizes in Mathematics respectively.

While these two Soviet scientists were given permission by the authorities to accept the Wolf Prize, neither was allowed to personally receive the award at ceremonies in Jerusalem. The Wolf Foundation, through the Israel Foreign Ministry, is currently making efforts to enable them to be presented the awards at a foreign embassy representing Israel in Moscow.

Professor Whitney's work is said to have "inaugurated the style of geometric and combinatorial reasoning that has become the standard for the second half of the 20th century", while Professor Krein's contributions have led to important developments in the application of mathematics in different fields, ranging from theoretical mechanics to electric engineering. Both mathematical giants were born in 1907.

- 2 -

Said to be second in value to the Nobel Prize, the Wolf Prize consists of \$100,000 awarded for internationally - recognized achievements in each of six categories; Physics, Agriculture, Chemistry, Mathematics, Medicine and Arts (Music). The Fund was established in Israel in 1975 "to promote science and art for the benefit of mankind" by the late Dr. Ricardo Wolf, a noted chemist, inventor, diplomat and philanthropist.

Prizes will be awarded personally to the recipients by President Itzhak Navon in May 1983 at the Israeli Knesset (Parliament) in Jerusalem. Since 1978, 42 winners from 11 countries have been awarded the Wolf Prize, and four of these later received the Nobel Prizes, in Medicine and Physics.

The Israel Minister of Education & Culture is chairman of the board of the Wolf Foundation which was established by a special law of the Knesset in 1975. The international jury to select winners in each award category is comprised of three experts, one from Israel.

The Foundation's annual budget of one million dollars derives from income from an endowment of \$10 million by the Wolf family. In addition to its six international awards, the Fund also presents stipends and research grants to Israeli students and scholars.

The Wolf Foundation was created by Dr. Wolf, who was born in Germany, emigrated to Cuba before World War I, was named Cuban Ambassador to Israel in 1961 by the Castro government, and remained in Israel until his death last year at the age of 93. Among his professional achievements, Dr. Wolf developed the process which is used in steel mills throughout the world for recovering iron from the residue of the smelting process.

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# THE INSTITUTE FOR ADVANCED STUDY

**HARRY WOOLF**  
Director

January 28, 1983

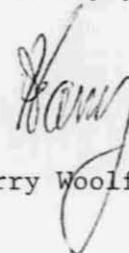
Professor Hassler Whitney  
School of Mathematics  
Institute for Advanced Study

Dear Hass:

I just learned that you are a 1982 recipient of the Wolf Foundation Prize. On behalf of everyone, though I know others will speak for themselves, let me express our pride and our pleasure in this much justified award.

With warm regards, I am,

Sincerely yours,



Harry Woolf

*cc. P H Jabalme*

CABLE #89327

January 28, 1983

Professor Hassler Whitney  
Institute for Advanced Study  
Princeton, New Jersey 08540 USA

Congratulations on your having been selected recipient of 1982 prize in mathematics totalling \$100,000 sharing prize in equal halves with Professor Krein from USSR for your outstanding contributions in this field to the benefit of mankind. Shall be honored by your attending prize awarding ceremony at Knesset, Israel Parliament, Jerusalem, early May 1983. Letter follows with full details.

Best regards,

WOLF FOUNDATION  
P. O. Box 39A  
Herzlia 46103, Israel

THE INSTITUTE FOR ADVANCED STUDY  
Princeton, New Jersey 08540

14 January 1982

Aida:

Caroline Underwood says:

You may already have these items:

A. Borel and H. Whitney were elected

Foreign Associates of the French Academy

of Sciences in January 1981.

I have told JH so that this will appear  
in the 1980-81 Annual Report.

J.

cc. Allen Rowe  
Mary Wisnovsky

October 29, 1981

Professor Hassler Whitney  
School of Mathematics  
Institute for Advanced Study

Dear Hass:

Thank you for yours of 26 October 1981. Your request to use your Assistant Funds towards some of the local expenses of the Executive Committee of the International Commission on Mathematical Instruction certainly seems in order. You are entitled, for the present academic year, to spend up to \$6800.

Your letter is unclear about whether or not you wish to have Institute housing for your visitors. We probably can have accommodations for them, at a modest charge, at Marquand House.

Sincerely yours,

Harry Woolf

THE INSTITUTE FOR ADVANCED STUDY  
PRINCETON, NEW JERSEY 08540

Oct. 26, 1981

SCHOOL OF MATHEMATICS

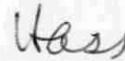
Harry Woolf, Director  
Institute for Advanced Study

Dear Harry,

As you probably know, the Executive Committee of the International Commission on Mathematical Instruction ( of which I am president) is holding a meeting in Princeton next Feb. 18-19, and plans are being made to house the members here at the Institute. I expect five to seven to come (from Japan, Australia, Brazil, Canada, France, and perhaps Switzerland and Denmark).

I would like to use my Assiatant funds (unused this year, except for some travel) towards the local expenses of the meeting; that is, housing, some meals, and some secretarial work. I would be glad to have your reaction to this.

Sincerely yours,



Hassler Whitney

PS. In the absence of ex-officio member L. Carleson from Sweden, President of IMU, the ex-president, D. Montgomery, will take part in the meetings.

January 17, 1979

Professor Hassler Whitney  
School of Mathematics  
Institute for Advanced Study

Dear Hass:

This is in response to your letter of 8 January 1979 about travel funds. As you know, the rules of the Institute do not allow a carry-over in the travel allocation of \$1500 per year, so I cannot suggest that you accumulate up to a certain maximum in unspent travel monies. Let us hope that any sum over \$1500 per year will be covered by other sources. If not, why don't we face that when and if required.

Sincerely yours,

Harry Woolf

THE INSTITUTE FOR ADVANCED STUDY  
PRINCETON, NEW JERSEY 08540

SCHOOL OF MATHEMATICS

Jan. 8, 1979

Harry Woolf, Director, IAS

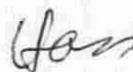
Dear Harry,

This is to raise a question about my travel funds. Briefly, I foresee a need for more travel (probably not this year, but most likely next and perhaps later) greater than would be covered by the present limit of \$1500 per year. I am at present not using my funds ~~from~~ from the IAS in any other way I don't foresee a need for other uses at present, though some special projects might use some.

The cause of my additional travel is primarily through my new position (this Jan. 1, for four years) as President of the International Commission on Mathematical Instruction. Some of my travel will be paid from other sources (as it has in the past); but much must come from me.

I raise this matter now simply so that you will have plenty of time to consider it.

Sincerely yours,



Hassler Whitney

cc: Wisnovsky

28 November 1978

Dear Hass:

The Institute for Advanced Study is now in the process of preparing an Einstein Centennial Celebration in honor of the one-hundredth anniversary of Albert Einstein's birth.

A principal feature of the Celebration will be a Symposium to be held at the Institute on March 4-9, 1979, dealing with the specific aspects of Einstein's scientific work. The emphasis throughout will be on both the historical context and the continuing importance of Einstein's ideas in various fields, perhaps bearing in mind Einstein's remark that "the most incomprehensible thing about the world is that it is comprehensible."

The Planning Committee for the Symposium consists of the following members:

Freeman Dyson  
Herman Feshbach  
Marvin Goldberger  
Gerald Holton  
Martin Klein  
Abraham Pais  
John Wheeler  
Harry Woolf (Chairman)

The audience for the Symposium and its published product will be on the one hand the community of scientists of the present and immediate future and, on the other, future historians who will look to this record for some answers to the questions of how Einstein and the physics he helped to create influence, either explicitly or tacitly, the science being done today.

Dr. Hassler Whitney

Page 2

It is our intention that the Symposium be an occasion where scientists and scholars can reflect on what science is, and how at its best it is carried out, with specific reference to Einstein's work.

On behalf of the Institute for Advanced Study and the Planning Committee, I am writing to invite you to participate in the Einstein Centennial Symposium. The attached preliminary program will give you a sense of the substance of the meeting; further details will be sent to you at a later date.

I look forward to hearing from you soon, and very much hope that your answer will be affirmative.

Cordially yours,

Harry Wolf

Dr. Hassler Whitney  
65 Linwood Circle  
Princeton, NJ 08540

THE INSTITUTE FOR ADVANCED STUDY  
OFFICE OF THE DIRECTOR  
PRINCETON, NEW JERSEY

Dictated by Professor Whitney

The National Medal of Science is awarded  
by the President of the United States of America  
to Hassler Whitney for founding and bringing to  
maturity the discipline of differential topology.

1976

Jimmy Carter

This medal was presented to Professor Whitney  
in Washington on November 22, 1977.

October 21, 1977

Dear Hassler:

The following resolution was adopted by the Trustees at the October 8, 1977, meeting of the Board:

On the occasion of the retirement of Hassler Whitney after twenty-~~five~~ years as Professor of Mathematics at the Institute for Advanced Study, the Board of Trustees of the Institute expresses its admiration for the quality of his scholarship and influence in his field, and its sincere best wishes for the fruitful continuation of his work as Professor Emeritus.

I know that all of those associated with the Institute would wish to join the Trustees in this expression of gratitude, affection, and best wishes for the future.

With warm personal regards, I am

Cordially yours,

Harry Woolf

Professor Hassler Whitney  
School of Mathematics

SAA

Promises

August 12, 1977

Hassler Whitney  
The Institute for Advanced Study  
Olden Lane  
Princeton, N.J. 08540

Dear Dr. Whitney:

On behalf of the Committee on Archives of Science of the Society of American Archivists I wish to thank you for responding to our questionnaire concerning the preservation of the papers of members of the National Academy of Sciences.

I will have to do some investigative work before I can make any suggestions for an appropriate repository for your papers, but I will get back to you on this. In the meantime, I am enclosing a copy of our preservation brochure for your information.

Sincerely,

Joan N. Warnow, Chair  
SAA Committee on Archives of Science  
Center for History of Physics  
American Institute of Physics  
335 East 45th Street  
New York, N.Y. 10017

the society of american archivists  
the library, post office box 8198  
university of illinois at chicago circle, chicago, illinois 60680

Whitney

October 7, 1976

MEMORANDUM

Subject: Hassler Whitney workshop

I told Mr. Whitney that he could hold the first session of this announced meeting. He came with a modified version of that statement, which I approved of only for the first session. I tried to convey to him my discomfort with courses for fees appearing either formally or informally under the sponsorship of the Institute, or indeed the idea of courses under the sponsorship of the Institute that were not part of its intellectual concerns. I also pointed out that I believed very much in the commonalty of judgment as a system of governance, that there was now a formal system at the Institute, and that issues of this kind should be cleared with the faculty, and that I would be willing, if he gave me permission, to, either specifically on the course or generally on the practicality of the thing, raise this as an agenda item for the first faculty meeting. It was clear he did not want that to happen, at least specifically on the course. So I told him I would do this as a general item for the first faculty meeting.

I reviewed the process of trying to consult him and his colleagues in Mathematics first. He seemed pleased and satisfied by this. Lesson: always do this. I also told Whitney that his colleagues in Mathematics were the only individuals with whom I had discussed this, and that they tended to agree with me as he already knew.

HW

Institute for Advanced Study  
Princeton, N.J. 08540  
June, 1976

MY WORK PERTAINING TO SCHOOL PROBLEMS

Hassler Whitney

My general goals. My professional work has been in mathematics and mathematics education. A deep interest has always been in people as humans, and how they act and feel; in particular, what learning means to them. In 1967 I decided to make this my main purpose in life: I would work to help students in the schools make their learning more meaningful. This means, how can the school situation for the masses of children throughout the country be improved so that education, in fact life, can be better for the students? This goal has required studying all the forces on the children, teachers etc. in all their complexity; only with such understanding can real improvements be expected. In the last five years, this has meant studying myself and people in general, to understand better what a truly functional, responsible and creative life can mean.

Teaching experience. I taught two 7th grade pre-algebra classes for four months during 1968-69 in a Princeton public school, with the regular teachers present. I used materials I wrote for this purpose, largely to help the students learn by explorations.

Over a number of years I have taught groups of children for shorter periods of time in their classrooms, mostly in public schools in Princeton, N.J., and New York, N.Y.

In the summer of 1973 I taught groups of children on the elementary and junior-high level in a clinic in Princeton for children with learning disabilities, with teachers and aides present, partly to help the staff in good teaching methods.

I have taught demonstration classes at times, grades 1 through 6, in schools in several parts of the USA and in Brazil.

Tutoring and consulting in the classroom. This has been my principal activity since 1967, especially during 1969-73. The reason is because this is the best way to learn the full story of how children function in the classroom. I have mostly worked with the slower children, to see where the principal difficulties lie, and helped them find that they can do really better than they thought. Then talking with the teacher helps her or him in later work. I have carried out this work in a number of schools of various types, mostly in Princeton and New York, but also elsewhere in the USA and in England and Brazil.

Research on children's learning and feelings in schools. The work just described has been the basis of my research. It has led to much deeper understanding of what children really go through in the school. For instance, in spite of the main purpose of the new math being to help the children think better, the result for nearly all, in attitude, has been just as before: "What am I supposed to do," rather than "I'll try this, I think I can find out something."

This work was aided during 1974-75 by a National Science Foundation grant.

Some basic findings are presented in a paper, "Are we off the track in teaching mathematical concepts?," printed in several places. Some later work has appeared in preprint form.

I have had help in particular from three people: Sue Walker Toledo, my assistant in 1972-74 also did considerable work in schools, sometimes with me. Stanley H. Erlwanger, my research associate during 1974-76 (the first year under a National Science Foundation grant) has had extensive experience in schools, and has written articles showing, quite unexpectedly, how children, thought to be succeeding in individualized programs, have in reality been failing in blatant ways to understand the basic concepts being taught. My many contacts with these two, and also with Stanley Tenenbaum and others, have been very valuable for my own learning.

Teacher training. In 1964 I taught a National Science Foundation Summer Institute course at Rutgers University for high-school teachers of mathematics.

In 1970 and 1971 I helped introduce laboratory methods to mathematics teachers in the Madison Project, New York City.

I taught a semester course in mathematics for elementary school teachers at Bank Street College, New York, in 1973-74.

I have conducted a number of workshops for teachers, in schools in various places, at conferences, here and in Brazil; and have collaborated in such a workshop in London, England.

I have supervised two Princeton University seniors in a program giving them high-school certification.

Consulting work for organizations. I consulted for the Educational Development Center, Newton, Mass., 1968-69.

In 1969-70 I was a member of the Tri-University Project at New York University, studying problems of elementary mathematics education and assisting teachers.

For periods of weeks, I worked with the Cambridge Conference on School Mathematics, helping produce their report on teacher training, in the summer of 1966; also that summer, with the School Mathematics Study Group, towards the main features of a revision of their program on the junior-high level.

I have also consulted for the CEMREL regional laboratory, Carbondale, Ill., (1968), the Plato project at the University of Illinois (1974), and the Centre National de Pedagogie Mathematiques, Brussels, Belgium, (1969); also other consulting work of a shorter nature.

I consult on a yearly basis for new experimental programs in mathematics and science at the University of Campinas, Brazil, starting in 1975.

Major committees and conferences. I was a member of the New Jersey Basic Skills Task Force, 1973-74, for the State Department of Education.

In the summer of 1973 I took part in two intensive conferences on school mathematics, for grades K-12 and for the middle school years, funded by the National Science Foundation.

Besides speaking at conferences of the National Council of Teachers of Mathematics and other organizations, I spoke at the 1972 International Congress on Math Education, Exeter, England (the above paper, "Are we off the track ..." was published by the Congress).

Materials produced. In working in classrooms, I always found it difficult to find materials of a satisfactory form for teachers to continue with when I had to move on. To fill this gap, I first wrote some notes with brief descriptions of methods. Finally it seemed necessary to do something better. In October, 1974, the Institute for Advanced Study put out a first volume, "Elementary Mathematics Activities, Part A," for grade 1 and into grade 2. I quote from the review in *The Arithmetic Teacher*, January, 1976: "One long-range goal for the child is intelligent and appropriate use of the mathematics he knows; thus the activities are built around 'real problems' in the child's world." "More than anything else, the wisdom of the proffered advice exemplifies the importance of the goal to which the author is committed (p. 1): 'To help ... children develop their full potential in math, as part of their general growth towards a responsible, healthy, creative adult life.'"

#### Experience in counseling and therapy

Training. I took part in advanced workshops in the treatment of emotional problems at the Casriel Institute for Group Dynamics in 1974-75 and in 1976.

I have attended workshops in sensitivity training, gestalt, transactional analysis, marital therapy, family therapy, and sexuality.

My experience includes conferences on humanistic education, on learning disabilities, and on emotionally disturbed children.

Further experience. I have been informally associated for some years with a school in New York, N.Y., for emotionally disturbed children.

I have worked with children with learning disabilities in a clinic in Princeton during one summer.

I have carried out intensive work in groups with adults with emotional problems at the Casriel Institute, 1973-76.

For a week I lived in a therapeutic community (AREBA, of the Casriel Institute) for people with severe drug and delinquency problems.

Since January, 1976, I have led and shared the leading of an ongoing group for growth and therapy in Princeton, N.J.

March 12, 1976

Memorandum for the File

Subject: Stanley Erlwanger

In a further discussion with Professor Whitney and Mr. Erlwanger it was agreed that Erlwanger would get his March 1976 check before leaving. That he would be paid for April, and possibly for part of May, for work done in Canada. Whitney would be responsible for determining whether any pay was due.

Carl Kaysen

cc. Mr. Morgan

December 11, 1975

Dear Hassler:

I have talked to Francis Sutton at the Ford Foundation who would be very glad to see you and Stanley at a convenient time. I suggest you call him directly at (212) 573-4950. He tells me that he is going to be away most of the first half of January, so perhaps you could fit in a date this month.

Your appointment at the Spencer Foundation is with Dr. H. Thomas James, on Tuesday, January 6th, at 9:00 a.m. The office is located at 875 North Michigan Avenue, and the telephone number is (312) 337-7000.

Cordially,

Carl Kaysen

Professor Hassler Whitney  
School of Mathematics

November 19, 1975

Dear Hassler:

I had a note from John Knowles at the Rockefeller Foundation and he would like to get in touch with you. What he suggests is that you come to a Wednesday morning staff meeting at which outside speakers with new ideas for programs regularly talk. Lydia Bronte, one of his staff members, will be in touch with you about this possibility.

Cordially,

Carl Kaysen

Professor Hassler Whitney  
School of Mathematics

# The Rockefeller Foundation

1133 AVENUE OF THE AMERICAS, NEW YORK, N.Y. 10036

JOHN H. KNOWLES, M. D.  
PRESIDENT

CABLE: ROCKFOUND, NEW YORK  
TELEPHONE: (212) 869-8500

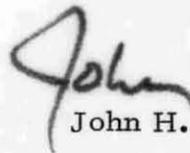
November 18, 1975

Dear Carl:

I, too, enjoyed our chance meeting at the University of Pennsylvania, and I'm encouraged by your reaction to my talk. Thanks so much for following up our informal discussion about the work of Professor Hassler Whitney of the School of Mathematics at the Institute. Although our present program guidelines do not include his interests, I'm nonetheless most interested in meeting with him, at his convenience, sometime after the first of the year. Perhaps the best way to do this would be to ask him to give a short talk at one of our Wednesday morning staff meetings, where we invite outside speakers who we believe would present new and interesting ideas and possibilities for program interests at The Rockefeller Foundation. I shall pass your letter on to Dr. Lydia Bronte who organizes these meetings, and she will be in touch with Dr. Whitney in the near future.

Very best wishes,

Sincerely yours,



John H. Knowles, M.D.

Mr. Carl Kaysen  
Director, The Institute for  
Advanced Study  
Princeton, New Jersey 08540

JHK:jf

June 27, 1975

Memorandum for the File

1. Whitney reported that there is some problem with his request to the NSF, and that as a consequence he thought it likely that he would not receive the funding to support Erlwanger's work. He raised the question whether he could spend two years' Assistants Funds next year, i.e., 1975-76 and 1976-77 (his last year). This would provide \$16,000 and together with a balance of what is available in the present NSF contract would support Erlwanger for next year, and perhaps a little longer. I agreed that such a transfer would be possible in the particular case.
2. We talked about possible private foundation support for Whitney's work and I mentioned the Spencer Foundation. If he wishes to seek such support, after he has had a definitive rejection from NSF, I will introduce him to Tom James. In this connection, Whitney mentioned his work with the Casriel Institute in New York.

Carl Kaysen

cc. Mr. Morgan

THE INSTITUTE FOR ADVANCED STUDY  
PRINCETON, NEW JERSEY 08540

SCHOOL OF MATHEMATICS

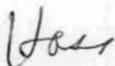
Feb. 24, 1975

Dear Carl:

I have been invited to spend some time at the Mathematics Institute, Universidade Estadual de Campinas, Campinas, Brazil, to work with mathematicians and teachers. I have accepted for two weeks in March, and expect to be away from here March 8-22.

The mathematics faculty here is aware of my plans.

Sincerely yours,



Hassler Whitney

H-14-70

PROFESSOR WHITNEY'S CHILDREN:

|                          |      |                   |
|--------------------------|------|-------------------|
| James N. Whitney         | born | June 9, 1935      |
| Carol Whitney            | "    | December 19, 1936 |
| Marion Whitney Melhuisch | "    | December 17, 1938 |
| Sarah N. Whitney         | "    | April 28, 1956    |
| Emily B. Whitney         | "    | May 10, 1958      |

THE INSTITUTE FOR ADVANCED STUDY

PRINCETON, NEW JERSEY 08540

Telephone-609-924-4400

THE DIRECTOR

February 10, 1972

Memorandum for the Record

Discussion with Professor Hassler Whitney  
in my office - February 8, 1972

I discussed the possibility that he would invite Sue Wheeler of I.B.M. as an assistant. Her work is primarily in Logic and I agreed that she should be charged to Logic rather than the Mathematics quota and paid out of Professor Whitney's assistants fund. Her negotiations with I.B.M. are not complete.

cl

THE INSTITUTE FOR ADVANCED STUDY  
PRINCETON, NEW JERSEY 08540

SCHOOL OF MATHEMATICS

12-17-71

Dear Carl,

Enclosed is a copy of a blurb on Whitney which I helped write. I thought you might want it for the files.

Jack