SUBSIDY FUNDS FOR MATHEMATICAL PROJECTS[1]

HERETOFORE little attention has been given to the question of subsidy funds for mathematical projects, quite unlike the case with some of the more spectacular sciences. The presumption is prevalent among non-mathematicians that mathematics is an organized and crystallized body of necessary conclusions drawn some decades or centuries ago from certain intuitional concepts of number and form, and that no special provision for equipment or funds is necessary for carrying on mathematical work.

On the contrary, it is the purpose of this paper to show that mathematics, as a live and active subject, is in need of funds for its promulgation as much as any other science. For example, the following needs may be mentioned:

(1) A revolving book fund for the publication of mathematical treatises. It has not been possible, on account of economic conditions, for an author to secure the publication of a mathematical treatise by one of the commercial publishing houses for several years past and, apparently, will not be possible for some time to come. It is well known that such treatises of worthy character are awaiting publication, but that not even second or subsequent volumes will be accepted by publishing houses which have already printed the preceding volumes. The only remedy for this most unfortunate situation is a subsidy fund which may be drawn upon to guarantee the cost of publication, such guaranty to be returned, in whole or in part, to the fund whenever the sales may so warrant. A lump sum of $25,000 could be wisely used at once for this purpose and should be handled through the American Mathematical Society.

(2) A mathematical dictionary in English. There is no mathematical dictionary in any language that is even approximately up to date. Students and workers of all kinds in mathematics, and in fields in any way related to mathematics, should have the benefit of the best dictionary in the English language that can be made. The Mathematical Association of America has already considered this matter in great detail, even to the careful estimating of the scope and size of such a publication and of the cost of its preparation. A lump sum of $100,000, or of $20,000 per year for five years, will be needed for the preparation of the manuscript. Such a work would be monumental in character and would insure great honor to any donor.

(3) Publication of a historical journal in English. As is well known, the only mathematical journal in the historical field, the *Bibliotheca Mathematica,* has been entirely suspended on account of economic conditions. Its venerable editor, Mr. G. Enestrom, has appealed to friends in this country to assist in continuing this journal as an American publication. The *American Mathematical Monthly* has recently made a serious effort to secure funds for combining the *Bibliotheca* with the *Monthly,* but so far without success. A fund of $2,000 per year, or an endowment of $40,000 would be needed in order to appropriately perpetuate the long and honorable record of this journal, and to do this would not only render assistance in a most worthy cause, but would bring honor to America and to any donor who should make it possible.

(4) Enlargement of our mathematical research journals. It is a distressing fact that all of our mathematical research journals are in crying need of more space for the publication of scores of articles already accepted. The *American Journal of Mathematics,* the *Annals of Mathematics,* and the *Transactions of the American Mathematical Society* should all be brought up to at least five hundred pages per volume and the latter could well be extended to six hundred pages. But this could not be done at present, and probably not for a long time to come, without a subsidy fund of at least $2,500 a year or an endowment of $50,000. In addition to this space, the *Transactions* would need a whole extra volume, at a cost of about $4,000, in order to catch up with available worthy contributions.

[1] A paper presented to the joint meeting of the American Mathematical Society and the Mathematical Association of America at Toronto, Ontario, December 29, 1921.

(5) Expansion of the *American Mathematical Monthly*. It has long been the hope of those in charge of the *American Mathematical Monthly* that it might become possible to publish two extra numbers (in July and August of each year) to be devoted entirely to expository and historical articles of an elementary character suited to the needs of students and teachers of mathematics in the normal schools and colleges throughout the country. This need is great and the service thus rendered would be of inestimable value. The regular volume of the *Monthly* should also be expanded by eighty pages in order to handle matter pressing for publication. For these purposes an annual subsidy of $2,000 would be needed, or an endowment of $40,000.

(6) Publication of mathematical monographs. A subsidy fund has recently been donated to the Mathematical Association of America by Mrs. Mary Hegeler Carus, as trustee of the Edward C. Hegeler Trust Fund, for the purpose of publishing a series of mathematical monographs which shall provide in convenient and readable form, and at low cost, expository presentations of all the great subjects in pure and applied mathematics. This gift is in the form of an annual subsidy of $1,200 for five years with the promise of capitalizing this income in perpetuity if the project proves successful. Such an endowment would need to be $24,000 on a five per cent. basis.

(7) A mathematical abstract journal. A journal in the English language of abstracts of mathematical publications has long been needed and became very urgent during and subsequent to the world war, when foreign abstract journals were suspended or were hopelessly in arrears. Such a journal of the high character and efficiency contemplated by the committee of the National Research Council and the American Mathematical Society could only be produced and maintained with a liberal subsidy—at least $15,000 annually or with an endowment of $300,000.

(8) A bibliography of bibliographies in mathematics. The National Research Council has proposed as one aid to efficiency in scientific work to publish a bibliography of bibliographies in each of the various sciences, which shall combine in one volume all the bibliographies obtainable in a given science whether published hitherto or not. The council will bear the cost of publication and clerical expense, but the work involved in preparation of the manuscript will be extensive and should be covered by a lump sum of $5,000.

(9) Prizes and research fellowships. Something seems to be wrong when a poem or a short story may bring its author adequate financial reward, while the author of a mathematical article of the highest merit, on which he may have spent weeks or months, not only receives no financial return but actually has to pay cash for a few reprints. The only means apparently available to offset this injustice is through prizes and fellowships of liberal value. One bequest of $10,000 and one or two small funds for prizes (none of which are operative as yet) constitute the sum total of effort to date in this country. An annual fund of $25,000 or an endowment of $500,000 would be only a fair estimate of the need in this line and such an annual expenditure could be used to the utmost advantage with the greatest degree of justice to the workers in the field of mathematics. Fortunately some farsighted and loyal individuals are thinking of these things and are contemplating liberal provisions in wills toward this end. One such will is already definitely known to be made.

(10) Honorary stipends for executive officers. Time was in most scientific societies when one or two permanent executive officers worked like slaves for the upbuilding of these organizations, with no financial return and sometimes even without adequate clerical assistance. Those days of pioneering should be gone forever. In some societies, the membership is large enough, or includes those with large incomes outside the teaching profession, so that the annual dues may be made adequate to cover salaries to their executive officers; but those societies whose members are almost entirely teachers in the universities and small colleges cannot raise their dues beyond certain maximum amounts without shutting out large numbers to whom the organizations are of the utmost value. The only other alternatives seem to be either to continue the old pioneer methods or else to secure adequate subsidy funds with which to give these hard worked permanent

officers respectable honorary stipends. In the American Mathematical Society and the Mathematical Association of America there are four such officers to whom honorary stipends of at least $1,000 each should be given annually. For this purpose an endowment of $80,000 is needed. In this case again farsighted and loyal individuals are contemplating bequests, and one or two such wills with liberal provisions are known to be already made. Also a special gift toward this end has just been promised to the association for the coming year.

It will be found that the totals of the above ten items, as estimated, are as follows: For lump sums $134,000; and for annual subsidies $51,700, or, if capitalized at five per cent., an endowment of $1,034,000. As stated under (6) the provision for mathematical monographs is already made, and under (9) and (10) beginnings have been made by bequests provided for in wills or by special cash gifts. Also in connection with (2) it should be said that the proposition is under favorable consideration by a prospective donor. A donation of this magnitude would, indeed, be a monument worthy of great honor to the donor, and would render a service of untold value to the cause of education. The same may be said in varying degrees of all the items enumerated. It is believed that when information concerning these needs becomes sufficiently widespread there will be liberal responses in supplying the funds.[1]

[1] As this article goes to the printer a donor offers to provide the items of $4,000 mentioned in (4). Also a report in SCIENCE for January 13 of grants made by the Heckscher Research Foundation contains three items amounting to $2,600 for mathematics. Possibly this latter amount is the one quoted in the same issue of SCIENCE (page 52) where grants for research in twelve sciences range from $352,000 for biology down to $2,600 for mathematics. The compiler seems not surprised that "mathematics brings up the rear," since he says that "it would probably appear to most of us to be the subject farthest removed from practical interests." His surprise will doubtless be great when he contemplates a proposal for a million dollar endowment fund for mathematics.

In this connection, attention may be called to the fact that an important and urgent need of mathematics has already been recognized and met by the General Education Board of the Rockefeller Foundation in financing the work of the National Committee on Mathematical Requirements, a committee working under the auspices of the Mathematical Association of America. This work has extended over a period of three years and the funds supplied will total over $65,000 when the exhaustive report of the committee is published in a volume of five or six hundred pages.

H. E. SLAUGHT

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SCIENTIFIC EVENTS

BRITISH RESEARCH ON CEMENT

IN order to discover some means of increasing and cheapening the supply of Portland cement, experiments are being made by a panel of experts associated with the British Engineering Standards Association. The object of the research is to ascertain whether cement made from blast-furnace slag can not be made according to a recognized specification which would enable it to be used for work in which Portland cement, manufactured according to the British standard specification, has hitherto been employed.

Mr. H. O. Weller, of the Department of Scientific and Industrial Research, who is a member of the panel, explains in the London *Times* that the British standard specification for Portland cement is recognized all over the world, and has done more than anything else to make Portland cement recognized as a safe material to use. But it is beginning to be recognized that the specification is rather too narrow, and that there is need for a standard specification for iron Portland cement—*i. e.*, cement to which a small portion of blast-furnace slag has been added after clinkering. Cement of this character was first tested in Germany in 1902, and by decree of the Prussian Ministry of Public Works, in 1909, was sanctioned for use in the erection of German public buildings. This cement has come into England in fairly large quantities in recent