March 21, 1946

Dr. Frank Aydelotte
Hotel King David
Jerusalem, Palestine

Dear Dr. Aydelotte:

The Executive Committee met yesterday and Professor Morse
has just written you a lengthy letter to which I have very little
to add. Since the last meeting of the Standing Committee on
March 18th one or two events have occurred in which you may be
interested.

Mrs. Persons has told Professor Morse that she would like to
resign her position as Librarian in June. Professor Morse has asked
her and Professor Weyl to make inquiries as to a possible successor.

The Standing Committee approved the renewal of Dr. Ky Fan's
membership for the year 1946-1947 with a stipend of $2,100.

On March 13th, Donald Bourne, a lawyer, telephoned from Trenton
to get the corporate name of the Institute. He was preparing a will
which contained a substantial bequest to the Institute. He volunteered
the information that there were certain recommendations attached to
the bequest but no strings. I did not ask him for any further details.
The incident was reported to the Trustees on Tuesday. No action was taken of
course.

Kusaka paid a brief visit to the Institute on March 14th.

Yesterday we received a letter addressed to you from Francis
Miller reporting on the results of his investigations in getting
Professor Herzfeld's manuscript published. The publishing firm of
Dietrich Reimer has not been granted a license to publish because
of the record of one of the members of the firm. Col. Miller suggests
that Professor Herzfeld either give his manuscript to a licensed
publisher or else have it published in the United States. The
character of Professor Herzfeld's manuscript has no bearing on the
case. I have replied to Col. Miller thanking him for his assistance
and sent a copy of his letter to Professor Herzfeld. Col. Miller
hopes to return to the States in the middle of summer and to have a
chance to see you then.

At the meeting of the Executive Committee Professor Morse
presented Professor von Neumann's progress report on the Electronic
Computer Project. Some of the highlights of this report include the
following:

The negotiations for contracts with the Army Ordnance Department and the Navy Office of Research and Inventions are proceeding favorably. On both contracts the following agreement in principle has been reached: The authorities do not expect the Institute to produce a machine for the Government. It is understood that the machine will remain the absolute property of the Institute and will be used for purely scientific purposes under the administrative control of the Institute. The Government support will be given in order to promote research and experimentation in the field of high speed computers. It expects to get only reports, plans and free, non-exclusive, non-transferable licenses on Institute patents.

To date the following persons have been appointed to the staff of the computing project.

Herman H. Goldstine, mathematician, to help on overall planning and coordinating of the project, at $5,500 a year beginning March 1, 1946.

Julian Bigelow, to be Chief Engineer of the project, at $6,000 a year beginning sometime between April and June. In the meantime he is doing part-time consulting on the basis of $25.00 per diem.

A. W. Burks, at $4,800 a year to begin in May or June. Until then he will act as part-time consultant at $16.00 per diem.

James Pomerene, electrical engineer, at $4,500 a year, to begin in April.

Ralph Slutz, at $3,600 a year, to begin in June.

John C. Sims, Jr., an engineer who will work on mechanical problems in connection with the machine, at a salary of $3,120 as of April 1, 1946. Mr. Sims joined the project as of January 1st with a salary of $2,700 and has been handling certain administrative details.

This seems to be the cream off the top. I hope the diet of detail isn't too heavy. I am also enclosing a copy of a letter of Gil's (March 20, 1946) to Dr. Allen. We were all very much pleased to hear from Mrs. Aydelotte that you had been able to manage two games of golf in Cairo!

Looking forward to seeing you in May.

Sincerely,

Mathematics Given Bigger Role by Army

Washington, July 3. — (ÆP) — Because the army will need to know about lightning-quick caluculation in tomorrow's atomic and rocket warfare it has called upon an advisory committee of methematicians to help it.

Major General A. C. McAuliffe, deputy director for research, announced the appointment of the six-man panel today.

McAuliffe listed these quqestions which will be posed for the panel:

What new applications of mathematics to military problems seem most important? What will the army need in the way of high speed computing machines? How should mathematical methods be applied in working out problems in strategy, tactics and logistics? What steps should be taken to provide mathematically trained personnel within the army?

Appointed to the advisory committee are: John Von Neumann of the institute of advanced study, Princeton, N. J.; Hendrik Bode, director of mathematical research of the Bell Telephone Company, New York; H. P. Robertson of the California Institute of Technology; J. B. Rosser, Cornell university, Ithaca, N. Y., and J. J. Stoker and Richard Courant, both of New York university.

McAuliffe also announced the appointment of Dr. Edgar R. Lorch, Columbia university, New York, as mathematics adviser to the research group for a six months' period.

'BRAIN' SPEEDED UP FOR WAR PROBLEMS

Electronic Computer Will Aid in Clearing Large Backlog in Weapon Research

By WILL LISSNER
Special to The New York Times.

ABERDEEN, Md., Dec. 12 — Eniac, the only electronic computer among the four "mathematical brains" now in use, is being converted so that it can handle without resetting all types of mathematical problems to which it is adapted, it was disclosed at the Aberdeen Proving Ground today.

Seventeen per cent of the machine time is now lost in changing the set-up by resetting switches and pulling plugs every time the type of problem fed into the robot is changed, Dr. Franz L. Alt of the Ballistic Research Laboratories reported. The loss is higher as the variety of problems is increased.

Col. Leslie E. Simon, director of the laboratories, said the latest change-over was begun five months ago, on the basis of a new mathematical approach by Dr. John Von Neumann of the Institute for Advanced Study, Princeton, N. J., and was scheduled to be completed by Christmas. It involves adding a panel of circuits and making other minor structural changes in the machine. These retain the basic design and permit the machine to be reconverted at any time to the former set-up, which gives faster results in computing firing tables and other ballistic work used in wartime research.

Better Machine on Way

The reconversion will give the Eniac a substantial part of the efficiency which is being built into the Edvac, a more advanced type of automatic computer, employing both electronic and electrical relay circuits. Edvac will not be completed for at least seven months, Colonel Simon said.

Greater efficiency was needed in electronic computing and this could not wait on the completion of Edvac because there was a backlog of six months of top-priority computation in basic research for pilotless aircraft, guided missiles and supersonic flight, the colonel explained. Eniac is a year or more behind on important but less urgent business, he said.

Dr. Alt said the top-priority work scheduled for Eniac for the next six months could be done by human computers only in 250,000-man hours.

As an illustration of the type of work being done on Eniac, Colonel Simon cited the measurement of the path of the V-2 rockets which are being fired at the White Sands proving range in New Mexico. Nine methods of measurement are employed, including advanced-instrument techniques such as radio and radar, to track the missiles every 2.6 feet they move. Plotting the path requires solving for 900 points and it cannot be done by human computation in time to be of any value. Eniac does the job in seven minutes.

"Orders" to Robot Reduced

Dr. Von Neumann explained that the problem of the conversion involved finding a set-up of the robot's two sets of twenty accumulator tubes which would work for all types of problems.

By an approach through mathematical logic it was found, he said, that the robot could be taught, in effect, a simplified dictionary instead of directing its operation by 350 to 380 orders having a highly complex inter-relationship. It was found that the orders could be reduced to sixty to seventy. That could be put on punch cards and checked by a machine developed by the International Business Machines Corporation. This approach requires the mathematician to translate his problem into sixty orders.

One advantage, Dr. Von Neumann said, is that the new system of operation more nearly approximates the operation of the human brain in mathematical thinking and avoids errors in preparing problems for the machine. It requires more human brains in the form of mathematicians, however, for the preparatory work. Although the machine is still operated by magnetic tape, the problem is fed into the machine from punch cards and the solution is printed on punch cards.

The new coding technique is being demonstrated to 300 members of the Eastern Association for Computing Machines who are attending a meeting that closes tomorrow morning.

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Army Calls on Math Group to Aid Study

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Tokyo Scientist Here to Study

Special to THE NEW YORK TIMES.

SAN FRANCISCO, Sept. 3—Dr. Hideki Yukawa, first Japanese scientist to visit here since before the war, arrived by Pan American Clipper from Tokyo today. He is en route to Princeton, N. J., where he will study higher nuclear physics for a year as the guest of Dr. J. Robert Oppenheimer, director of the Institute for Advanced Study. Dr. Yukawa emphasized that his studies would have nothing to do with the atomic bomb. He is accompanied by his wife.

Experts Appointed To Advise Army In Mathematics

Service Would Need Quick Calculation In Rocket, Atomic War

WASHINGTON, July 3—(AP)— Because the army will need to know about lightning-quick calculation in tomorrow's atomic and rocket warfare, it has called upon an advisory committee of mathematicians to help it.

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McAuliffe also announced the appointment of Dr. Edgar R. Lorch, Columbia University, New York, as mathematics adviser to the research group for a six months period.

Dr. Paul Dirac To Be Lecturer At Princeton

Nobel Prize Winner To Be Einstein's Colleague at Advanced Study Institute

Famed for Atomic Study

Theory of Matter Revolutionized by Professor

Special to the Herald Tribune

PRINCETON, N. J., March 15.—Dr. Paul A. M. Dirac, Lucasian professor of mathematics at Cambridge University, England, and winner of the Nobel Prize in physics last year, will lecture next year at the Institute for Advanced Study, it was announced today by Dr. Abraham Flexner, director of the institute.

Dr. Dirac is one of the younger physicists whose work has carried science onward into the strange regions indicated by the relativity theory of Professor Albert Einstein, who will be Dr. Dirac's colleague at the institute. Dr. Dirac's studies in wave mechanics and atomic construction, which, with those of Heisenberg and Schroedinger, the German physicists, have resulted in a revolution in physical theory that culminated with the discovery of the positron or positive electron, have been based on a combination of the relativity theory and Planck's quanta.

The "now you have it, now you don't" quality of the atom, in which the ultimate particles of matter seemed to act now as waves and now as particles, was explained by Dr. Dirac by the theory that the electron is capable of being both positive and negative. He arrived at his conclusion, since reinforced by the discovery of the positron, through a series of mathematical equations quite as complicated and quite as difficult for all but the few as the Einsteinian. Reduced to the simplest terms in Dr. Dirac's own words, the theory is:

"It is believed all matter is built up from two elementary kinds of particles, the electron and the proton. Recent theoretical work seems to suggest that these two kinds of particles are not independent and that actually there is only one fundamental particle in nature.

"The quantum theory of the electron combined with the principle of relativity shows there must be status for the electron in which its kinetic energy is negative—and is less the faster the particle moves, in addition to the usual state in which the energy is positive.

"To give a positive meaning to these negative energy states we must assume that they are nearly all occupied by electrons with just one electron in each state, in accordance with the exclusion principle. We can then interpret the unoccupied energy state as protons. They will appear to us as things with a positive energy and also a positive charge."

At the time when Dr. Dirac propounded his theory before the 1930 meeting of the British Association for the Advancement of Science he was just twenty-eight years old. Sir Oliver Lodge remarked of him after hearing it that he "had gone more fundamentally than ever before into the secrets of the atom." Then he was about the age of most students finishing their Ph. D. thesis, which he had handed in at Cambridge some time before. He is now thirty-two. He was given the Lucasian professorship at an age younger than it ever had been awarded before, and he was made a fellow of the Royal Society also in his twenty-eighth year. Dr. Dirac took his degree of Bachelor of Science at Bristol University. He is a fellow St. John's College, Cambridge. His principal publication is "Principles of Quantum Mechanics."

DR. WALTHER MAYER
The New York Times, 1930
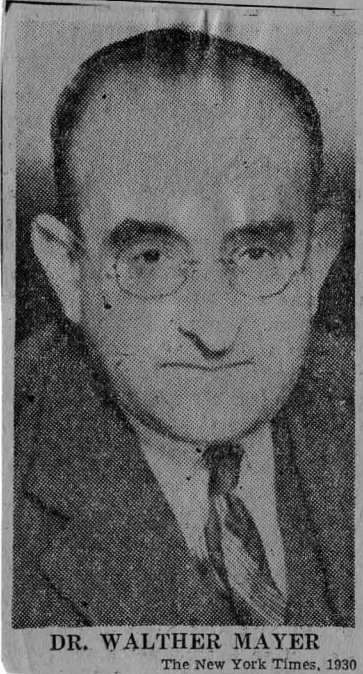
WALTHER MAYER, LONG AN EDUCATOR

Collaborator of Einstein on Unified-Field and Relativity Theories Dies in Jersey

Special to THE NEW YORK TIMES.

PRINCETON, N. J., Sept. 12—Dr. Walther Mayer, who collaborated with Dr. Albert Einstein in the formulation of the theory of relativity, died on Friday in the Princeton Hospital at the age of 61.

Born in Graz, Austria, he studied at the Universities of Zurich, Paris and Vienna, receiving a doctorate from the last-named institution in 1914. Dr. Mayer lectured at the University of Vienna after the first World War and was named a professor there in 1931.

He began his collaboration with Dr. Einstein in 1930, and visited this country with the noted physicist the same year. In 1931 the new Einstein-Mayer unified-field theory was announced.

"The general relativity theory," Dr. Mayer explained then, "suffered from a dualism: adequate for gravitation, it harbored the electro-magnetic field as a foreign body, and its formulas Professor Einstein had to introduce artificially, as it were.

"This dualism is abolished in the new theory, which subsumes both gravitation and electricity under one comprehensive theory of the same architecture throughout."

Dr. Mayer added that the theory was developed by means of a new mathematical concept, that of a vector with five components, or determination elements, in a space of four dimensions—the Einsteinian space-time-continuum.

"Therefore it had been taken for granted by everybody that a vector's components must be the same number as the dimensions of its space—or might be less, but could not be more," he went on. "Of course, the new vectors gave us new tensor equations.

"The unified field theory gives not only gravitational formulas agreeing with those in the general relativity theory, but also electro-magnetic formulas agreeing with Maxwell's. There had long been a question of whether the Maxwell formulas were really exact or only approximative; the unified field theory shows them to be quite exact."

Dr. Mayer accompanied Dr. Einstein to this country in 1933, after Hitler came to power in Germany, and both took posts at the institute for

1948   *Vertical file*   January

MITRANY, D.   Biographical

     Pamphlet on "Should Christianity Count in International Relations?" by David Mitrany.

     Filed in Vertical File under "M" for Mitrany.

A File, Mitrany, David

SHOULD CHRISTIANITY COUNT IN INTERNATIONAL RELATIONS?

By David Mitrany

Should Christianity count in international relations? The question seems redundant. International relations, more than any other form of communal relations, need the grace of goodwill and charity. The new problems are tense, the old habits are hard-set; and the participants so many and mixed in their ways and memories and beliefs. Beliefs - Christianity! We almost forgot that leaving aside the many minor creeds there are in the world not quite seven hundred million Christians, and nearly 1,200 million non-Christians. With all these we must have a relation of regard and understanding if the world is to be at peace. Obviously we cannot set up Christianity as in any way superior to the other creeds, with a claim to govern the common life which we need and desire.

And indeed, which brand of Christianity? The Christian world itself is harshly divided just in the matter of creed. Therefore we must ignore theology and Church organisation, and go back to first principles. The Christian conception of life rests upon two central principles: (i) the doctrine of human equality, and (ii) the principle of the unity of life, of community. "For as the body is one, and hath many members, and all the members of the body, being many, are one body, so also is Christ." And again, and very relevantly, "And whether one member suffereth, all the members suffer with it; or one member is honoured, all the members rejoice with it" (Corinthians XII). These words of St. Paul's were meant in the main for the life of the spirit. But to the New Testament, and to all serious Christian thinkers, humanity is one great

society whose members are interdependent, and in this they found the characteristic principle of human life. It is the perfect principle for international society. But that principle cannot well be pressed by a body which is so intransigently divided in itself; though, you may say, it is divided on dogma - cannot we act together on the application of that great principle?

Such an attempt to bring religion down to earth, to go to the living heart of the matter, at first sight, and taking things as they are, only increases our difficulties. The divisions become more manifold and, especially, the parts are found to be allied precisely to those worldly forces which the spirit should control. The Church has travelled far, if not well, from St. Paul to our day. Already in pre-Christian antiquity the Cynics and the Stoics accepted universal brotherhood and were reserved towards any active part in political life; and so were the Christian fathers. The change came with the conversion of Constantine. If the Church captured the Empire, she herself became the servant of her captive. The Fathers had been not only pacific but pacifists - a Christian could pray for the Empire, but could not fight for it. After the conversion Christians were allowed to fight in "just" wars - and what was just was left, even by St. Augustine, who hated war, to the judgment of the Emperor. The second and more irretrievable step came with the Reformation. The Roman Church accepted the unified Empire and Imperial authority, but still as a co-equal; the Reformation accepted the individual national state and the authority of the ruling prince as almost a superior. Luther was a fervent Christian, but he accepted the supremacy of political rulers even more explicitly than St. Augustine, and why he did so is clear from a missive he sent to the Prince-Elector of Saxony: "The Papal order being abolished, it is your duty to regulate these things." The Church had become one among the institutions of the state, and the head of the state was ruler by "divine right."

The medieval Church had still held to the conception of unity as expressed in the Holy Roman Empire; though it is a grim comment on that sense that the only great action which Christian Europe performed in common through all those years was the military venture of the Crusades. But with the division of the Church that outlook could not survive. I do not refer to the fact that the two sections actually fought each other bitterly and persecuted each other's followers ruthlessly. Rather have I in mind, because it bears directly upon our subject, the fact that from then on the Churches accepted and upheld the moral authority of the state and its rulers. Treitschke, the most modern exponent of that extreme political doctrine, acknowledged that he owed as much to Luther as to Machiavelli. But that is not a view peculiar to the Lutheran Church in Germany, or indeed to Christianity. For a period in English history the king was regarded as head of the Church, and he still is in a way its director. In old Russia the Tsar was the supreme head of the Church; so was the Japanese Emperor; and so were the Sultans, who as Caliphs were indeed the heads of the whole Mohammedan world. In the West, as in the Balkans, the Churches had become in effect national tribal churches.

Such a union between the temporal and the spiritual does not of itself spell right or wrong. It all depends on whether the Church becomes the tool or the conscience of the state. We may inquire how this was in the particular matter which interests us here. The central and oldest problem in international relations is the use of force, and more immediately of uncontrolled force. St. Augustine and others after him allowed "just" wars. Luther readily endorsed the use of force by the Prince, within and without his realm, and defended the Christianity of it with some other words of St. Paul's about the "authority that bareth not the sword in vain." That is still in general the position of ecclesiastical authority. In an address on this very issue, in 1936, the then Archbishop of Canterbury insisted that the Church of England had not departed from any Christian principle when it laid

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down in its 37th article that it was lawful for Chris-
tian men, at the command of the magistrates, to bear
weapons and to serve in war. Indeed, the Archbishop
went a great deal further in his justification, de-
claring that the "use of force by the State was the
ministry of God for the protection of the people." The
historical trend in this respect had been summed up by
a German Lutheran pastor, Friedrich Naumann, later
famous as a political writer, in these words: "The
more exclusively Jesus is preached, the less does He
help to form states; and when Christianity attempted
to come forward as a [politically] constructive force,
that is to form states, to dominate civilisation,
there it was farthest away from the Gospel of Jesus.
Now this means, for our practical life, that we con-
struct our house of the state, not with the cedars of
Lebanon, but with building-stones from the Roman
Capitol."

Naumann wrote that not as an ecclesiastical critic,
but as a political admirer of the strong state. And
though few of us would have put it quite so bluntly,
students will have to grant the general truth of his
summing-up. That historical dilemma brings us up
sharply against the very core of the matter. When we
ask "should Christianity count in international rela-
tions?", we really are thinking of a Christian *attitude*.
Any more specific assumption would quickly reveal its
own inadequacy. Consider for a moment the possible
alternatives. (1) We cannot think of a Church bound to
a particular political unit or cause. Nothing in form-
er times gave autocratic kingship a greater sense of
power than the confident belief that it ruled by "di-
vine right." These were no mere words for them. Bis-
marck, greatly devout in his personal life, repeatedly
insisted that "no state has a secure existence unless
it has a religious foundation"; and from that he
slipped into the conviction that the Prussian cause
rested "on authority created by God, an authority by
the grace of God." Most national churches in time of
war have had no difficulty in believing that their
country's was a "just war." No religious group is

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immune from the effects of such an alliance with the
secular. In Germany the Protestants were attached to
the State as the only secular support of the Evangeli-
cal Church, while the Catholic Church kept rather to
the tradition of the Holy Roman Empire. In France, on
the contrary, the Catholic hierarchy and aristocracy
were in the main strongly nationalist, and even mili-
tarist.

(2) The Churches might shed their formal political
attachments, but could not act as a supreme and serene
binding force while engaged in sectarian disputes and
institutional competition among themselves. Recently
there was published in America the result of a careful
collective study on the adjustment of generations of
immigrants to their new common milieu; from much fac-
tual evidence the study established that of all the
institutions serving particular national or racial
groups - family, schools, churches, social and friend-
ly societies, etc., - their churches kept them more
intransigently distinct and apart than any other.

(3) Nor can we mean a Church perhaps united in it-
self, but which might bring to this field the spirit
of the Crusades. Unity is needed, but not the unity
which finds expression in a militant sense of right-
eousness. Sir Thomas Arnold has noted how remarkable
was the old unity of the Muslim world; better than any
other religious system it had succeeded in obliterating
racial prejudice among its followers, but that unity
in the bonds of faith was also capable of expressing
itself in a fanaticism that could spread rapidly over
great tracts of territory.

(4) By this gradual elimination we are left with
one last possible conception of the Christian part. A
political world system needs to rest upon a sense of
human unity. The sense of world unity in early and me-
dieval times rested upon the general acceptance of
"natural law" - itself the basis of the later inter-
national law - which gave an eternal substance to what
was conceived to be just in human relations. But by

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the very fact of its universal validity "natural law" could not and did not expect the acceptance of the Christian faith as such by other creeds and peoples. If religion, therefore, is to be, as it should be, the foundation for a revived sense of human unity, it must free itself from ties which bind it to a particular institution or to a partial interest, secular or ecclesiastic.

This summary analysis seems to lead to an inescapable if paradoxical conclusion. If Christianity is to count in international relations it can do so essentially only in spirit; and to that end must detach itself in its attitude and judgments from the body politic of the state and, if need be, even from the body ecclesiastic of a Church. Is that a meaningless ideal? No more truly religious man ever sat in the seat of power than Abraham Lincoln - and that at a time when the Church still held a dominant and jealous position. Yet when one night, in a circle of friends, he was asked about his religion, Lincoln, it is related, became restless, and only after a while answered: "It is a spirit in the life that He laid stress on and taught, if I read aright.... If the Church would ask simply for assent to the Saviour's statement of the substance of the law 'Thou shalt love the Lord thy God with all thy heart..., and thy neighbour as thyself' - that Church would I gladly unite with." A distinguished group of Americans are preparing to bring together in Boston, in the autumn of 1948, a conference of all religions, for the purpose of finding a common religious basis in support of world peace. If that gathering is to achieve an active common attitude to that most human of worldly ends, it could clearly be only on some such basis as that expressed in Lincoln's faith.

There are two simple reasons for this conclusion. Religion will count internationally not by injecting itself as one more institution and one more competing force into the fray of peoples and states. First, because it seems to be almost in the nature of institu-

tions to grow selfish interests of their own. The Churches are no exception. It was a great scholar and divine, Dr. Jowett, the famous Master of Balliol, who in speaking of the Church lamented that "the spirit creates the organisation, and the organisation kills the spirit." And in this more than in any other field it is the spirit that matters. But, secondly, and again somewhat paradoxically, religion will count internationally only in so far as it counts nationally; in so far as it guides and controls as a way of life the attitude and conduct of its particular followers. As Christian in the *Pilgrim's Progress* says to Talkative, in reproof, "The Soul of Religion is the Practick part." Its part, in other words, cannot be through incitement abroad, but through restraint at home. Jesus typified and taught a way of life. Those who follow it are, in Lincoln's sense, practising Christians; those who do not follow it, are not. But neither the one group nor the other necessarily coincides with formal membership of a Christian Church. Nor was the way of life typified by Christ unique. In its great and broad teachings it is close to the way of life conceived by all the great religious teachers. It is, put practically and at its simplest, the way of decency. That alone is the test, whatever the name or the doctrine. Christianity must play its part in international relations if we are to have lasting peace. But in this sense: that not all internationalists are or need be Christians; though no one can be a true Christian unless he be a true internationalist, unless in all matters of everyday life and policy he views all the peoples of the world as one body.

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MITRANY D.   Biographical

KENNAN, G.

      See The Manchester Guardian, April 8, 1952, for article on
American Foreign Policy, The Futility of the New Isolationism by David
Mitrany.

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A File, Mitrany

THE MANCHESTER GUARDIAN, TUESDAY, APRIL 8, 1952

stunned. This way is open to the ussians—provided, of course, there a serious intention behind their iginal proposal. And if they were erely making propaganda they ight all the more to have had their ext move ready.

Collective Punishment

When a successor had to be found Malaya to Sir Henry Gurney many eople urged that a civilian should be ppointed. They argued that while a ldier might be very efficient, and ight act logically, he might also be ore liable than a civilian to make litical mistakes. General Templer's llective punishment of the village of anjong Malim is an example of the nger into which soldiers may fall. o doubt many of the villagers have en in league with the Communists, ther of their own free will or cause of terror. Perhaps General empler's methods may now induce em to betray the Communists. But will be a gain bought at a high ice. The willingness to inflict llective punishment, even if it is nited and moderate, is one of those litical shibboleths by which good overnments are sorted out from bad. logic it may be easy to argue a se, in such an emergency as exists Malaya, for resorting to rough and ady measures of pressure upon tire populations. "It does not amuse e to punish innocent people," said eneral Templer to the villagers. "But any among you are not innocent. ou have information which you are o cowardly to give." The aim is to ake the villagers more afraid of the overnment than of the Communists, and to win co-operation in this way. Have some guts and shoulder the sponsibilities of citizenship," said eneral Templer to the offenders. merican correspondents have pointed t that most of his listeners were inese who under the present law e denied Malay citizenship. Logic ill not upset the fixed belief in the ee world that collective punish-ents are odious. (They are not made y better by calling them by a differ-t name.) General Templer might irly complain that if he was not lowed to use such methods he would ve one arm tied behind his back. et that is precisely the way in which ritain has to carry on its campaign Malaya if it is not to lose its good me. And if one arm is out of action is may have a wonderfully imulating effect on the head.

Struggle for Steel

Both sides in the wage dispute hich threatens to bring the United ates steel industry to a standstill -night are fighting from prepared sitions, and both sides probably er-estimate their strength. The mployers say that they cannot pay wage increase recommended by a ajority vote of the official Wage abilisation Board without putting o steel prices, and they are no doubt oking to public opinion for support what looks like a resolute attempt keep down the cost of living. The ited Steelworkers' Union can claim e moral backing of the official mmendation that a wage increase gher than anything so far offered by e employers is justified, and it is unting on the need for rearmament make the employers' refusal to pay em unpatriotic. Each side reckons at the other will give in fairly ickly once a major strike in the eel industry has actually started, t in industrial struggles as in some storic military campaigns hopes of short, decisive action may prove lse. Even with rearmament there not wholly a seller's market for eel in the United States, and it may en suit some producers to have oduction halted for a while by a

OUR LONDON CORRESPONDENCE

LONDON, Monday Night
By PRIVATE WIRE

SIR ARCHIBALD SINCLAIR, who has been ill for many weeks at Dalnawillan Lodge, Caithness, has come up to London with Lady Sinclair for treatment and is in St Mary's Hospital. He sounds quite cheerful and is allowed up during the day. His treatment in London would have started earlier but for the snow-storms which cut him off from the railway. Sir Archibald does not know how soon he will be able to get back into public life, but is encouraged by the knowledge that his friends both in the Liberal party and outside are eager for him to take his place in the House of Lords with the peerage that was conferred upon him at the New Year.

Liberals are also hoping that the directing secretary of the party, Mr W. R. Davies, will make a speedy recovery from the operation he underwent on Saturday. Mr Davies has taken part in every election since 1907 and has attended every party assembly since 1925.

Subway for Motor Traffic ?

The Kingsway subway entrances were locked this morning though the lights were still on in the empty station at Aldwych. The last trams have now run through it and the future of the tunnel is still undecided. A technical committee appointed by the last Minister of Transport is still considering the problems involved in using the tunnel for motor traffic. They are not simple ones and London Transport decided some time ago that the subway was unsuitable for use by buses without extensive rebuilding. Trams running in indeterminate grooves were able to avoid each other on the bends—some of which are quite sharp —but the margin of safety for buses or trolley-buses is not sufficient. There is also a serious ventilation problem. What can be done about exhaust gases ?

But if these difficulties can be over-come the tunnel will be useful for drawing off a certain amount of traffic which must otherwise reach the Embankment through narrow streets running off the Strand, Aldwych, and Fleet Street.

A Valuable Route

The technical committee is secretive and will not say exactly what prob-lems it is considering—but it has representatives of London Transport, local authorities, and police sitting under the chief highways engineer of the Ministry. Clearly the problems include safety, traffic control, and cost. The last time the subway closed—for conversion to take double-deck trams—it was reopened with-in a year. Perhaps it will not remain closed for long this time: it is too valuable a route to be ignored.

Telegraph Ship

The General Post Office has become quite a substantial dollar earner. A United States company has engaged her Majesty's telegraph ship Monarch to lay cables in American waters and to-morrow she starts her voyage across the Atlantic from Greenwich. The Postmaster-General to-day invited newspaper representatives to inspect the 8,000-ton ship, and told them not only what dollars would be earned but what could be bought with such a sum—48,000 bushels of wheat, or 300,000 pounds of raw cotton. Seen from a distance the Monarch's bows have the elegant profile of a steam yacht, but at close quarters her figure-head turns out to be a ringed snout through which the cable passes. She will lay about 240 miles of cable and earn at least $120,000. Cable is laid at a rate of seven knots and 160 miles can be put down in a day, but that does not mean the dollars will take only a day and a half to earn. The loading of the cables is itself a lengthy operation, and the whole job will last about twelve weeks.

To a landlubber's eye the officers and sailors look like men of the Royal Navy, but in fact they belong neither to the Royal nor to the Merchant but to the Post Office fleet. They are civil servants, or, as one of the stewards put it, "a pretty hybrid lot."

Taxi Drivers' Protest

The taxi drivers have again pro-tested against what they regard as the overcrowding of their trade. They held a meeting to-day at the Seymour Hall and one of the drivers who organised it estimated that 800 cabs and 1,200 drivers were idle while the meeting lasted. The fact that this was scarcely noticeable may go some way to prove one of the men's principal arguments—that London has too many drivers and too few fares. The drivers who met in Marylebone to-day resolved to ask the Home Secretary to forbid the recruitment of new drivers at a time when business is declining and owners can no longer afford to buy new cabs. There are now about 6,000 cabs and 9,200 drivers, many of whom have therefore been compelled to work in shifts.

The Home Secretary, who is ultimately responsible for licensing drivers and for enforcing the strict regulations about the state of the cabs themselves, has so far refused to entertain the drivers' repeated demands that their trade should now be closed. The new cab fares have already induced the public to vote, as it were, with its feet. Whatever Sir David Maxwell Fyfe may think about the state of the cab trade it is obvious that cabs are plentiful and empty because their rates are too expensive.

Glyndebourne Plans

Rossini's opera on the Cinderella theme, "La Cenerentola," opens the Glyndebourne Festival on June 18. Apart from the film, and occasional excerpts such as the final rondo given at the Proms, this delightful opera has not been heard here since the memorable production under Sir Thomas Beecham, with the lamented Spanish singer Supervia in the title rôle. That was one of the delights of Covent Garden in the 1934-5 season. The work should suit Glyndebourne. Carl Ebert is to produce, Oliver Messel to decorate, and Victorio Gui to conduct. The Cinderella will be Marina de Gabarain, of whom many kind things have been said on the Continent ; Ian Wallace and Hervey Allen are the Britons among the seven principals.

A revival of Verdi's "Macbeth" (not given here since the first Edin-burgh Festival) will bring Marko Rothmüller back, and with him, as what Verdi calls simply "Lady," the American soprano Dorothy Dow, a leading light at Zurich among other places. Mozart's "Idomeneo" and "Cosi Fan Tutte," as last year, will be graced by Sena Jurinac. As in previous years since the war, the orchestra (which has to come down from London every night, like the audience) will be the Royal Philharmonic.

"The Terrible Thunderer"

Some of the "million pound German royal treasures," as the Ministry of Works calls them, lent by the Duke of Brunswick and Luneburg, are to be on show at the Tower of London from Wednesday. They are selections made by the Master of the Armouries, Sir James Mann, after three visits to the ducal castle in Marienburg. Among the armour Sir James has chosen to exhibit are twenty sixteenth and seventeenth century suits, including one worn by Duke Julius at his wedding to Hedwig of Brandenburg in 1560.

Sir James also picked a cuirass two and three-quarter inches long, a number of two-handed swords made for Duke Julius, and a collection of highly coloured military uniforms of the eighteenth and nineteenth centuries. Another of the weapons to be shown is "the terrible thunderer," a flintlock made in London for George I, and described in an inscription in French as "a means of ending war and establishing the golden age." The exhibition at the Tower will last until October, and the Victoria and Albert Museum is to show some of the Duke's silver and pictures during the summer.

AMERICAN FOREIGN POLICY

The Futility of the New Isolationism

By David Mitrany

The recent debate on foreign policy in the House of Commons has brought out once more the uneasiness, if not the suspicion, with which American foreign policy is apt to be looked upon in Europe. One must fear that Mr Kennan's book (discussed in the "Manchester Guardian" of February 9 and 21) may cause that suspicion to grow and spread. Yet while his ideas may for the moment aid and abet the small harsh voices of the new "realists" they cannot become a basis for American opinion at large, and therefore for the programme of either of the two great parties on foreign policy, because they misinterpret and misrepresent what has become in America a deeply felt attitude to international relations.

The reason for this can be stated fairly simply. Before doing so I should like, however, to say a word about two (one wants to take issue with many more) of Mr Kennan's secondary arguments ; though secon-dary, they are material to his reason-ing and help to place and date what he advocates. First, his point about the character of diplomatic personnel. Much mischief could be avoided, he thinks, if foreign relations were left to trained and sober-minded profes-sional diplomatists—a plausible asser-tion but not a reliable one. To take only two instances from recent experi-ence : which of the two proved a sounder interpreter and defender of his country's interests when facing the Nazis in Berlin, America's amateur William Dodd or our own professional Nevile Henderson ? It so happens that both countries have had the experience of a foreign dis-pute over oil : who dealt with it more effectively and pacifyingly, the dis-tinguished amateur Dwight Morrow in Mexico or our own professional ambassador lately in Tehran ?

PROFESSIONALISM

The point is linked to a second and wider one, and here Mr Kennan's interpretation is correspondingly wide of the mark. He wants not only more professionals but more professional-ism in the conduct of foreign policy—in other words, that foreign relations should be treated as in former times as a matter for diplomacy. This ignores that Government now enters into every sector of economic and social life, and that in its turn this has tied every one of those sectors to international activities and relations. One need only look at the technical purpose of the endless international conferences which are now the order of the day to see how utterly they are beyond the training and outlook of pro-fessional diplomatists, and a fortiori beyond the purview of diplomacy as Mr Kennan still conceives it.

That brings me to what is the central issue, and the central weak-ness, in Mr Kennan's argument. A return to professional diplomacy is urged merely as the instrument of a return to an earlier brand of foreign relations, a policy based on the pursuit of clear, restricted, and exclu-sive national interests ; a policy, let it be said in fairness to him, which Mr Kennan no doubt would want to be decent in its aims as well as decent in its manners. Mr Kennan is exas-perated by the "sentimental" inter-nationalism of the two late Presidents, Wilson and Franklin Roosevelt, above all by its aspirations to set up a code of moral and legal principles for the conduct of relations between States. He argues that their attempts have in fact hardened the principle of national sovereignty by making all States equal on the basis of "one Government, one vote" (though that has always been so in modern times) without regard to a country's size and effective power ; and that, while designed to do away with war, it has, in fact, made the use of force more vicarious.

All this may be so. Yet in con-trasting his "realistic" approach with the "idealistic" approach of the two Presidents Mr Kennan has failed to perceive—surprisingly so in a person so studious—the deep meaning of the circumstances he assails. Wilson and Roosevelt wanted to get acceptance for a common and controlled code of conduct because they aspired to make a start with some measure of inter-national government. Because they were statesmen of historical stature they grasped that the historical task of our time was no longer merely to keep the nations peacefully apart but to bring them actively together ; and because they grasped this and gave voice to it each of the two Presidents in the two world wars became in his turn automatically the spokesman of world opinion.

A new society is not created with-out long and heavy birth-pangs. Democratic national society also had to begin by recognising each man's equal citizenship, "one man, one vote" ; nor was respect for law and authority achieved without stern restrictions upon those who still tried to act as feudal or economic barons. The process is bound to be longer and harder in the international sphere, but it is inescapable. That is the pro-found meaning of the "legalistic-moralistic approach" which Mr Kennan decries. His own frank preference is for a return to a "balance of power"—a "maximum equilibrium" between legitimate "power, realities, and aspirations,"— to the old state of things, in Canning's words, of "everybody for himself and God for us all."

CONTAINMENT

Mr. Kennan tried to anticipate possible criticism by complaining that such views were likely to be judged as "cynicism and reaction." That Mr Kennan is no cynic is patently transparent ; that does not save his views, however, from being reactionary. Whether he wants it or not, they must land him in the camp of General MacArthur and Senator Taft. The only difference is that while the first is aggressive by temperament and the latter isola-tionist by temperament Mr Kennan joins the two by syllogism. In practice his views found expression in the policy of "containment," which he is reputed to have worked out while in the Department of State, and which became so fashionable an idea with writers here and in America some two years ago. It was not altogether a new idea. The Holy Alliance was devised for a similar purpose ; and it not only contained but even destroyed the military power of Napoleon. But did that check the march of the idea of nationality which Napoleon had used as an instrument in his campaign of expansion and power ? One can con-tain an object or a physical action ; one cannot contain an idea. On the face of it Mr Kennan's appointment to Moscow looks like a shrewd move because he talks the language of "national interest," which is the language of Soviet policy. But it is not the only language of Moscow ; Moscow also utters or whispers the language of social revolution, and it is that which gives it a world-wide hearing and influence. To that Mr Kennan's views offer no counterpart or answer.

The strange effect of a combination of "containment" and national interest is that it would face United States policy with a chain of issues all around the globe, but without a global union of nations, and therefore with a choice between total isola-tionism or total interventionism. When Europeans feel uneasy about American foreign policy they are apt to forget that Americans are increas-ingly distressed about the heavy military and economic responsibilities falling upon their country. The new isolationism tries to exploit that national distress, and Mr Kennan's prescription may appeal to some as likely to assuage both of those burdens ; but only for a time, till the next outbreak of a world crisis. The aspiration and intent of Wilson and Roosevelt, on the other hand, was to relieve such strain for all time by building up, through a special momentary effort, the foundations of a working international society. The two are not choices between

Letters to the Editor

THE TEXTILE SLUMP

To the Editor of the Manchester Guardian
Sir,—The debate in the House last week on the textile industry and the

must lead to a complete breakdown of the existing export system in this country, which had been built up with

NEW FINDS IN JUDEA

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Sir,—The article by your Paris Correspondent is so interesting and illuminating that the only flaw in it, I feel, ought not to remain uncorrected. Bar Kochba, the military leader of the

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research files, Vertical Files Box 4 M ... Shelby White and Leon Levy Archives Center ... is to show some of the Duke's silver and pictures during the summer.

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military and economic responsibilities falling upon their country. The new isolationism tries to exploit that national distress, and Mr Kennan's prescription may appeal to some as likely to assuage both of those burdens; but only for a time, till the next outbreak of a world crisis. The aspiration and intent of Wilson and Roosevelt, on the other hand, was to relieve such strain for all time by building up, through a special momentary effort, the foundations of a working international society.

The two are not choices between different foreign policies, they are choices between two different worlds; and there is no doubt as to which idea has sunk deeply into the consciousness of the mass of American people, especially of its younger generations. The historical sense of Wilson and Roosevelt has been matched by the good sense and generous impulse of the mass of Americans, and evidently the first could not have sprung except from the second. Both expressed the simple but vital proposition, demonstrated by the two world wars, that the conditions of the twentieth century have inescapably merged national interests into world interests. The occasional excess of zeal of American opinion, no less than the continuous sacrifices of the American people, only shows that they want to follow that lesson, not to escape it.

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... the House last ...ustry and the ... finds itself in ...sed import res- ...as very disap- ...gative result.

Government's ...markably weak ...otest expressed ...violation of the ...of international ...regard of exist- ... any concrete ...he effect that ...to the moment ... were imposed ..., if necessary, ...anted.

... that the only ...ation is the ...e purchase tax ...raid that this ...ufficient help to ...try. One has ...ods of all kinds ...oximately £20 ...ods are like an ... the British ... no outlet to ...ntry they were

must lead to a complete breakdown of the existing export system in this country, which had been built up with such great effort (encouraged by the Government), disregarding the tremendous expense.

Exporters have, in the present circumstances, neither the interest nor the creative mood to make new ranges. The loss of one season's trade is most detrimental for the continuity of business. We shall even lose our agents overseas, who have worked so hard for us and who play such an important part in an efficient export organisation, because of financial reasons; loss of commission will force them to take up other agencies.

Pending commitments against English spinners, weavers, printers, &c. cannot be fulfilled if our customers do not fulfil their commitments.

There is no denying that the economic situation of Australia demanded drastic measures. However, is there not the possibility of taking the necessary steps by developing constructive proposals under which contracted goods could be taken into the Australian market within a certain time, while the financing of the goods could be done by using existing Australian funds in this country for payment?

Such or similar methods would result

NEW FINDS IN JUDEA

To the Editor of the Manchester Guardian

Sir,—The article by your Paris Correspondent is so interesting and illuminating that the only flaw in it, I feel, ought not to remain uncorrected. Bar Kochba, the military leader of the last Jewish rising in Palestine (132-135), had the full support of the outstanding Jewish religious authority of the time, Rabbi Akiba (c. 50-132), who applied to him the Biblical verse "There shall come a star from Jacob" (Numbers xxiv.17) in allusion to the name "Kochba," which means "a star" (Sanhedrin fol. 97a). Rabbi Akiba, in fact, acclaimed him as the Messiah and travelled far and wide in his efforts to strengthen Jewish solidarity. Only the more timid Rabbis kept aloof (Cf. Palestinian Talmud, Ta'anith IV). According to a Rabbinic tradition Rabbi Akiba had 24,000 disciples.

When Bar Kochba fell he was named Bar Kozeba, the latter name being derived from a root meaning "deception," though others maintain that that was his original name, being derived from the name of his native town, Kezib, in Northern Galilee. Rabbi Akiba suffered a martyr's death a few years earlier.

The discovery of the two letters of Bar Kochba to which your correspondent refers is indeed an exciting

History At Dawn

THE LIVING PAST. By Ivar Lissner. Translated from the German by J. Maxwell Brownjohn. Illustrated. 444 pp. New York: G. P. Putnam's Sons. $5.95.

By E. B. GARSIDE

THIS survey of ancient civilizations by Ivar Lissner, savant and world-traveler from Riga, is described on the jacket as having been a best seller in several European countries. And there is every reason to believe that it will be as enthusiastically received in America, for it is surely one of the most comprehensive and expertly constructed books of its kind this reader has ever come across.

The key to Mr. Lissner's success is not hard to find: he has mastered his huge subject before proceeding to make a synopsis of it. At the same time he has a gift for putting his finger on essences. Thus he is able to pick and choose with maximum effectiveness from the enormous mass of information that confronts any popularizer in archaeology.

Thorough preparation and intuitive skill also enable Mr. Lissner to take a big step beyond the rhapsodic physical descriptions on which so many

Mr. Garside is a translator and writer in the fields of archaeology and pre-history.

Civilization

WE only learned how to write four or five thousand years ago, but the most important events in our history occurred at widely separated points in that tiny portion of earth-time. Every civilization, every race, has furthered at least one side of human development in its own inimitable fashion; and in the prime of every civilization lie the seeds of its death.—"The Living Past."

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writers in this field depend to enchant the reader. True, he provides all we can assimilate about temples, tombs, pyramids, ziggurats and ornaments of gold, lapis lazuli and cornelian. Again we read, and in more than usual detail, of Egyptian mummies, the Hanging Gardens of Babylon, Cretan bullfights and mazes, the rock reliefs of Darius at Behistun, the Khmer ruins of Angkor Wat, the Great Wall of China, the Sun Pyramid of Teotihuacán, the Circus Maximus, the water supply of Mohenjo-Daro.

The author is not content with a simple rewrite of archaeological texts. Ranging all over the earth, from the Etruscans of Italy to the equally mysterious Ainu primitives of Hokkaido, he delves into law, cus-

Cairo Museum.
Pharaoh Akhenaton and his queen worship the Sun Disk, fourth century, B. C.

A Genius With Figures

NIELS HENRIK ABEL: Mathematician Extraordinary. By Oystein Ore. Illustrated. 277 pp. Minneapolis: University of Minnesota Press. $5.75.

By JOHN G. KEMENY

IN most fields the professional expects to be an apprentice till the age of 30. But poetry and mathematics can claim, among their greatest, men who never reached this age. Most schoolboys know of the tragic deaths of Keats and Shelley, but few of them know of Evariste Galois, the French mathematician, who was killed in a duel at 21, or of the Norwegian mathematician, Niels Henrik Abel, who died at 26.

Abel was the son of a village preacher in the mountains of Norway. He was born in 1802, at the beginning of the century of great mathematicians. He showed little talent till at 16 one of his high-school teachers aroused a new interest in him. At this time Abel had just over ten years left in his life, which he devoted first to the study and then to the enrichment of mathematics. In spite of his untimely death, due to tuberculosis, he is remembered as one of the apostles of what much later became the spirit of modern mathematics.

While Newton and Leibnitz invented the calculus, it remained for the nineteenth century to lay a rigorous foundation under analysis. Abel must be credited with spearheading this movement. He not only worked on the foundations of the field but added greatly to its content. His work on eliptic functions and on infinite series are two outstanding examples. Abel is also credited with the first of many celebrated "impossibility proofs." He demonstrated that, while general formulas were available for the solution of equations up to the fourth degree, no such formula can be given for equations of a higher degree.

DURING much of his short life he was troubled by his health, ceaseless financial difficulties and family worries. But his story is also the story of devoted teachers and patrons of the sciences who discovered his genius early and tried to ease the path of one of Norway's greatest sons.

Oystein Ore, who is Sterling Professor of Mathematics at Yale, performs a great service to the literature of mathematical history with this scholarly work. It is only to be regretted that his devotion to detail often makes the book less than exciting reading. But the reader who is good at skimming a book will find the subject-matter fascinating. Not least among the rewards in reading this book is the vivid picture of the bitter

Mr. Kemeny is chairman of the Mathematics Department at Dartmouth College.

Illustration from "Niels Henrik Abel."
Niels Henrik Abel, by Gustav Vigeland, Royal Park, Oslo.

competition among the pioneers in mathematical research, a picture as true today as 150 years ago.

The book may be read as a plea for civilization to make the life of its rare geniuses easier and happier. Abel spent his last few years vainly seeking a position of permanence and security in academic life. He was in touch with the leaders of the field, but rarely did he benefit by this contact. He never found the courage to see Carl Friedrich Gauss, the recognized monarch of German mathematics, and perhaps the greatest mathematician of all time. And the only result of his meeting with Augustin Cauchy was that what may have been Abel's greatest masterpiece never reached the French Academy.

MR. ORE leaves us with a feeling of shock as to the state of academic research in the early Eighteen Hundreds. One wonders what the fate of young Abel would have been, had his father preached in the United States today. The disease from which the young mathematician suffered is now curable; he might have lived to a ripe old age. There is no shortage of fellowships to help the deserving and even the not so deserving young mathematician. Academic positions in mathematics go begging for the lack of suitable candidates. And while it is true that the reigning sovereigns in the field still are slow to recognize ideas that are very new, the avenues of publication have grown so vast that there is no danger of masterpieces remaining unpublished.

But is it still possible for a man, even for a genius, to master what has since become an enormous field and to leave an undying monument, all in ten short years? The answer is, probably, "No." And while Abel would have comfort and security once he were well launched on his career, one wonders how well we would do today in getting him started. It was the personal attention and guidance of his teachers in secondary school and early in college that woke up the dormant genius. In most of our schools so rare a talent would never be discovered.

A Whirl in

ORPHEUS IN AMERICA: Offenbach's Diary of His Journey to the New World. Translated from the French by Lander MacClintock. Illustrated with drawings by Alajalov and contemporary prints. 200 pp. Bloomington, Ind.: Indiana University Press. $3.95.

By MORRIS GILBERT

WHEN Jacques Offenbach returned to France after a swift centennial-year visitation here in 1876—New York, Philadelphia, inevitably Niagara Falls—he loyally threw together a set of personal impressions of his trip and posted them to the publisher, Calmann-Lévy. They appeared in 1877.

This was standard practice in the tradition of adventurous Europeans who dared to go out to far America. Offenbach was himself, not waspish, like Mrs. Trollope; and he lacked the *snobisme* of Dickens. So his travelogue had not weight or malice or outrage. It had, indeed, as the present astute translator suggests, much ingenuousness. But, as Mr. MacClintock also writes, the little chronicle "is lively, witty, a scattered series of impressions, often superficial, with occasional flashes of acute insight—a fascinating account of life in New York during the second half of the nineteenth century."

What the Americans did not apparently know or care, when they invited Offenbach to conduct thirty concerts at Gilmore's Garden in New York and deposited $1,000 per concert, i.e., $30,000 in a Paris bank prior to his departure, was that Of-

Mr. Gilbert, a member of The Times Sunday staff, has reported on musical events both here and abroad.

From "Orpheus in America."
Jacques Offenbach in New York, 1876.
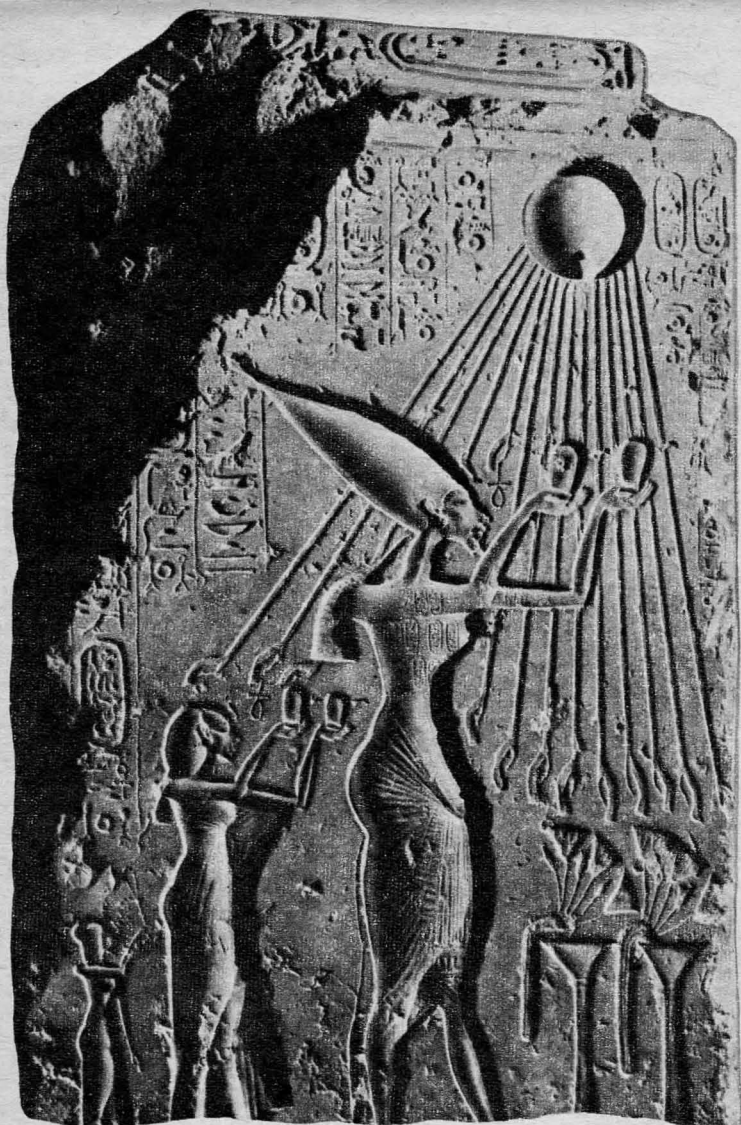
Poisoned Snowballs

THE IMPOSTOR. By Jean Cocteau. Translated from the French by Dorothy Williams. 132 pp. New York: The Noonday Press. $1.25.

THE HOLY TERRORS. By Jean Cocteau. With illustrations by the author. Translated from the French by Rosamond Lehmann. 193 pp. New York: New Directions. $3.

By JUSTIN O'BRIEN

JEAN COCTEAU is a poet who on occasion expresses himself in plays, novels, ballets, drawings or paintings. The novels form the smallest part of his output, for he wrote but three between the ages of 30 and 40 and never returned to the form. All are highly poetic novels of adolescence, catching much of the elusive charm of that transition period. And now, many years after Cocteau's excursion into fiction, the best two of those novels are made available in very sensitive English translations by Dorothy Williams and Rosamond Lehmann.

The very starting point of "The Impostor" lies in the heart of Cocteau's poetic theory, for he has always been concerned with the relation between falsehood and reality. The poet, he tells us, cares nothing for admiration; he merely wants to be believed. Hence Cocteau gives a portrait here of a young myth-maker having a field day during the first world war. Thomas, the impostor, comes to believe his own inventions, like the child playing horse who literally becomes a horse. Thus his death on the battlefield just

Professor of French at Columbia, Mr. O'Brien is the translator of André Gide's Journals.

Camouflage

THE sand-dunes were the show-piece of the sector. They only appeared to be deserted: in reality, they were nothing but stage effects, scenery, sham, traps and contrivances. On their very top was a hidden observation post, which the observer could vacate in a split-second by sliding down on a toboggan. In effect, these dunes which confronted the German telescopes looked like a great tower of cards or an untalkative card-sharper on the surface; on the reverse, they had a never-ending supply of tricks.
—*"The Impostor."*

as he feigns death to avoid being shot provides a perfect ending to his life of prevarication as reality catches up with the make-believe.

Aside from this basic conception, however, which equates the poet with the child, the poetry of this novel becomes apparent only superficially in ingenious images and verbal artifices. The author remains so playful throughout that many readers back in 1923 were shocked by his personal view of the war. Yet one has only to read the memoirs of his friends and certain poems by Cocteau to see that the poet has faithfully depicted the war as he experienced it.

In "The Holy Terrors" (originally titled "Children of the Game" on its appearance in London) the artifice is less apparent and the atmosphere of make-believe more convincing. Starting with a brother and sister who resist the process of

(Continued on Page 36)

Drawing by Jean Cocteau for "The Holy Terrors."

A Touch That's Magic

LAST TALES. By Isak Dinesen. 341 pp. New York: Random House. $4.

By EUDORA WELTY

THE Danish-born author (Baroness Karen Blixen) who writes under the pen name of Isak Dinesen has the straight-out gift for performing illusion, and the resources of mind and heart of a great lady who has lived for a good many years in many different parts of the world. In her tales, one of the extraordinary things is that the spell—for they lie in the realm of magic and romance—gets done by the speed of wit, takes its turn within the circle of morality, and keeps its hold through irony, which usually attends on learning and experience, not enchantment. But I haven't found anything out, for the spells work, too, through the pure delight of the senses.

Isak Dinesen has, of course, a long time ago made herself master of the tale and her three previous books, "Seven Gothic Tales," "Out of Africa" and "Winter's Tales," are well known in this country. Austerely objective in their execution, true to her credo of the storyteller's story, her tales are also extrem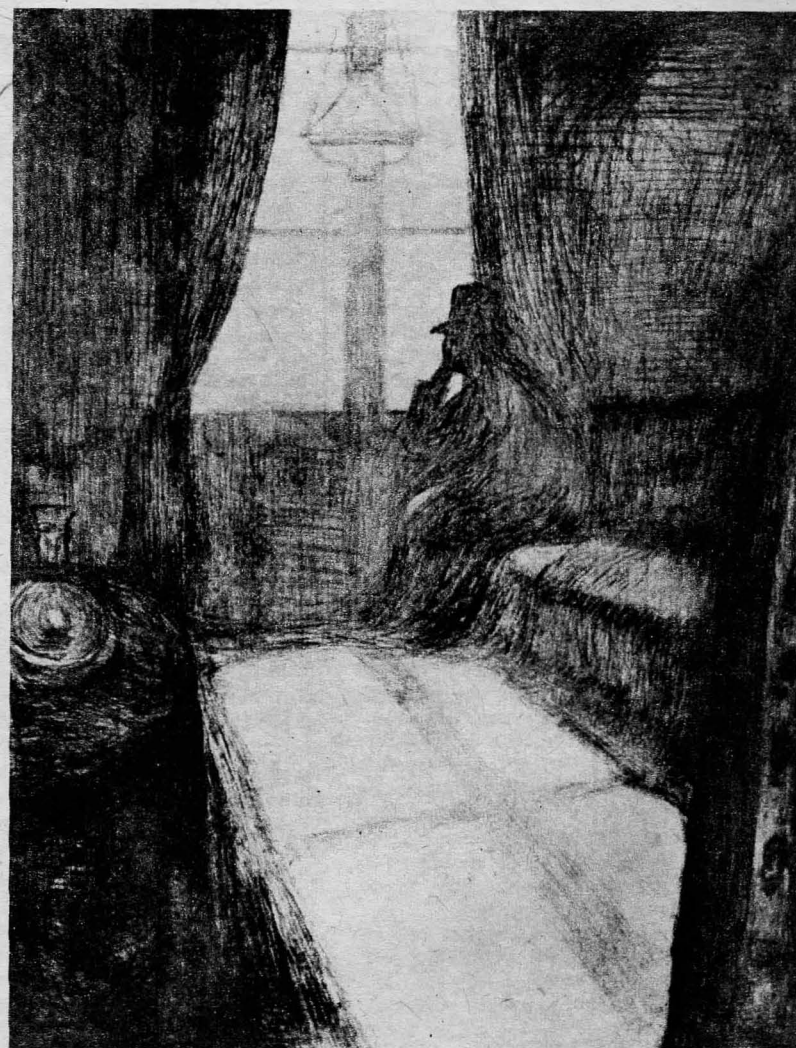ely personal in their point of view, in their great style. They have a vigor which persuades us that vigor perfectly solves the secret of delicacy, for her stories are the essence of delicacy.

She has a marvelous gaiety, and what makes it more marvelous still are its transpositions, true gaiety's other key. Her tales are glimpses out of, rather than into, an extraordinary mind. Sometimes one feels that Isak Dinesen's stories come toward one like the flashes and signal-beams from a lighthouse on a strange and infrequently sighted coast—a coast beautiful and precarious, for it may be the last outreach of magic, but resting on bedrock.

LIKE all her tales, these twelve (her first collection in seventeen years) are like no other tales. They range from country to country, the North to the South—from point to point in time, from here to there in reality. There are tales joined onto other tales, tales inlaid in tales, and one long, disturbingly beautiful, unfinished Gothic tale called "The Caryatids." What is their inner relation and their true domain?

In "Night Walk," a story happening in Italy some centuries ago, a betrayer of his friend who afterwards cannot sleep is told that if he walks through the streets of the city, proceeding always from the

Best known for her short stories, often allegorical, Miss Welty is the author of "The Ponder Heart" and other books.

larger street into the smaller and narrower, until he can turn no further, he will find sleep at the end. He reaches the place: "This moment was a return and a beginning. He stretched out his hand, took care to draw his breath lightly twice, and opened the door. By a table in a little, faintly lit room, a red-haired man was counting his money." Who was the red-haired man? That's the story.

HER tales all have a start in other tales—for a tale must have its "start," as good bread must; as good flowers must, proliferate how they may. Her "starts" are the fables, the fairy tales, stories from the Bible and the Arabian Nights and Ancient Greece and Rome. Sometimes they can be felt to be passing, like a procession not more than one street over; sometimes we see their old rich banners and colors, catch their songs and sight their retinues of seraphic or diabolic origin, and sometimes that procession and the procession of her story cross and mingle, they may even dance, and all the queens and lovers then, the magicians and children and beasts and hunters and wives and gypsies and country gods and artists and angels are of a company together.

Are these tales human? Whatever they are *not,* is irrelevant.

"The divine art is the story," a storyteller says in one of these tales. "In the beginning was the story * * *. Where the storyteller is loyal, eternally and

Drypoint with aquatint by Edvard Munch. Collection The Museum of Modern Art.

unswervingly loyal to the story, there, in the end, silence will speak. * * * We, the faithful, when we have spoken our last word, will hear the voice of silence."

Remembering her "Out of Africa," surely one of the most sensitive personal accounts written in our time, we are moved to think how it is the same eye that saw the Giant Forest Hog on the path in the Ngong Forest that sees the primeval boar in the Gypsy's spell of the water wheel in her tale "The Caryatids." And we realize so clearly that they are visions both, even perhaps of the same thing: one life gave to her and one a story gave to her. Both visions she has let us see, but kept them two.

It is enough to open this book and start reading:

"It was a lovely spring day, and the almond trees were blossoming. * * * From the terrace at the top there was a wide view over the landscape, and all the shapes and colors within it * * * in the cool of the evening were as beautifully harmonious as if an angel had stood behind the shoulder of the observer and poured it all out from his flute."

"Are you sure," a lady asks a storyteller in this book, "that it is God whom you serve?"

"The Cardinal looked up, met her eyes and smiled very gently. 'That,' he said, 'that, Madame, is a risk which the artists and priests of the world have to run.'"

Arthur M. Woodward

REVIEWS

Epigraphica Attica. (Martin Classical Lectures, vol.
ix) By Benjamin Dean Meritt. Cambridge, Mass.: Harvard
University Press; London, Humphrey Milford, 1940. Pp.
x + 157, 22 Figs. $2 (11s. 6d.).

In these four lectures delivered in November 1939 at
Oberlin College, Ohio, Professor Meritt shows us how an
expert epigraphist goes to work. His title might seem at
first sight misleading, for he makes no claim to survey the
whole field of Attic epigraphy - a wellnigh impossible task
even in a work of ten times the length of the present slender
volume. What he actually gives us is an esposition of epi-
graphical method, illustrated by examples taken from Attic
inscriptions, mostly, but by no means entirely, of the
fifth century. His four chapters, corresponding to his
four lectures, deal with Readings, Reconstruction, Lettering,
and Restoration: then follow ten pages of notes which give
all the needful documentation, and an index of inscriptions
discussed.

Readers familiar with Professor Meritt's published work
will find here all the qualities they have learned to expect
in his writings. His extreme accuracy and lucidity in the
presentation of evidence are matched by his candour in facing
difficulties and, no less, in acknowledging those occasional
mistakes of his own which subsequent study or discovery has
enabled him to rectify. He emphasizes, and effectively illus-
trates (esp. pp. 119 ff.), that epigraphy is a progressive
science, owing much to collaboration. Within the space of a

short notice it would be impossible to give an idea of the
learning and wisdom which this book contains, but special
attention may be drawn to his discussion of the following
points: the value and limitations of photographs and
squeezes as compared with the study of the actual text on the
stone; the necessity of regarding an inscription as a three-
dimensional monument, whether or no it is inscribed on more
than one face, and the consequent value of the study of the
lines of fracture in reconstructing an inscription consisting
of scattered fragments. On more controversial topics, such
as the limits within which it is safe or prudent to endeavour
to recognize identical hands in different texts, and the
value of conjectural restoration in mutilated texts,
Professor Meritt appears to follow a wise _via media_ between
over-confidence and excess of caution. The lesson to be
learned from his book as a whole is effectively stated in
his final paragraph: 'However persuasive the argument, or
however plausible the suggestions that may be made for
filling the lacunae in broken texts, there is no hope that
they will be right if they cannot be reconciled to the
physical requirements of the stone on which the texts were
inscribed.' It is by no means only the beginner in epigraphy
who should take this warning to heart.

A. M. W.

Mathematics and Biology

Biology and its related fields appear to be following the course of physics and chemistry in becoming more closely dependent upon mathematical techniques virtually unknown to most biologists of earlier generations.

There are numerous complex processes in living organisms which can be studied by approximately describing their behavior over a period of time by mathematical functions of one sort or another. In the ideal case, biological research will suggest the nature of the initial mathematical approximation, and then the exploration of the equation or set of equations set up may suggest lines for further research and experimentation by the physiologist. The latter's new findings will permit a still better approximation

NY T letr 1963

by the mathematician in a reciprocal and continuing research interaction.

If present trends continue it may well be that medical and biological researchers will need thorough training in such fields as mathematical analysis, modern algebra, and information theory. Yet the traditional training for biology and medicine has not emphasized mathematical preparation. Those planning to go into these fields will find it increasingly necessary to take a careful look at the requirements now emerging.

THE INSTITUTE FOR ADVANCED STUDY
SCHOOL OF MATHEMATICS
PRINCETON, NEW JERSEY

For Dr. Aydelotte   April 19, 1945

THEORETICAL PHYSICISTS AND MATHEMATICIANS

who have been discussed informally by our group

Theoretical Physicists   CONFIDENTIAL

Top rank

Niels Bohr, Director, Copenhagen University Institute for Theoretical Physics.
    Age 59.   Out of the question.   Nobel Prize laureate.

Erwin Schrödinger, Professor of Theoretical Physics, Institute for Advanced Studies,
    Dublin, Eire.   Age 57.   Created the "wave" form of quantum mechanics. (1926).
    Nobel Prize laureate.   Brilliant, but less steady than Pauli.   Already in
    1937, when we compared their relative merits we decided in favor of Pauli.

Werner Heisenberg, Professor in Leipzig until quite recently, but if I am not mis-
    taken now Director of the Kaiser Wilhelm Institute for Theoretical Physics in
    Berlin.   Age 44.   Nobel Prize laureate.   Heisenberg is to be credited with
    the basic idea of the new quantum mechanics, in which observables are repre-
    sented by matrices in a space of infinitely many dimensions.   Although Schrö-
    dinger's work is based on an entirely different idea, Heisenberg's fundamental
    paper was known to him when he started his work.   Dirac's work would have
    been impossible without Heisenberg and Schrödinger.
        Heisenberg considered it his duty to stay in Germany, and on the whole
    took a courageous stand against much of the nonsense the Nazis did in physi-
    cal science.   But his political attitude was never too clear to his friends
    outside Germany, and the impression prevails that his fate is tied up with
    that of Germany.

Paul Adrien Maurice Dirac, Lucasian Professor of Mathematics, Cambridge, since 1932;
    Fellow of St. John's College, Cambridge;   now at Cavendish Laboratory, Cam-
    bridge, England.   Age 42.   Outstanding achievement: relativistic quantum
    equation for the electron.   More speculative than Pauli.   Concentrates on
    the most fundamental questions of quantum physics.   Nobel Prize laureate.

Enrico Fermi, Professor of Physics, Columbia University, since 1939.   Age 43.
    Early work in theoretical physics rates almost as high as Pauli's.   He de-
    veloped that sort of statistics for particles ("Fermi statistics") which cor-
    responds to Pauli's exclusion principle.   In his last years in Italy, and
    since he came to this country, he has developed more toward the experimental
    side (transformation of elements by bombardment with neutrons, nuclear physics),
    and now definitely needs and wants a laboratory.   Nobel Prize laureate.

Second rank

George Gamow, Professor of Physics, George Washington University, since 1934.
    Age 44, Russian origin.   Main achievement: quantum theory of radioactive de-
    composition, which he developed simultaneously with E.U.Condon and R.W.Gurney.

Hans Albrecht Bethe, Professor of Physics, Cornell, since 1937. Age 38, German
    origin. Very versatile theoretical physicist. Outstanding work in quan-
    tum theory of crystals, astrophysics; also nuclear physics.

Eugene Paul Wigner, Jones Professor of Theoretical Physics at Princeton University
    since 1938; now doing research work at University of Chicago. Age 42,
    Hungarian origin. Stronger on the mathematical side than most theoretical
    physicists. Main achievement: group-theoretical aspect of quantum mechanics.

W. Heitler, Professor of Theoretical Physics, Dublin Institute for Advanced Studies.
    Age probably a little over 40; German origin. Main achievement: showed the
    importance of the quantum mechanical exchange energy for chemical bindings
    (jointly with F. London); recent work in meson theory.

These four men are of the same rank as Oppenheimer, all several steps lower than
Pauli; but Oppenheimer is the most inspiring for younger physicists. In my opinion
Bethe is the strongest and Heitler the weakest in this group of 4; but that is purely
subjective.

Mathematicians

André Weil, now at the University of São Paulo, Brazil. Age 39, French origin.
    A mathematician of the same type as Siegel, and among all those mentioned here
    the one who probably comes nearest to him in rank. (Might be a somewhat diffi-
    cult colleague.) *Algebra*

Kurt Gödel. Age 39, Austrian origin. Extraordinary in the particular field of
    mathematical logic; but that is a somewhat limited field.

Emil Artin, Professor of Mathematics, Indiana University; since 1939 was Professor at University
    of Hamburg before he came here. Age 47; Austrian origin. Very brilliant as
    a young man, in particular in algebra and number theory. Ten years ago I should
    have rated Artin as high as Siegel. Since then Artin has fallen off, while
    Siegel has been on the ascent.

Oscar Zariski, Professor of Mathematics, Johns Hopkins, since 1937. Age 46, Polish
    origin. Had his mathematical training mainly in Italy. Excellent work in
    algebraic geometry, where he combines the great Italian tradition with the more
    modern and abstract algebraic methods.

Hassler Whitney, Associate Professor, Harvard, and Witold Hurewicz, Assistant Professor,
    University of North Carolina. Whitney, age 38; Hurewicz, age 41, of Polish
    origin. The two outstanding younger topologists: Lefschetz rates Whitney,
    Alexander rates Hurewicz, the higher.

Garrett Birkhoff, Associate Professor, Harvard. Age 34. Outstanding work in algebra
    of the more abstract type.

Norbert Wiener

Hassler Whitney, Associate Professor, Harvard, since 1940, and Witold Hurewicz, Assistant
    Professor, University of North Carolina. Whitney, age 38; Hurewicz, age 41, of
    Polish origin. The two outstanding younger topologists: Lefschetz rates Whitney,
    Alexander rates Hurewicz, the higher. Hurewicz comes from the school of the
    great Dutch topologist, L.E.J.Brouwer.

For Dr. Aydelotte - 3   April 19, 1945

Garrett Birkhoff, Associate Professor, Harvard, since 1941.   Age 34.   Outstanding work
    in algebra of the more abstract type;   but much weaker than, for instance, André
    Weil.

Norbert Wiener, Professor, M.I.T., since 1932.   Age 50.   Probably the strongest man
    America now has in analysis, but abroad the Finn Rolf Nevanlinna is at least of
    the same rank, and Harald Bohr comes pretty close.   His strength is impressive,
    but Siegel in his fields is even more original and strong.   He is certainly
    very far from Siegel's perfection.   His enthusiasm makes him an inspiring
    teacher, but his uncritical and extremely egocentric attitude warps his judg-
    ments.   Not easy to get along with.

There is no doubt that if we cannot get Siegel, we should have to come down several
steps for an appointment in mathematics.

                                                    Hermann Weyl

HW:GB   Hermann Weyl

S. Math.

THE INSTITUTE FOR ADVANCED STUDY
SCHOOL OF MATHEMATICS
PRINCETON, NEW JERSEY

For Dr. Aydelotte

March 16, 1945

THEORETICAL PHYSICISTS AND MATHEMATICIANS
who have been discussed informally by our group

Theoretical Physicists

Top rank

Niels Bohr, age 59.   Out of the question.

E. Schrödinger, age 57, now at Institute for Advanced Studies at Dublin, Eire. Created the "wave" form of quantum mechanics (1926).   Nobel Prize laureate. Brilliant, but less steady than Pauli.   Already in 1937, when we compared their relative merits we decided in favor of Pauli.

W. Heisenberg -- his fate seems to be tied up with that of Germany.

P.A.M.Dirac, age 42.   Outstanding achievement: relativistic quantum equation for the electron.   More speculative than Pauli.   Concentrates on the most fundamental questions of quantum physics.   Nobel Prize laureate.

E. Fermi, age 43.   Early work in theoretical physics rates almost as high as Pauli's.   Has developed more towards the experimental side, and now definitely needs and wants a laboratory.

Second rank

G. Gamow, age 44, George Washington University.   Main achievement: quantum theory of radioactive decomposition (simultaneously with some other physicists)

H.A.Bethe, age 38, Cornell University.   Quantum theory of crystals, nuclear physics, astrophysics.

E.P.Wigner, age 42, Princeton University.   Main achievement: group-theoretical aspect of quantum mechanics.

W. Heitler, Institute for Advanced Studies, Dublin.   Main achievement: showed the importance of the quantum mechanical exchange energy for chemical bindings (jointly with F. London);   recent work in meson theory.

These four men are of the same rank as Oppenheimer, but Oppenheimer is the most inspiring for younger physicists.

Mathematicians

André Weil, age 39, is a mathematician of the same type as Siegel, though not quite of the same rank.   (Might be a somewhat difficult colleague.)

K. Gödel, age 39 -- extraordinary in the particular field of mathematical logic; but that is a very limited field.

E. Artin, age 47, University of Indiana.   Very brilliant as a young man.   Ten years ago I should have rated Artin as high as Siegel.   Since then Artin has fallen off, while Siegel has been on the ascent.

For Dr. Aydelotte - 2   March 16, 1945

Mathematicians (Continued)

O. Zariski, age 46, Johns Hopkins.   Excellent work in algebraic geometry.

Hassler Whitney, age 38, Harvard, and W. Hurewicz, age 41, University of N.Carolina.
    The two outstanding younger topologists: Lefschetz rates Whitney, Alexander
    rates Hurewicz, the higher.

Garrett Birkhoff, age 34, Harvard.   Outstanding work in algebra of the more ab-
    stract type.

There is no doubt that if we cannot get Siegel, we should have to come down several
steps for an appointment in mathematics.

HW:GB   Hermann Weyl

March 15, 1945

Pauli

Backed by the Rockefeller Foundation, we invited Pauli (along with Niels Bohr) in 1940 when the Nazis invaded the North European neutral countries. The authorities of the Technische Hochschule in Zürich granted him leave of absence for a limited period. The war prevented his return in time, but he is clearly under obligation to resume his duties in Zürich as soon as it is possible for him to go back. Making him our offer before this happens would obviously increase our chances, and would tend to eliminate complications arising from his citizenship status.

Siegel

escaped from Germany in 1940. He took out first papers and resigned his position in Göttingen. But it seems that his resignation has never been accepted.

HW:GB

Gödel

M Vert

<u>This is a textual reproduction of the remarks that I made to Gödel at the presentation of the Albert Einstein Award at Princeton, March 1951.</u> I hope they are sufficiently informative.   JvN.

Kurt Gödel's achievement in modern logic is singular and monumental --
indeed it is more than a monument, it is a land mark which will remain visible
far in space and time. Whether anything comparable to it has occurred in the
logic of modern times may be debated. In any case, the conceivable proxima are
very, very few. The subject of logic has certainly completely changed its nature
and possibilities with Gödel's achievement.

Gödel's name is associated with many important achievements in detail, and
with two absolutely decisive ones. The occasion is such that I think I should
only talk about the two latter.

The nature of the first one is easy to indicate, although its exact tech-
nical character and execution escape an adequate characterization without the
specialized and rather intricate techniques of formal logic.

Gödel was the first man to demonstrate that certain mathematical theorems
can neither be proved nor disproved with the accepted, rigorous methods of mathe-
matics. In other words, he demonstrated the existence of undecidable mathematical
propositions. He proved furthermore that a very important specific proposition
belonged to this class of undecidable problems: The question, as to whether mathe-
matics is free of inner contradictions. The result is remarkable in its quasi-
paradoxical "self-denial": It will never be possible to acquire with mathematical
means the certainty that mathematics does not contain contradictions. It must be
emphasized that the important point is, that this is not a philosophical principle
or a plausible intellectual attitude, but the result of a rigorous mathematical
proof of an extremely sophisticated kind.

The formulation that I gave above has coarsened the result and obliterated
some of the fine points of its rigorous formulation, but if one is to state the
theorem without having recourse to the difficult technical language of formal
logic this is, I think, the best approximation that one can achieve.

Gödel actually proved this theorem, not with respect to mathematics only,
but for all systems which permit a formalization, that is a rigorous and ex-
haustive description, in terms of modern logic: For no such system can its
freedom from inner contradictions be demonstrated with the means of the system
itself.

Gödel's second decisive result can only be stated in the terminology of
formal logic and of an important but rather abstruse modern mathematical disci-
pline: Set theory. Two surmised theorems of set theory, or rather two principles,
the so-called "Principle of Choice" and the so-called "Continuum Hypothesis" re-
sisted for about 50 years all attempts of demonstration. Gödel proved that neither
of the two can be disproved with mathematical means. For one of them we know,
that it can not be proved either, for the other the same seems likely, although
it does not seem likely that a lesser man than Gödel will be able to prove this.

I will not attempt a detailed evaluation of these achievements, I will limit myself to repeat: In the history of logic, they are entirely singular. No indemonstrability within mathematics proper had ever been rigorously established before Godel. The subject of logic will never again be the same.

* * * *

PRINCETON (HARVARD, J. H., U. CHICAGO,   Educational Institutions
    MICH, COL.)

VON NEUMANN   Biographical

AYDELOTTE, F.
MATHEMATICS   Academic Activities.

  Von Neumann to Aydelotte on comparative ranking, domestic
and international, of schools of mathematics.

  Filed in Vertical File under "M" for School of Mathematics

F. A., 1/8/57

THE INSTITUTE FOR ADVANCED STUDY
SCHOOL OF MATHEMATICS
PRINCETON, NEW JERSEY

July 23, 1941

Dear Doctor Aydelotte:

On your last visit in Princeton you asked me to repeat in writing some of the things we discussed concerning the mathematical niveau and structure of various universities.

I think that it is beyond doubt that the Princeton group -- by this I mean the Institute, plus Princeton University, plus such temporary (alas) members of the Institute as Gödel and Siegel -- is the strongest and most widely interested group of mathematicians existing anywhere at this moment. The other principal center of mathematical science in this country is Cambridge, Massachusetts,-- again taking Harvard and Massachusetts Institute of Technology together. That group contains four or five unquestionably first rate men who cover a wide variety of subjects. Next important centers which should be mentioned are, I think, Chicago, Johns Hopkins, Michigan, Columbia. But the Institute and Harvard are probably the leading ones. If one should judge by sustained first-rate quality over a longer period (the last thirty years), then the first place probably should be shared by Princeton University and Harvard.

In the international field the greatest mathematical centers in our generation were Cambridge (England), Göttingen, and Moscow. There was also a center of very high mathematical quality in existence in Poland, which of course has been completely broken up and destroyed by the war. The last ten years have also shown a very promising development in Japan, but it might be too early to judge that as yet. French mathematics has lost much of the important role it had in previous generations, but the last ten years saw a considerable renascence, although more under outside influence than in continuation of the French tradition. You understand, of course, how subjective all these views are; also how arbitrary and unreliable all comparisons of quality and (horribile dictu!) quantity in science are. But if you had to compare the present establishment in Princeton with the best international centers -- that is, Cambridge (England), Göttingen and Paris, in their respective primes -- I would say this: I think that Princeton is comparable to any of them in pure mathematics, but that they were probably better integrated in the direction of applications. By applications I mean both mathematical physics and applied mathematics proper.

I hope you won't mind if I conclude with one more disclaimer of reliability of such comparisons. Perhaps you will nevertheless find them not completely useless.

Dr. Frank Aydelotte
Stockbridge
Massachusetts
JvN:GB

Sincerely yours,

John von Neumann,

John von Neumann

MEMBERS   Academic Personnel

SCHOOL OF MATHEMATICS   Academic Organization

    Digest of members for School of Mathematics for years
1933-42 with source and grants.

    Filed in Vertical File under "M" for Members.

F. A., 1/8/57

    Dr. Aydelotte:

Miss Blake handed this to me for you and says
that it is very close.

               B. A. Miller

July 14, 1941

STATEMENT RE TEMPORARY MEMBERS OF IAS. SCHOOL OF MATHEMATICS
(including visiting professors like Dirac, but exclusive of assistants)

Numbers are approximate:

Candidates include not only formal applicants, but candidates suggested by the IAS professors for invitations, and others suggested from outside

Members registered include some who resigned their stipends after a couple months, and others who planned very short visits

Positions held,- information received not always accurate ("Prof. 1936-41" when given in 1941 is not sure to mean position terminated 1941. Dates of termination of European positions not always reported.)

From abroad includes all who first came to the IAS from abroad, though Bergmann, for instance, has remained at the IAS for 5 years

IAS stipends include payments administered by IAS from special funds from outside earmarked for special individuals,- e.g. Fubini and Pauli; also payments of as little as $200 per year

	Number of Candidates	Members Registered	Holding Positions	Without Position	From Abroad	From U.S.	With IAS Stipends	Other Fellowships
1933-34	*	23	12	11	5	18	9	8 [1)]
1934-35	*	36	16 [2)]	20	8	28	19	12 [3)]
1935-36	59	43	14	29	19	25	25	14 [4)]
1936-37	52	47	21	26	19	28	21	13 [5)]
1937-38	55	25	13	12	8	17	17	2 [6)]
1938-39	53	23	12	11	11	12	15	2 [7)]
1939-40	57	23	13	10	7	16	14	5 [8)]
1940-41	48	23	11	12	9	14	11	5 [9)]
1941-42	34?	25?	8?	17?	13?	12?	9?	9? [10)]
	358	268	120	148	99	170	140	70

1) 3 Rockefeller Foundation; 5 NRC.

2) Including 2 part time during 1934-35 ?

3) 2 RF; 10 NRC. ched w/ Petrie

4) Inst.Internatl.Ed. 1; CRB 2; NRC 5; Phil.Soc. 1; Baldwin Piano Co. support of research employee; Cambridge Univ. 1; Commonwealth Fund 3

5) 1 CRB; 5 NRC; 1 Junta de Ampliacion de Estudios; 1 Amer.Asso.Univ.Women; 2 Commonwealth; 1 Grant from Carnegie Trust and St. John's College, Cambridge; 1 Univ. of Oslo; 1 Academia Sinica; 1 Carnegie Trust (Scotch) Fellowship

6) 1 NRC; 1 Grants from Carnegie Trust and St. John's College, Cambridge

7) 1 CRB; 1 Commonwealth

8) 1 C.B.Keen (Brown Univ.); 1 Commonwealth; 1 Leverhulme; 1 Univ. of Mich.; 1 Rhodes

9) 3 NRC; 1 Emmy Noether (Bryn Mawr); 1 Guggenheim

10) 1 Rosenwald; 4? Guggenheim; 2 NRC; 1 Univ. of Mich.; 1 Sheldon (Harvard)

* No record.

July 14, 1941

OCCASIONAL VISITING LECTURERS

Not surely complete

(Usually $50 honorarium per lecture; sometimes Princeton maintenance only)

1934-35
    Prof. Carl L. Siegel
    Prof. Emmy Noether (No honorarium)

1935-36
    Prof. Max von Laue
    Prof. C. E. Weatherburn
    Prof. Otto Szász
    Prof. Kazimierz Kuratowski

1936-37
    Prof. T. Vijayaraghavan (about $123)
    Prof. Niels Bohr (about $125)
    Prof. Karl Menger (about $56)

1937-38
    Prof. Karl Menger ($100)
    Prof. Emil Artin ($100)
    Prof. Oystein Ore

1938-39
    Prof. A. A. Albert
    Prof. Arnaud Denjoy
    Prof. Hassler Whitney

1939-40
    Prof. Alfred Tarski

1940-41
    Prof. A. A. Albert
    Dr. Victor F. Weisskopf (Entertainment only)

SCHOOL OF HUMANISTIC STUDIES   Academic Organization

SCHOOL OF MATHEMATICS

MORSE   Biographical

AYDELOTTE, F.

     Original or Morse to Aydelotte on his Trustee Report on
Humanistic Studies and stressing mathematics as humanistic
studies and as an art. Important and valuable.

     Filed in Vertical File under "M" for School of Mathematics.

F. A., 1/8/57

THE INSTITUTE FOR ADVANCED STUDY
SCHOOL OF MATHEMATICS
PRINCETON, NEW JERSEY

June 5, 1941

Dear Doctor Aydelotte:

The report on the School of Humanistic Studies seems to me to be most admirable. In particular I would underline the idea that the Humanistic Studies are critical examinations "of that organized tradition which we call civilization and which it is the purpose of this war to preserve". I appreciate fully Miss Goldman's comment concerning our present dependence upon the great foundations, and the importance of our becoming financially more independent. In my opinion the scholars of the School of Humanistic Studies are adhering to the purposes for which the Institute was founded. These purposes, I believe, remain the principal justification for the existence of the Institute.

There is one implication (probably unintentional) of the report on which I would like to comment. As far as the Humanistic Studies are concerned, this comment is unimportant. To make my point clear, I shall quote two sentences from the report:

> "I rejoice that the members of our School of Mathematics are at present engaged on various important and confidential tasks connected with ballistics and aviation, of direct use in the prosecution of the war. *****
> It seems to me that all the disciplines which are included under the term humanities have a value which, while entirely different, is nevertheless of supreme importance."

I do not believe that the traditional influence of mathematics, its purposes, or its associations, are "entirely different" from the influence, purposes or associations of the humanities. Mathematics is both an art and a science. As a science it is classified with studies which are materialistic, such as chemistry or economics; as an art it is subject to the criticisms which are made of the humanities. In spirit we mathematicians at the Institute would cast our lot in with the humanists. Historically and traditionally, over the long range of years we belong there. It was so at the time of the Greeks, and has remained so through the days of Thomas Aquinas, Leonardo and Leibniz. The Christian church has ever used Aristotelian logic.

The humanists are finding that the study of the history of mathematics and science in general, like Panofsky's study of art, helps much in the broad understanding of civilization. Mathematicians are the freest and most fiercely individualistic of artists. They are subject to no limitations of materials or

instruments. Their direction at any time is largely determined by their tastes
and intellectual curiosity. Their studies are really the studies of the human
mind. To me the work of Einstein is even more important as a free and beautiful
expression of the creative imagination of an individual than as a part of the
science of physics. That this point of view be recognized is of tremendous im-
portance to civilization in general and to democracy in particular.

We engage in the study of ballistics or aviation as loyal citizens of
America, just as some of us served as soldiers in the last war. Our duty in
this respect is clear; but over and above this present use of our faculties,
stand the great ideals and purposes for which the Institute was founded and
which we wish to serve.

I have not written at length concerning the major paragraphs of your
report because I agree with them wholeheartedly. I hope my comment on your ref-
erence to mathematics will be helpful. I am grateful for this opportunity to
read the report before its presentation.

Cordially yours,

Marston Morse

Marston Morse

Dr. Frank Aydelotte
MM:GB

MATHEMATICS IN THE DEFENSE PROGRAM

by

MARSTON MORSE

Chairman of the War Preparedness Committee
of the American Mathematical Society and Mathematical
Association of America

Institute for Advanced Study
Princeton, N. J.

Address delivered before the National Council
of Teachers of Mathematics at Atlantic City
on February 21, 1941.

The American Mathematical Society and the Mathematical Association of America number some 5000 members. The American Mathematical Society is devoted primarily to the development of research in mathematics, and the Mathematical Association of America to the teaching of mathematics. About a year ago these societies appointed a committee known as the War Preparedness Committee, to prepare the two societies to be useful to our nation in time of war. The ways and means of doing this were not prescribed, but were left to the committee. Before I give you details about our organization and aims it will be helpful to make a few remarks concerning the role of science in defense in general.

The most effective employment of science in a defense program must include the use not only of the facts of science, but also of the methods and men. In time of war science must be resourceful and inventive and capable of quick analysis of emergency problems. The defense against the magnetic mine by the English is a magnificent example of the immediate application of theory to practice. Theoretical science cannot be neglected; for it is the reservoir of general methods any one of which may be needed. But theoretical science should be in a form in which it can be quickly applied. We should further develop the technique of making applications.

This is particularly true of mathematics. North America leads the world in pure mathematics. We are also strong in the simpler applications appearing in ordinary engineering or industrial practice; but we have preferred experiment to theory and have tended to use the laboratory to obtain results which might have been predicted. This is in contrast to the situation in Europe, where tradition as well as material necessity have produced engineers with greater theoretical knowledge and training. This state of affairs should be remedied; for in time of war we cannot take the time to experiment.

We are beginning to correct this situation. In this we are aided by a number of European experts of great talent and ability. Several of the leading authorities on aerodynamics of Germany are now refugees in this country. The leading mathematical authority on ballistics of Italy, is also a refugee and is lecturing in this country. In addition, there are a few Americans who are well trained in these fields. But these authorities are in such demand from industry for immediate purposes that they have little time for teaching or general education and research.

I have given you one reason why this bottleneck has arisen. There is another reason which goes very deep. It is our national suspicion of theory, on the part of the general public. We are perilously lowbrow. This is dangerous in a democracy where the great motivating forces must come from the people. One result has been a lack of cooperation between the theoretically-minded scientist and the practically-minded scientist. The pure scientists have intensified their study of science for science's sake, and the applied scientists have adhered to "common sense" and the laboratory. It is one of the problems of education to show that the more mature and socially-minded way is to respect both theory and practice, and particularly their combination.

In this connection I wish to refer you to a pamphlet on Science in War, written by twenty English scientists during the last year. This book is in the Penguin series, costs twenty-five cents, and may be ordered from New York at any bookstore. It is an illuminating account of the success of science when used in the English defense, and of the difficulties in getting science used. Here are discussed the problems of nutrition, of agriculture, of stock-breeding and planting, and of the reactions of the Civil Service and tradition to these problems. There is the problem of rationing, of the hours of labor, of the care of the

wounded and prevention of disease, the dispute between the artists and naturalists over camouflage, the uses of mechanical science, the problems of morale and propaganda. On reading this book one sees clearly the necessity in a democracy of an adequate understanding of science by the general public, and as a corollary the fundamental need of education in the methods and aims of science, as well as in the facts.

With the foregoing in mind I shall now describe the aims and organization of the War Preparedness Committee.

Our objectives may be listed under five heads:

1. <u>Research</u>. The solution of mathematical problems essential for military or naval science, or rearmament.

2. <u>Preparation for Research</u>. The preparation of professional mathematicians for such research.

3. <u>Education for Service</u>. The strengthening of mathematical education in our schools and colleges to the point where it affords adequate preparation in mathematics for military and naval service or rearmament.

4. <u>Military and Naval texts</u>. The study by a large group of mathematicians of the current routine military texts and sources wherein mathematics is involved,- to obtain <u>certain</u> knowledge of what should be taught in the schools and colleges, and in order that mathematicians may be able to aid in the re-vision of these texts if and when their aid is needed.

5. <u>Roster of Personnel</u>. The collection of specialized information concerning mathe-maticians, similar to that in the national roster but more detailed as to mathematical training; and the making of this information available to all scientific or military committees or organizations aiding in the defense.

To carry out these objectives three subcommittees were appointed with the following titles:

1. Research
2. Preparation for Research
3. Education for Service

It is the last committee, on Education for Service, in which you are naturally most interested, but I shall first tell you about the other two committees.

<u>Committee on Research</u>. This committee is headed by Professor Dunham Jackson of the University of Minnesota. It is ready to receive mathematical problems important for the national defense, and will seek to solve these problems. To aid this committee we have appointed consultants in each of six fields. These fields are as follows:

Aeronautics
Ballistics
Computation (numerical, mechanical, electrical)
Cryptanalysis
Industry
Probability and Statistics

The chief consultant in <u>aeronautics</u> is Professor Bateman of the Cali-fornia Institute of Technology. This is perhaps the most difficult of all the

fields, and one of the most important. Thousands of hours of mathematical labor go into the design of each new type of aeroplane. There is the problem of the flow of air by moving objects and the problem of the determination of surfaces of least resistance and greatest lifting power. The problem of flutter is a very troublesome one, but nevertheless admits a mathematical approach. An essential tool here is the theory of conformal mapping. Those who wish further details may refer to a paper entitled "The engineer grapples with non-linear problems" by Theodore von Kármán, in the Bulletin of the American Mathematical Society of 1940.

The chief consultant in <u>ballistics</u> is John von Neumann of the Institute for Advanced Study at Princeton, N. J. The Government maintains its proving grounds at Aberdeen, Maryland, and Dahlgren, Virginia, and has several able mathematicians at work in this field. These men are charged with the proper design of guns and projectiles, with their testing, and the making of tables. The problem of bombsights is also referred to them. An interesting discovery of the last few years is the close connection between the theory of projectiles and that of high speed aeroplanes. High speed projectiles move at a velocity somewhat greater than that of sound, while the maximum speed of aeroplanes is now nearly two-thirds that of sound. It is therefore natural that ballistics and aerodynamics should be intimately related. The speed of sound is critical for bodies moving in the air. The tremendous resistance met at this speed seems to indicate that the maximum velocity at which aeroplanes can fly is fast being approached.

Professor Norbert Wiener of the Massachusetts Institute of Technology is the chief consultant in <u>computation</u>. A great deal of the computational work at the Aberdeen Proving Ground is now done by mechanical means by the so-called Bush Analyser. This is an intricate and expensive machine occupying a large room and capable of giving the numerical solutions of an important class of differential equations. Since the original machine was set up at Massachusetts Institute of Technology some ten years ago, several larger and better ones have been built. In the whole world at the present time there are not more than ten such machines. Professor Wiener is working on the problem of using this machine or similar machines to solve partial differential equations. If accomplished, this would be an important aid for applied mathematics. In spite of the existence of these machines, much computation still has to be done in the old-fashioned way. Fortunately for this country, we have a number of experts on numerical computation.

<u>Cryptanalysis</u> is the science of the making and solving of codes and cyphers. There is ample literature on the subject and by virtue of its intriguing nature it might appeal to students of high school age. The chief consultant is Professor Engstrom of Yale. Professor Engstrom is an officer in the Naval Reserve and with his aid a number of able young mathematicians are making an intensive study of cryptanalysis. It is possible to use the latest and most powerful algebras to make codes that are unbreakable. The catch is that complex codes are difficult to transmit without mutilation. Ordinary code theory involves a use of frequency tables and much ingenuity. It was only during the last war that the Germans discovered that it was better to employ statisticians than philologists in this branch of the military service. Here is a field in which mathematicians are very useful.

The chief consultant in <u>Industry</u> is Dr. Thornton C. Fry, Mathematical Research Director of the Bell Telephone Laboratories. Dr. Fry is associated with important defense work. Since this work is confidential in nature I cannot give you a description. But for our purposes, a most significant pamphlet has just been written by Dr. Fry called "Industrial Mathematics". This can be purchased from the National Research Council of 2101 Constitution Avenue, Washington, D. C.

In this pamphlet Dr. Fry enumerates the industries which use professional mathematicians, and describes the type of mathematics which they use. There are more than fifty corporations employing more than 100 mathematicians. He finds that integral equations are used in prospecting for oil, matrix algebra in studying the vibration of aircraft wings and in electric circuit theory, the calculus of variations in improving the efficiency of relays, the theory of numbers in the design of reduction gears, and in splicing telephone cables, and topology in the classification of electric networks. He points out that there is no place in this country where a mathematical consultant for industry can be trained as such. Such a man studies as an engineer, or a physicist, or a mathematician, and must be partially self-trained to serve as a mathematician in industry. Fry's plea for better training in the field confirms the emphasis of our committee on training in applied mathematics. Moreover, in this field the demand for men exceeds the supply.

Professor S. S. Wilks of Princeton University is the chief consultant in probability and statistics. I shall quote Wilks as follows:

> "In a war emergency the greatest service which can be rendered by probability and statistics is of the nature of routine and practical applications. Because of the extreme importance of mass production techniques in modern warfare the feeling is very general that statistical methods of quality control such as those used by Shewhart in the Bell Telephone Laboratories would be valuable. Another main technique is that of sampling surveys and their application to the problem of stores and supplies, personnel selection, transportation, communication, etc. There is also the problem of statistical analysis of data obtained in bombing practice and in range firing."

Preparation for Research. The second main subcommittee on "Preparation for Research" is headed by Professor Marshall H. Stone of Harvard University. It is concerned with the professional education of mathematicians to the end that they may be available for research on mathematical problems of the defense. Up to date expositions of ballistics, aerodynamics and hydrodynamics are not available. This committee is concerned with this lack. It seeks to encourage the giving of special courses on applied mathematics in the various graduate schools, and a number of these courses are now being given. Bibliographies need to be published and special seminars on mathematics of the defense need to be arranged at various scientific gatherings. This is a work of great importance, but one that will take time. It is an essential part of the proposed development of applied mathematics.

Education for Service. The third committee, and the one in which you are undoubtedly most interested, is on Education for Service. Its Chairman is Professor William L. Hart of the University of Minnesota. At my suggestion his committee embarked on a vigorous campaign of investigation of mathematical education in the secondary schools and of undergraduate mathematical education in the colleges, in relation to the national defense. The objectives as formulated by his committee are as follows:

1. To investigate what mathematics is of prime utility in industry and in the Army and Navy in the national defense.

2. In accordance with the results of this investigation, to make useful recommendations in regard to mathematical curricula at both the secondary and college levels.

3. To determine in what ways mathematicians may aid in the preparation of textbook material and in the teaching of those who will have mathematical duties in industry or as enlisted men or officers.

Professor Hart conferred with the officers in charge of the R.O.T.C. at the University of Minnesota, with teachers of aeronautical engineering, and with teachers of ground school courses in the Civil Aeronautics Program. He visited two warships and some major coast defenses of the Army, and examined the workings of a major aircraft plant. He has drawn upon his experience as a major of artillery during the World War. At my recommendation his committee obtained textbooks of a mathematical nature employed in the R.O.T.C., for ground school courses for pilots, and for various service schools maintained by the Army. No consideration was given to training at West Point and Annapolis because the officers from these schools are exceptionally well prepared for their duties. His report concerns mathematical aspects of the preparation of all others, officers or men, who will eventually enter the national service.

A representative sample of the military textbooks which such men would study was sent to various mathematicians to review. I have some of these reviews with me and shall be glad to show them to anyone of you who may be interested. I shall continue with a reading of parts of Professor Hart's report as presented to a group of teachers in Minneapolis:

"One object of these reviews is to learn at first hand what mathematics is a minimum essential for the study of the texts and for the performance of field duties by officers and enlisted men in various branches of the military services. As a second object, in these reviews, we wished to observe the nature of the exposition of mathematical material in the texts, with the possibility in mind that mathematicians might aid in the construction of any future editions of the books. In this outline of my sources of information, I take pleasure in acknowledging assistance received by me from President Mary Potter of the National Council in connection with viewpoints for the secondary field and mathematics appropriate for skilled industrial workers.

"I shall now summarize some of the evidence at my disposal and then, later, I shall draw certain conclusions, principally concerning effects at the secondary level.

"Permit me to be very brief on the non-military side. It appears to me that the aircraft and munitions industries, with their demands for skilled workers and draftsmen, the drain on the national supply of skilled workers due to Army and Navy calls for enlisted specialists, and the statistical work associated with the activities of government agencies and industry, will operate to require largely increased numbers of men and women who have appropriate training in mathematics. It would be desirable if skilled workers in industry had substantial secondary mathematics, through the stage of computational trigonometry, with at least an intuitional knowledge of solid geometry, and with emphasis on numerical applications at all possible stages. For these non-military activities, as many women as possible should be trained at least through substantial high school mathematics; a more select group should be trained through the stage of elementary college mathematical statistics to create a reservoir of computers for government and industry.

"I evaluate the pure mathematical needs of the various Army and Navy services as follows, if we eliminate the requirements of those exceptional officers whose work can be designated as military research.

"First, the lowly but important infantry, motorized or not. Even this branch of the Army places demands on mathematics. All enlisted men in the infantry find use for arithmetic and intuitional geometry. The officers, non-commissioned

officers and privates first-class should have familiarity with elementary geometry to permit map reading, map construction, appreciation of contour designations on maps, the use of coordinate systems. These men also should be able to appreciate the complicated mechanical drawings and the internal workings of the rifles, light anti-aircraft guns, and other material assigned to the infantry. In brief, for these men I would specify elementary algebra and geometry as frequently taught in training for industry. In addition the officers should have some acquaintance with the notions of probability and probable error as met in elementary statistics.

"Second, the Coast Artillery Corps. This exceedingly mathematical branch includes all artillery for seacoast defense, all high altitude anti-aircraft artillery, and all mobile artillery of heavy caliber. The officers of this corps have to perform the duties of surveyors on some occasions, and they deal with very complex optical instruments, motorized machinery, and complicated guns. These men should have very strong training in mathematics -- in fact they should be engineering graduates as the most desirable stipulation. But, as a minimum, they must know mathematics through computational plane trigonometry, and elementary spherical trigonometry, with some background in solid geometry. They should also have an acquaintance with the notions of probability and probable error as met in elementary statistics, in order to appreciate the theory of gunfire. All enlisted men should have a background of geometric and algebraic knowledge equivalent to the training suitable for skilled workers in industry. In addition, about 25 per cent of the enlisted men should be as well qualified mathematically as the officers.

"Third, the field artillery, or light artillery. We can make the same minimum stipulations for mathematical training as in the Coast Artillery with the omission of mention of spherical trigonometry, and with somewhat less insistence on the need for mathematics in the case of the enlisted men.

"Fourth, the signal corps. The officers should be electrical engineers and the enlisted men should have the mathematical training suitable for skilled men in industry.

"Fifth, the Ordnance Dept. It needs various specialists, both officers and enlisted men, with highly mathematical backgrounds such as possessed by engineering graduates or college majors in mathematics.

"Sixth, Flying officers in the air-force of the Army and Navy, and all other officers in the Navy. They require at least the same minimum training as officers of the Coast Artillery, because of the necessity for studying navigation in all present cases, aerodynamics and meteorology for air-force officers, and numerous other technical subjects. In fact, it bewilders a civilian who has seen the workings of a warship, to conceive of any Navy Officer who is not a trained engineer. These officers of the air-force and Navy should have substantial courses in solid geometry and spherical trigonometry, far beyond what is satisfactory for the artillery service.

"Seventh, the ground force of the air-force. It requires a large number of graduated engineers, men with college mathematics and physics especially for the meteorology section, and a large force of men with mathematical backgrounds suitable for skilled industry.

"Eighth, enlisted men in the Navy. All of them should have the mathematics suitable for skilled workers in industry. A substantial number of the enlisted men should be as well qualified as stipulated in the description of minimum mathematics for the officers.

"In summary, I believe that the preceding specifications of mathematical training for officers give minimum levels if our Army and Navy are to be well led. The training which I specified for various types of enlisted men may exceed the true minimum but probably is the desirable level if it can be attained. I hazard the guess that, without special effort on the part of the high schools, colleges, and centers for adult training, the nation will not have a proper reservoir of men with the mathematics necessary for the needs of industry and the military services.

"Now let me present certain personal recommendations for viewpoints and actions as a consequence of the nature of the probable mathematical needs which I have just enumerated.

"Item 1. In the secondary field, it would be very undiplomatic and harmful if the national emergency were taken as a crude excuse for a violent attack on certain curricular trends, even though it is possible that weaknesses of some features of these trends may become apparent when analyzed under the searchlight of our present national requirements. I recommend that initially we should make our proposals and state the mathematical objectives in the preparedness program without any stipulation as to the pedagogical details involved in attaining the objectives.

"Item 2. The National Council of Teachers of Mathematics and all organized bodies of mathematics teachers at all levels should advertise the utility of mathematics in industry and military service. In high schools it should be advertised that Army and Navy R.O.T.C. units in colleges require trigonometry and should require solid geometry and spherical trigonometry.

"Item 3. I recommend that every club of secondary teachers of mathematics should promptly hold a special meeting devoted to a discussion of the role of mathematics in the present national emergency and to a discussion of possible local actions in the high schools.

"Item 4. I recommend that in the junior and senior high schools, every boy and girl of sufficient mathematical aptitude should be urged by the high school advisers, to take as much mathematics as possible, through the stage of trigonometry and some solid geometry, as a national service. And, I recommend that a new definition of socialized mathematics be adopted in the curricula for students of all ability levels, where we would recognize that, at least for boys, mathematical content with military uses is the most socialized variety of mathematics to which they can be exposed at present.

"Item 5. The military necessity for spherical trigonometry and space diagrams in many important places leads me to recommend that the high school course in solid geometry be given much more emphasis than in recent years. I suggest that it be modified by replacing some of the classical content with a treatment of the elements of spherical trigonometry, thus giving a combined course in solid geometry and spherical trigonometry. In fact, this combination appeals to me on purely mathematical and pedagogical grounds apart from the requirements of the preparedness program.

"Item 6. I recommend that a single set of courses be used for secondary students of ability in attaining the desired ends, rather than separate curricula, some designed to fit men for industry and some planned for men and women who will proceed more deeply into mathematics.

"Item 7. As a temporary measure, I suggest that boys of intelligence, now in grades 11 and 12, who have previously omitted substantial mathematics, should be offered an abbreviated treatment of logarithms, plane trigonometry, intui-

tional solid geometry, and an introduction to spherical trigonometry, to permit these students to train themselves rapidly for their practically certain entrance into skilled industry or the Army or Navy.

"Item 8. I advance the opinion that a severe shortage of men with engineering training is at hand. This should be brought to the attention of interested boys of mathematical ability in the high schools.

"Item 9. As a final recommendation for the secondary field I urge the National Council to appoint a special committee on "Mathematics for National Service", to coordinate and direct appropriate activities in the secondary field."

The applications of mathematics in the national defense will be made by men in all branches of the national service and in the various scientific professions. Some of the men contributing in this way will be mathematicians. The one thing for which mathematicians are mainly responsible and in which they have the greatest influence, is the education in mathematics for this service. I know that we can count on the teachers of mathematics for the fullest aid.

SCHOOL OF MATHEMATICS

individual research,
In the School of Mathematics work is carried on by/individual contact

with students, by seminars, by courses of lectures and by other means, as each

professor sees fit.   In the past the work of the permanent staff was greatly

amplified by the activities of the temporary members, and it is expected that

the same will be true in the future.   The lectures and seminars, ~~which are~~
either in our own building or in
~~often~~ held/in Fine Hall on the campus of Princeton University, are open to

advanced students in the University, while, vice versa, University courses are

open to members of the Institute.   There is the closest cooperation by both

groups in seminars as well as in the Mathematics Club.

Since America's entrance into the war, the members of the permanent
important research connected with
staff have given part, in some cases almost all, of their time to the war effort.

Nor could the younger mathematicians and physicists be spared.   ~~Thus the   ex-~~

~~ternal activities of our school as described above came of necessity to an al-~~
standstill
~~most complete/stand in 1943 and 1944.   They will be resumed as scholars in our~~

~~field gradually become free again to pursue independent research work.~~

The following is a list of (1) courses and seminars held by members from

1941-1944, (2) lectures and series of lectures given by members and visitors during

the same period.   The courses and seminars given or planned for the present

academic year 1944-1945 are included.

1941-1942

Courses and Seminars

Seminar on Harmonic Integrals (main speakers: H. Frederic Bohnenblust,

Claude Chevalley, Gerhard P. Hochschild, Hans Samelson, Albert W. Tucker,

André Weil, Hermann Weyl)

James W. Alexander

Selected topics in Topology

Nevertheless - the amount of pure research carried on in mathematics and theoretical physics during this year has been impressive.

Marston Morse

    Seminar on the Foundations of the Variational Theory of Multiple Integrals

John von Neumann

    Selected Topics in Operator Theory, *and in Quantum Mechanics*

    ~~Quantum Mechanics~~

Hermann Weyl

    Functions of Complex Variables

    Fluid Dynamics

    (with George W. Whaples, Ellis R. Kolchin and Richard D Brauer.)

    Algebra Seminar ~~(Hermann Weyl, Orthogonal and symplectic groups as algebraic varieties; George W. Whaples, Structure of simple rings; Ellis R. Kolchin, Differential polynomials; Richard D. Brauer, Representations of groups)~~

Valentine Bargmann

    Methods of Mathematical Physics ~~(course at Princeton University; repeated 1943-1944)~~

and   Statistical Mechanics ~~(course at Princeton University)~~

Subrahmanyan Chandrasekhar

    Stellar Dynamics

Joseph L. Doob

    Continuous Stochastic Processes

Wolfgang Pauli

    Theory of Cosmic Rays

    Theory of the Meson Field

    Advanced Quantum Mechanics ~~(course at Princeton University)~~

Carl L. Siegel

    Modular Functions

II

SCHOOL OF MATHEMATICS

In the School of Mathematics work is carried on by individual research, individual contact with students, by seminars, by courses of lectures and by other means, as each professor sees fit. In the past the work of the permanent staff was greatly amplified by the activities of the temporary members, and it is expected that the same will be true in the future. The lectures and seminars, held either in our own building or in Fine Hall on the campus of Princeton University, are open to advanced students in the University, while, vice versa, University courses are open to members of the Institute. There is the closest cooperation by both groups in seminars as well as in the Mathematics Club.

Since America's entrance into the war, the members of the permanent staff have given part, in some cases almost all, of their time to important research connected with the war effort. Nor could the younger mathematicians and physicists be spared. Nevertheless the amount of pure research carried on in mathematics and theoretical physics during these years has been impressive.

The following is a list of (1) courses and seminars held by members from 1941-1944, (2) lectures and series of lectures given by members and visitors during the same period. The courses and seminars given or planned for the present academic year 1944-45 are included.

1941-1942

Courses and Seminars

Seminar on Harmonic Integrals (main speakers: H. Frederic Bohnenblust, Claude Chevalley, Gerhard P. Hochschild,

Hans Samelson, Albert W. Tucker, Andre Weil, Hermann Weyl)

James W. Alexander: Selected topics in Topology

Marston Morse: Seminar on the Foundations of the Variational
   Theory of Multiple Integrals

John von Neumann: Selected Topics in Operator Theory, and in
   Quantum Mechanics

Hermann Weyl: Functions of Complex Variables, Fluid Dynamics;
   Algebra Seminar: (with George W. Whaples, Ellis R. Kolchin
   and Richard D. Brauer.)

Valentine Bargmann: Methods of Mathematical Physics and Statis-
   tical Mechanics

Subrahmanyan Chandrasekhar: Stellar Dynamics

Joseph L. Doob: Continuous Stochastic Processes

Wolfgang Pauli: Theory of Cosmic Rays, Theory of the Meson Field;
   Advanced Quantum Mechanics

Carl L. Siegel: Modular Functions

The Institute mourns the death in 1944 of its two founders, Mr. Bamberger and Mrs. Fuld. Both have made the Institute residuary legatee under their wills. While the two estates have not yet been settled, it is expected that these bequests will result in a substantial addition to the endowment funds.

Info on applied + pure math
res -
See Millikan
    Vol. 10/23 on single
        adm. Com. N.R.C.
    GD Birkhoff P. 3.5
                1938.

Notes from <u>NOTICES</u>, Amer. Math Society forFeb 1961 (Vol. 8,
No.1 Issue no 52) pp 25 ff. <u>A Report on Soviet Mathematics</u>.by J.
P. LaSalle.

Results of a year's study   by panel of RIAS in ff. fields: (own)
1. algebra
2. control and stability theory
3 functional analysis
4   numerical analysis
5 partial differential equations
6 probability and statiscits
7 topology
<u>Ordinary differential equations,</u>"where Russia clearly leads the world,"
  not included.

Major conclusions
   1. In math the Soveit Union and US lead world and are about same
level. Othe r than algebraic geometry there is no broad arsa of
math. in/USSR is not working and making significant contributions
   2. USSR will move "at a faster rate than US in the practical
  application of mathematical theories." Also, there is "a distinct
possibility that the S.U. will gradually surpass us in certain areas
more or less directly connected with applications: e.g., control
theory, numerical analysis, ordinary and partial differential equations."
In US"there is a growing gap between known/mathematicians and those
 interested in applications."   This was explained as being due to
lack of interest in applications shown by pure math. in US and
the contrary in SU./ "Soviet math. make serious and successful
efforts to communicate the latest theoretical advances to engineers
and scientists" in publications. In US "the space in math journals
is inadequate,and conciseness in presentation is often enforced
to the point of unintelligibility. Our specialists write for each
other."   "Applied math is quite respectable in SU." Emphasis
in certain areas: e.g. control theory, numerical analysis, diff.
equations, attracts young people. In US,/"there is an increasing
tendency towards greater and greater abstraction, with a lessening
regard for application, which tends to discourage/young people
from ever approaching the applications." Tendency therefore to
improve quality of app. math in SU and decrease US.
3 The increasing group in SU working in control theory and numerical
analysis in quality match those in US, and "lead the world
in quantity of output and in numbers of people."
4SU'S efforts in control theory is part of SU's knowledge and tech-
 nical competence in automatic controls, with application to missiles
and space vehicles, and automation in industry.
5 "The very breadth of Soviet mat h conceals special objectives."
The prestige of mathematicans still protects Sov. mathematicians
in this regulated society. "'Pressure to publish'" results in many
inferior articles being published there.
6 Many fine books published in US SU at "fantastically low prices."
We cant compete. Tends to enhance their scientific prestige and
influence in world.

Report on special fields of math.
1. <u>Algebra</u>. Strong in SU, strongly and "relentlessly" pursued to
gain deeper knowledge.   Apparently they are more interested in
abstract algebra than in applications, but this may be because they
conceal their work in applications, such as (matrix theory, for example.)
2 <u>Control and stability</u>. Research in control carried at two levels
in SU: general theory of optimal control, which leads to deep studies

Panel:

Diaz — ? ?

F~~orbt~~ ?of

Forbt   Henri Poincaré Paris

Giese   Aberdeen Ballistic Res. Lab.

Gus? ?

La Salle   RIAS

Lefschetz   RIAS

Lesser   Aberdeen B. (?? lab.)

etc

Soviet Sci. + Engrs have high regard for mathematics.

in differential equations and stability.. Second, strong group
of math. engineers working on applications. "(Mathematicians in US (SU
call them engineers and American engineers who know them call
them mathematicians.)" Strongest purely math. group working here
is led by Pontryagin; it is xtrex influenced by considerations of
application, working independently of other pure math. groups but
closely with math-engineers of the Inst. of of Automatics and
Telemechanicsxxfxkxex (Automation and Remote control) of the Academy
of Sciences of the USSR." The math-engineers make important contrib-
utions also, and are much better informed of the work of Amer.
mathematicians than are Amer. engineers. SU mathematicians appear to
enjoy freedom of research. Incentives used to direct attention toward
certain fields of interest such as control theory etc. while
It is difficult to determine extent to which mathematical control
has been applied in SU. There are claims that applic. have been
made; that improvements in design have been made. "(The development
of practical computational proceedures for the design of control
systems is a first step toward the development of control systems
that are truly adaptive.)"

"The view we have of the Soviet research program leads to the
conclusion that they are mounting an total scientific effort in
automatic control., By contrast there is no such balanced program
in the USA where developments in automatic control are primarily
in tha hands of engineers." p.27

SU'S/ "ere Panel expresses/opinion that while SU can go all out in
x x developing and applying automation, only in a communist societty
can carry out automation of industry without a breakdown in its
economy. The Panel wisely refrains from assaying this opinion of
SU, and says that both countries are moving in same direction and with apparently
with equal effects now, but that because they are putting more effort
into the control theory and applic. they may get ahead of us:
"Because they have a better balanced research program in control
they may recognize long before we do the importance of a fundamental
idea. If the theory of is applicable, they are likely to exploit
it before we do."

3. Functional analysis.
Russians traditionallly strong here. "This subject provides
a general language for the formulation and study of problems in many
fields of mathematics (ordinary and partial differential equations XX
, integral equations, numerical analysis and analysis in general).

Morse's x It is these applications to other fields of mathematics that are
work this of greatest interest to Soviet mathematicians. By contrast, Amer.
math. are primarily xntxxxxxed concerned with the structure of
p 27 functional analysis and the achievement of more abstractness
and greater generality." Extensive publications showing results and
explanation of current research are far ahead of anything in Amer.

on computers
4. Numerical analysis. Because of concentration in field of control,
"a substantial portion of the world's research in numerical analysis,
of excellent quality, is produced in USSR." Abundance of new books
and survey articles, "synthesizing the latest and most texnxcalx
modern achievements in mathematics (and naturally including topics
in or closely related to numerical analysis) is being written (fre-
(large) quently in a style to assure accessibility to relatively unspecial-
ized audiences) and published in mammoth editions.
The fact that most outstanding mathematicians in SU take active
interest in numerical analysis and computational math" cannot

* It has developed a theory (general) of optical control. xx See in B for quots -

"The view we have of the Soviet research program leads to the conclusion that they are mounting a total sc effort in automatic control. By contrast there is no such balanced program in the USA where developments in automatic control are primarily in the hands of engineers."

fail to affect beneficially the growth and development of the field of numerical analysis, and may even influence the areas of computer design and development."

5 Partial differential equations.
        SU research on par with that of US. SU doing large amt of research on problems related to fluid dynamics.

6 Probability, information theory and statistics.
Quality on parity with that of US. .in probability theory, information theory and math. statistics. ETC.
        Math. statistics is receiving increased attention in XN.Univ. of Moscow.
            In applications, two areas of interest: "queuing theory and statistical quality control."Large number of papers on applied
Primarily statistics, particularly/on quality control...Large number of books on math. statistics designed for engineers have appeared in rather large editions.'

7 Topology
    "Because of its primitiveness, top. lies in the background of an immense enormous and ever-growing body of math.As a foundation element, one will not expect to find (and does not find) many practical applications of this science."
        The field started some 30 years ago "as much geometry and little algebra,X and consists today of likkle much algebra and little geometry. This is definitely the trend in the US, but much less so in the SU. In that country, there are comparatively few topologists and, if anything, their number tends to decrease."
As body they are grouped around Aleksandrov and Pontryagin. The Alek. group interested in problems of generation ago; latter group has offered much to world in modrn topology.

8 Russian Journals.
        Older serials for math research are generally tose with the formal titles of Trudy etc.,or Isvestia "which are the official Soviet organs of the scientific academies and institutions of learning. There are a few well-known exceptions to this xuxhxxx...which contain the word mathematics in the title. The newer journals show a tendency to imitate the prevailing Western practice of describing in the title the range of content xuxhxxx..."
        In West. good math papers may be published in the proceedings of Za learned society, but the preponderance of them find their way into a journal specializing in math or a particular field of math. In the SU an important paper may turn up in the journal"of a small
pedagogical /provincial/institute, buried among less note-worthy writings, and may therefore never become available outside SU. Hope that/growing with/ number of exchange agreements between libraries this difficulty of access may be remedied.
                    ___0**

Use of Soviet Mathematics Texts Is on Rise in U.S.

Score of Soviet mathematics textbooks are being published here in English, and many of them are being widely used in American universities. More than fifteen publishers are active in this field.

Works of leading Soviet mathematicians are represented in these editions that range from advanced theory to elementary expositional books for high school students.

In evaluating the texts, Dr. Martin Burrow, Associate Professor of Mathematics at New York University, said:

"They are written by top-notch people who seek to educate to a high level."

Hayward Cirker, president of Dover Publications Inc., said:

"Much of the interest in Soviet mathematics books is not that they're better but that they're different. This is stimulating."

"Many are written by top-cording to Dr. Lipman Bers, chairman of the Department of Mathematics at N. Y. U. He said that others were suited to high school senior as enrichment reading.

Text on Number Theory

He explained that the mathematics curriculum was made up of material from many sources. Traditionally in advanced courses works from Britain, France and Germany have supplemented books by Americans. He said that the addition of Soviet books to the curriculum was a natural process in the light of the strength of Soviet mathematics in several fields.

Dr. Bers stressed, however, that Russian texts were not necessarily better on the whole than those of the other groups. "In fact," he said, "more American math books are being translated into Russian than the other way around."

One of the more popular texts is "Elements of Number Theory" by I. M. Vinogradov, a leading Soviet mathematician. It is used in two courses at N. Y. U.

Professor Burrow, who uses the book in his undergraduate course, said it was written for a good student as a first course in number theory.

Some of the Soviet books are regarded as classics and as such are in wide use at the graduate level. One is "The Theory of Groups" by A. G. Kurosh, published in the revised edition of 1955 by the Chelsea Publishing Company. It is a basic text in this branch of mathematics.

A. N. Kolmogorov's "Foundations of Probability" is put out by the same publisher. The author is known for his "axiom of probability." "Topological Groups" by L. Pontryagin, published by Princeton University Press, is a third important work.

It is described as a pioneer book combining the two fields of algebra and topology.

Works of P. Alexandroff available here illustrate the tendency of Soviet mathematicians to divert time from advanced treatises to writing quite elementary texts. His "Combinatorial Topology," published in a multi-volume set by Graylock, is at an advanced theoretical level.

The Dover book by him, "Elementary Concepts of Topology," is a brief introductory book that is accessible to a layman or a beginning mathematician.

A considerable number of the current books are of the simplified type. One of them, "The Solution of Equations in Integers" by A. O. Gelfond, has been much admired as a pedagogically skillful enrichment book for high school students. The publisher is W. H. Freeman & Co. The author is a professor at Moscow University and a specialist in number theory.

Books of A. I. Khinchin, another leading mathematician who writes books at a less advanced level, are also appearing here. He wrote, in 1957, the basic first-year calculus text for Soviet science and mathematics undergraduates. The book, "A Course in Mathematical Analysis," has a great deal of explanatory text elucidating the development of concepts and proofs. Thus far it is available only in a $15 offset version of an Indian edition. It is sold by Science Publishers, Inc.

A Russian author will be represented in the American series of imaginative books for high school students of the School Mathematics Study Group, which Random House is publishing. The book is "Geometric Transformations" by I. M. Yaglob and is a part of a larger work.

Pergamon Press is an active publisher of Soviet technical books. Prentice-Hall has begun a series of Soviet mathematics texts. Other publishers here are Academic Press, Frederick Unger, McGraw-Hill, Blaisedall and Noordhoff.

Some of the titles of Soviet books are found under several publishers. The reason is that the books bear no copyright privilege because the Soviet Union is not a member of the International Copyright Convention. Likewise, American publishers are under no legal obligation to pay royalties to the Soviet authors of the books.