UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D C 20523

PD-ABG-856
841563

June 25, 1990

Dr. Richard Nicholson
Executive Officer
American Association For
The Advancement of Science
1333 H Street, NW
Washington, D.C. 20005

Subject: Cooperative Agreement No. AFR-0481-A-00-0037-00

Dear Dr. Nicholson:

Pursuant to the authority contained in the Foreign Assistance Act of 1961, as amended, the Agency for International Development (hereinafter referred to as "A.I.D." or "Grantor") hereby provides to the American Association For The Advancement of Science (hereinafter referred to as "AAAS" or "Recipient") the sum of three hundred three thousand one hundred U.S. dollars ($303,100). The purpose of this Cooperative Agreement is to provide support for a study entitled "Malaria in Africa: New Prevention and Control Strategies" as more fully described in the Attachment 1 of this Cooperative Agreement entitled "Schedule" and Attachment 2, entitled "Program Description".

This Cooperative Agreement is effective and obligation is made as of the date of this letter and shall apply to commitments made by the Recipient in furtherance of program objectives through the estimated completion date of September 27, 1991. Funds disbursed by A.I.D. but uncommitted by the Recipient at the expiration of this period shall be refunded to A.I.D.

The total estimated amount of the program is $303,100, of which $303,100 is hereby obligated. A.I.D. will not be liable for reimbursing the Recipient for any costs in excess of the obligated amount.

This Cooperative Agreement is made with the American Association For The Advancement of Science on condition that the funds will be administered in accordance with the terms and conditions as set forth in Attachment 1, entitled "Schedule", Attachment 2, entitled "Program Description," and Attachment 3, entitled "Standard Provisions", which have been agreed to by your organization.

Please acknowledge receipt of this Cooperative Agreement by signing all copies of this Cover Letter, retaining one set for your files, and returning the remaining copies to the undersigned, being sure to return all copies marked "Funds Available".

Sincerely,

Jean M. Hacken
Agreement Officer
Overseas Division-Africa
Office of Procurement

Attachments:

1. Schedule
2. Program Description
3. Standard Provisions

Acknowledged:

_____

By: _____

Typed Name: _____

Title: _____

Date: _____

Fiscal Data

PIO/T No.:	698-0481-3-0611175
Appropriation No.:	72-1101014
Budget Plan Code:	GSSA-90-31698-KG12
DUNS No.:	07-779-5672
TIN No.:	53-0196568
Total Estimated Amount:	$303,100
Total Amount Obligated:	$303,100
Technical Office:	AFR/TR/HPN, James Shepperd
Funding Source:	PFM/FM/CMPD/DCB

Attachment 1

SCHEDULE

A. Purpose of Cooperative Agreement

The purpose of this Cooperative Agreement is to provide support (under project 698-0481 AAAS Malaria) for a study entitled "Malaria in Africa: New Prevention and Control Strategies" as more specifically described in Attachment 2 to this Cooperative Agreement entitled "Program Description".

B. Period of Cooperative Agreement

The effective date of this Cooperative Agreement is June 25, 1990. The expiration date of this Cooperative Agreement is September 27, 1991.

C. Amount of Cooperative Agreement and Payment

1. A.I.D. hereby obligates the amount of $303,100 for purposes of this Cooperative Agreement.

2. Payment shall be made to the Recipient in accordance with procedures set forth in Attachment 3 - Optional Standard Provisions for U.S., Nongovernmental Grantees #1, entitled "Payment Letter of Credit".

3. The Recipient shall submit the required documentation to the following address:

   Agency for International Development
   Offfice of Financial Management, CMPD/CG
   Room 700, SA-2
   Washington, D.C. 20523-0209

D. Financial Plan

The following is the Cooperative Agreement Budget, including local cost financing items, if authorized. Revisions of this budget shall be made in accordance with the Standard Provision of this Cooperative Agreement, entitled "Revision of Grant Budget".

Budget

Category	Total Estimated Cost
1. Salaries and Fringe Benefits	$123,877
2. Travel, Transportation, & Subsistence	85,445
3. Other Direct Costs	+ 32,000
SUBTOTAL	241,322
Indirect Costs	+ 61,778
Total	$303,100

E. Financial Reporting

a. Financial reporting requirements shall be in accordance with the Optional Standard Provision of the Cooperative Agreement entitled "Payment - Letter of Credit", as shown in Attachment 3.

b. The original and two copies of all financial reports shall be submitted to:

Agency for International Development
Office of Financial Management, PFM/FM/CMPD/DCB
Room 700, SA-2
Washington, D.C. 20523-0209

In addition, three copies of all financial reports shall be submitted to the Technical Office listed below:

Jim Shepperd, AFR/TR/HPN
Health, Population and Nutrition Division
Room 307, SA-8A
Agency for International Development
Washington, D.C. 20523

F. Program Evaluation

a. The Recipient shall submit quarterly program performance reports, and a final report, which briefly presents the following information:

(1) A comparison of actual accomplishments with the goal established for the period, the findings of the investigator, or both. If the output of programs or projects can be readily quantified, such quantitative data should be related to cost data for computation of unit costs.

(2) Reasons why established goals were not met.

(3) Other pertinent information including, when appropriate, analysis and explanation of cost overruns or high unit costs.

b. Between the required performance reporting dates, events may occur the have significant impact upon the program. In such instances, the Recipient shall inform A.I.D. as soon as the following types of conditions become known:

(1) Problems, delays, or adverse conditions that will materially affect the ability to attain program objectives, prevent the meetings of time schedules and goals, or preclude the attainment of project work units by established time periods. This disclosure shall be accompanied by a statement of the action taken, or contemplated, and any A.I.D. assistance needed to resolve the situation.

(2) Favorable developments or events that enable time schedules to be met sooner than anticipated or more work units to be produced than originally projected.

c. If any performance review conducted by the Recipient discloses the need for change in the budget estimates in accordance with the criteria established in Standard Provision of this Cooperative Agreement entitled "Revision of Financial Plans", the Recipient shall submit a request for budget revision.

d. Five copies of each program performance report shall be submitted to the Technical Office specified in Part E of this document.

G. Indirect Cost Rate

Pursuant to the Optional Standard Provision of this Cooperative Agreement entitled "Negotiated Indirect Cost Rates - Provisional" a rate or rates shall be estimated for each of the Recipient's accounting periods which apply to this Cooperative Agreement. Pending establishment of revised provisional or final indirect cost rates for each of the Recipient's accounting periods which apply to this Cooperative Agreement, provisional payments on account of allowable indirect cost shall be made on the basis of the following negotiated provisional rate applied to the base which is set forth below.

The rate for the Cooperative Agreement period shall be as follows:

Type	From	To	Rate
Provisional	June 25, 1990	Until Amended	25.6%

Base:
(a) Direct Salaries and Wages Including Vacation, Holiday and Sick Leave Pay.

(b) Total Direct Costs Less Capital Items. (Note: Fringe Benefits are treated as Direct Costs).

PROGRAM DESCRIPTION

PIO/T

Summary

The American Association for the Advancement of Science (AAAS) Directorate for International Programs will conduct an extensive interdisciplinary study to investigate science-based and extra-medical factors associated with malaria in Africa. The purpose of this study is to provide USAID with recommendations for new preventative and/or therapeutic strategies for the control of malaria in sub-Saharan Africa. The use of bednets, spraying techniques and sophisticated forms of chemotherapy and chemoprophylaxis will be reviewed. Solutions provided by agricultural engineering and the behavioral and policy sciences will be explored. The costs and benefits of these strategies will be determined. Their impact on the development will be assessed.

The study will be carried out over a fifteen month period, under the management of Dr. Amy Wilson. US and African experts on malaria will be identifed from the science and health community. These experts will be selected from a variety of disciplines. The AAAS will organize and administer two agenda-setting meetings in Washington. These meetings will produce an agenda for an International Workshop on Strategies For the Control of Malaria in Africa. The International Workshop will be held in Africa in the fall/winter 1990. Following this meeting, the AAAS staff assisted by participant rapporteurs, a technical editor and a translator will produce a project report on the deliberations and recommendations of the workshop (in English and French).

This report shall clearly set forth workable strategies for addressing malaria in Africa. The report will be distributed to: WHO headquarters and regional offices, CDC, NIH, Walter Reed, The World Bank and bilateral agencies such as the International Devlopment and Research Center and the Canadian International Development Agency, and tropical medical centers in the US, Africa, Europe and elsewhere. Responses will help shape the Bureau's strategy for malaria control during the coming decade.

The proposal "Malaria in Africa: New Prevention and Control Stategies" is attached in Attachment 2. This proposal was originally submitted in July 1989 and has been revised following deliberation over the telephone.

PIO/T Attachment

American Association for the Advancement of Science

1333 H STREET, NW, WASHINGTON D.C. 20005 (202)326-6650
CABLE ADDRESS: ADVANCESCI

Office of International Science
Telex: 248933 SCIEN UR

A Proposal for

MALARIA IN AFRICA: NEW PREVENTION AND CONTROL STRATEGIES

Under

Grant No. DPE-5543-G-SS-8057-01

Program of Activities to Strengthen the Role of Science and Technology in Development

Prepared by:

American Association for the Advancement of Science
Directorate for International Programs

Submitted to:

United States Agency for International Development
Africa Bureau

November 1989

MALARIA IN AFRICA: NEW PREVENTION AND CONTROL STRATEGIES

Despite significant advances in medical science and health care, and large investments in malaria control and eradication, malaria remains a serious problem throughout Africa, one without clear scientific or technological solutions. Although even official figures vary widely, it is evident that some four fifths of the hundred million or more clinical cases of malaria worldwide each year occur in Africa. In response to the recent request of the Africa Bureau of the US Agency for International Development (AID), the American Association for the Advancement of Science (AAAS) proposes to undertake a fifteen-month project, currently expected to begin January 1990, that will employ specialized scientific knowledge and experience in order to develop new, more effective strategies to combat malaria in Africa.

Drawing upon its broad interdisciplinary base, and especially upon the readily tapped expertise within the mainstream US science and engineering societies that comprise the AAAS Consortium of Affiliates for International Programs (CAIP), AAAS will convene a US steering group meeting and two results-oriented international meetings. According to the present anticipated schedule, the US steering group will have its planning meeting in January/February 1990. An agenda-setting session, which includes participants from Africa, will be held in the US in winter/spring 1990. By fall 1990 we expect to convene a multidisciplinary workshop in Africa so that by fifteen months from project inception AAAS will have incorporated recommendations made at the workshop and produced a report that constitutes a practical blueprint for action. Details of the project workplan and its budget are provided below.

Throughout the project AAAS staff will work in close cooperation with AID staff, both in Washington and in African missions. From the earliest planning stages of the project, AAAS will also fully utilize the productive, collegial working relationships we have already established with African scientists and engineers, and their institutions. Such international partnerships, among peers, are a hallmark of the AAAS Sub-Saharan Africa Program, and indeed of all the Association's activities with developing and developed countries. In addition, the AAAS African malaria strategies project is designed to complement other, parallel undertakings, in particular the recently inaugurated eighteen-month study of the prevention and control of malaria worldwide being conducted by the Institute of Medicine (IOM), National Academy of Sciences (NAS), with funding from AID as well as from the Department of Defense and the National Institute of Allergy and Infectious Diseases, and the work of the World Health Organization (WHO), including its ongoing programs for malaria action, vector biology and control, and tropical disease research and its November 1989 meeting of the Experts Committee on Malaria.

Malaria in Africa: The Problem

Over 90 percent of the Sub-Saharan African population lives in malarious areas. As reported in Bioscience in 1987, "200 million people south of the Sahara are chronically infected with malaria and about a third of them 'suffer acute manifestations of the disease in the course of the year.'" With a few exceptions (Cape Verde, Ethiopia, l'Ile de la Réunion, Lesotho, Mauritius, St. Helena, and the Seychelles) a large part of Sub-Saharan Africa faces continued meso- and, more frequently, hyper- or holo-endemicity, with transmission and infection levels remaining extremely high. In several Sub-Saharan African countries, such as the Republic of the Congo, where local malaria control programs had been run successfully at one time, these efforts have since been terminated because of a lack of financial and human resources. Consequently, since the 1970s there has been a resurgence in malaria in Africa; in some countries, Kenya, Madagascar, Rwanda, Sudan, and Zambia, it is on the increase. The magnitude of the problem in Africa is such that it cannot be compared to any other region of the world.

Despite the prevalence and severity of this disease in Sub-Saharan Africa, the region was not included in WHO's global eradication efforts of the 1950s and 1960s. Recent efforts, particularly those of the African Child Survival Initiative-Combatting Childhood Communicable Diseases (ACSI-CCCD) project begun in 1982, do in fact focus on malaria prevention and control in Africa. ACSI-CCCD malaria strategies emphasize protection of high-risk groups--pregnant women and children--in 13 countries of Africa. Pregnant women, who lose their natural immunity to malaria, and children under the age of five, who have yet to develop immunity, account for a significant percentage of infected individuals. It is estimated that 5 percent of African children under the age of five die from the direct or indirect effects of malaria.

Several factors, including the increasing urbanization of the African population, contribute to the scope of the problem. Malaria, which had traditionally been most prevalent in rural regions, has now become an enormous health problem in the growing African towns and cities. Entomological studies in the rural areas surrounding Brazzaville, for example, have estimated the intensity of transmission by *Anopheles gambiae* (considered the most important vector of human malaria in Africa) to be one infective bite per night per person. Now, poor sewage and sanitation and lack of drainage for rainwater or irrigation projects, as well as the presence of pools of water accompanying new construction sites, all exacerbate the urban problem by providing ideal breeding sites for *Anopheles gambiae*. The economic impact of urban malaria, unless checked, could be devastating to further development in Sub-Saharan Africa.

Malaria, among the most ancient diseases, remains one of the single greatest health problems in Sub-Saharan Africa. The very resilient natures of both the vector and the parasite make it a complicated disease to eliminate or even control. The tremendous heterogeneity among vectors and parasites indigenous to Africa constitutes a particularly complex situation. The vector transmitting the parasite to the human host, the mosquito, has been shown to

develop resistance to various insecticides; most notably, more than 50 DDT-resistant mosquito species have been identified by WHO.

The parasite most often cited as the culprit in Africa, *Plasmodium falciparum*, has been reported since the early 1970s to be resistant to chloroquine, the drug that had once been among the most widely used forms of malaria chemoprophylaxis, largely because of its relatively low cost. Incidence of chloroquine resistance in Africa was first documented in the eastern region, but it now appears to be spreading rapidly. In many cases, this resistance has developed as a result of the systematic use of chloroquine for chemoprophylactic purposes, especially in endemic regions where the inhabitants would have developed natural immunity; in turn, natural immunity is reported to have been weakened, thereby leading to greater susceptibility to malaria transmission.

In addition to these vector-control and chemoprophylaxis efforts, much of the recent eradication focus has been on developing vaccines. Because of the tremendous variety in the parasites worldwide as well as the complexity of their life cycle, it is extremely unlikely that anything other than species- and stage-specific vaccines could be developed. Thus far this task has proved exceedingly difficult, partially because of inadequacies in vaccines developed to date, which only attack the parasite at one stage of its life within the human host.

Additional problems thwart each approach to control and/or eradication. In terms of health care delivery, even if a malaria vaccine were to be successfully developed, experience with distribution of other vaccines currently available suggests that no more than 20 percent of children in some rural African communities would even receive the malaria vaccine. One positive note is the ability of chloroquine, despite the above-noted resistance problem, to decrease the severity of the infection and lower the morbidity rate. However, it appears that in much of Sub-Saharan Africa, when chloroquine is used to treat malaria in children, it is usually improperly administered because of the often obsolete medical information available to local medical personnel as well as a general lack of guidance from public health officials. In addition, pregnant women who are counseled to be treated with chloroquine as a chemoprophylaxis often do not receive the dosages required insofar as they frequently do not receive prenatal care either until very late in their pregnancy or at all. Nor has chloroquine proved to be as effective against placental infection as originally believed. One possible alternative to chloroquine chemoprophylaxis, with its several shortcomings, the use of recently developed drugs such as fansidar, has to be temporarily dismissed as impractical because of its substantial cost and side effects.

Better-informed health care is vital to the prevention and control of malaria in Africa. To this end, the ACSI-CCCD project also stresses development of national malaria control guidelines as well as means to monitor implementations effected according to their guidelines. Health education should use already-established community groups and schools for effective transmission of information. It is also essential that efforts to design specialized health education programs consider each African community's perception of the disease and of various possibilities for treatment.

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Crucial to the development and implementation of successful malaria prevention and control strategies for Africa is adequate consideration of the economic realities unique to many African countries today. Their extensive poverty, limited available resources (human and financial), and current debt situation, inter alia, together render many countries vulnerable to reliance on external resources for combatting malaria and addressing similar health problems. This dependency in turn generally impedes the development of indigenous, sustainable health care systems and disease control programs. This same difficult set of economic conditions limits the funding that can be devoted to malaria control, even in countries where such control is a national priority. There has been a paucity of cost-benefit analyses or other economic research evaluating various approaches to malaria control. What is apparent is that the current malaria situation in Africa hampers worker productivity, further aggravating unfavorable economic conditions.

In light of the many characteristics unique to malaria, particularly its manifestations in Africa, the AAAS approach to prevention and control of malaria in Africa must be a far-reaching effort that gives primary weight to local factors--economic, political, sociocultural, and behavioral--and benefits from research and applications derived from entomology, epidemiology, parasitology, and immunology, among other fields, insofar as they are grounded in the African context.

Africa Malaria Strategies: Workplan

Scope

Over a fifteen-month period, presently scheduled to begin in January 1990, AAAS will conduct an extensive science-based study for AID that recommends new weapons for combatting malaria in Africa. (See Attachment 1 for a copy of the June 2 letter request to AAAS from AID and its attachments.) AAAS conceives this project to be decidedly interdisciplinary in scope, with significant attention given to extra-medical factors. Above all, we are committed to deriving effective near- and longer-term strategies for coping with and controlling malaria in Africa that together constitute a practical approach for African countries themselves, for AID, and for other concerned donors and agencies. These strategies include solutions such as the use and improvement of bednets and spraying techniques; more sophisticated forms of chemotherapy and chemoprophylaxis; as well as those provided by agricultural engineering and the behavioral and policy sciences, among other disciplines. An important component of our work will be economic in nature, weighing relative costs and benefits of various options, including assessing the impact on African countries of alternative health interventions.

Although the project will employ comparative data and will benefit from generic research, its explicit focus is malaria in Africa. As outlined above, malaria problems in Africa are not only quantitatively of a different scale but also biologically and operationally unique. In order to formulate appropriate strategies for Africa, our project must give adequate attention to the local policy environment (including legal and regulatory aspects),

economic factors idiosyncratic to African nations, and indigenous sociocultural and behavioral variables.

Results and Timetable

As soon as this AAAS malaria strategies proposal receives funding, AAAS staff is prepared to move ahead immediately in implementing the fifteen months of activities outlined directly below. AAAS will deliver to AID, at the end of the project, a succinct report, plus executive summary, setting forth policy recommendations for action. This report, to be issued in English and French, will be the result of a tightly structured, sequenced process, benefitting from the collective wisdom and knowledge of US, African, and European researchers and practitioners.

In addition to informing AID staff in Washington and in Africa, the primary audience, the AAAS malaria strategies report will be distributed to other major institutions concerned with malaria in Africa, including WHO headquarters and regional offices; the Centers for Disease Control, the National Institutes of Health, and Walter Reed; the World Bank and bilateral agencies such as the International Development and Research Centre and the Canadian International Development Agency; and tropical medicine centers in the US, Europe, and elsewhere. Special attention will be given to sharing results with front-line African organizations--especially scientific research institutes and public health units, up to the ministry level, that deal with malaria prevention and control on a daily basis. When the report is published, AAAS further expects to issue a press release that targets affiliated science and engineering societies and the news media, where science journalists increasingly cover significant science and science policy issues.

AAAS, through the Sub-Saharan Africa Program, now has a several-year history of working effectively on selected problems related to science, technology, and development in Africa, always in collaboration with African scientific organizations (See Attachment 2 for a description of Sub-Saharan Africa Program activities). We have also had successful experience constructing and then employing a several-step model to carry out our joint activities. Prior to a large meeting of African and foreign scientific leaders in 1984, convened in Grand Bassam, Côte d'Ivoire, a small joint planning session was held in Swaziland, bringing together a few US scientists and African counterparts who had been identified by a AAAS steering group. This sequential model enabled AAAS to produce a detailed agenda for involving African and developed world scientific and engineering societies more constructively in the development process. The recommendations made at the African Regional Seminar in Grand Bassam were disseminated through a widely distributed proceedings volume and report, published in English and French versions. (See Attachment 3, The Role of Scientific & Engineering Societies in Development, African Regional Seminar Report, 1985.) Several of those recommendations constituted the genesis of a AAAS Sub-Saharan Africa Program and have been incorporated into our projects.

For the AAAS Africa malaria strategies project, the initial planning session, presently scheduled for January or February 1990, will bring together

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a US steering group, three to five experts from the principal disciplines that focus on malaria. The steering group will meet for a day in Washington in order to conceptualize and map out the next, agenda-setting phase. In addition, the group will ensure that the agenda-setting meeting, held in winter/spring 1990, probably also in Washington, includes the most appropriate representatives from African scientific and health organizations, who will themselves constitute a small African steering group. Finally for the joint agenda-setting session, the US steering group will draw up a roster of US participants who are recruited sufficiently widely from our own scientific community in terms of institutional representation and disciplinary span--and who are experienced at achieving results through interdisciplinary teamwork.

In all, there should be no more than ten or twelve participants in the day and a half agenda-setting meeting in order for it to be optimally efficient and productive. Their principal task is to agree on major themes and subtopics for an international workshop in Africa, to be held approximately a half year later. At the agenda-setting meeting closure should also be reached on types of participants to be included; short lists of prospective US, African, and European attendees; specifications for participants' papers; candidates for rapporteurial assignments; deadlines that must be met, etc.

According to our present timetable, we expect to convene the workshop on African malaria strategies in fall 1990, in Africa, possibly Nairobi or Abidjan. An African scientific organization with which AAAS is familiar would be the local co-organizer. Some two dozen participants--African, US, and European specialists--will come together for three days of intensive interactions, consisting of plenary sessions and smaller working group meetings. By six weeks before the meeting, each participant will have submitted a synopsis of his/her specialty, written according to specifications developed at the agenda-setting meeting. Papers will be distributed to all participants prior to the Africa meeting, and will be the basis for group discussions. Three or four working groups will be charged with weighing costs and benefits of subsets of possible strategies and offering their respective recommendations to the workshop group at large. All recommendations will therefore be thoroughly vetted first in specialized working groups and later in the larger workshop setting. Above all, these prospective solutions for malaria prevention and control must be technically sound and practicable in the context of Africa today. It is critical therefore to select workshop participants who are as adept at process as they are at science, and who have an understanding of and appreciation for African circumstances and exigencies.

Statement of Products

After the workshop (no later than March 31, 1991 according to the present schedule, which assumes startup January 1, 1990), AAAS staff, assisted by three participant-rapporteurs from the workshop, a technical editor, and translator, will have distilled the deliberations and recommendations of the workshop; compiled a draft report manuscript that is then reviewed and accordingly revised; and produced a final project report, in French and English, that cogently and clearly sets forth workable strategies for addressing malaria in Africa. In order to be effective and efficient, the

report itself will be approximately 20 pages in length and will include as annexes important ancillary documentation. The report will be introduced by a two- to three-page Executive Summary (which can also stand alone) that outlines four to five major recommendations.

Scientific Resources Available to AAAS

Affiliated Societies

To cover this necessarily extensive terrain so as to formulate more effective approaches for combatting malaria in the region, the AAAS Sub-Saharan African Program will utilize the expertise resident in two major AAAS constituencies: mainstream US science and engineering societies and counterpart scientific groups in Africa.

In all its national and international programs, AAAS is able to capitalize on its structure as a broadbased membership organization and as a federation of scientific and engineering associations in order to call upon a diverse pool of exceptional scientific talent. Moreover, US scientists who participate in AAAS-sponsored activities typically do so as volunteers, demonstrating their commitment to having science serve society and leveraging substantially the contributions of AAAS program staff.

Of particular value in carrying out international activities is the AAAS Consortium of Affiliates for International Programs (CAIP), a multidisciplinary organization of more than 70 professional societies that coordinates and amplifies their mutual international interests. (See Attachment 4 for a description of CAIP and its activities).

First, to conduct the Africa malaria strategies project, AAAS will draw upon the relevant specialized knowledge within several members of CAIP:

o Affiliated societies whose members are professionally concerned with sociocultural and behavioral factors critically affecting the perception, treatment, and control of malaria among individuals, households, and communities. These factors include macroeconomic variables such as level of socioeconomic development, migration, and urbanization patterns, etc. Special attention will be given to involving US scientists with solid African experience.

American Anthropological Association
American Economic Association
American Sociological Association
Rural Sociological Society
Society for Applied Anthropology
Society for Research in Child Development

o US scientific groups that analyze problems of health care financing and delivery systems and of drug reliability and availability with emphasis on

developing countries, especially the constraints inherent in the contemporary African context.

American Association of Colleges of Pharmacy
American Medical Association
American Society for Pharmacology and Experimental Therapeutics

o Organizations whose members address critical environmental and ecological issues affecting malaria outcomes and can offer workable technical solutions for African countries.

American Society for Agricultural Engineers
American Society of Civil Engineers
Ecological Society of America
Society of American Foresters
Volunteers in Technical Assistance

o US associations in which natural science research has applications for malaria prevention and control in Africa, including the use of larvicides, chemotherapy, and chemoprophylaxis.

American Chemical Society
American Fisheries Society
American Institute of Biological Sciences
American Institute of Chemists
American Society for Microbiology
Entomological Society of America

o Member societies with methodological expertise in such vital areas as epidemiology, statistics, and operations research.

American Statistical Association
Operations Research Society

Other Linkages

In addition, AAAS will consult with and involve, as necessary, US groups and individuals outside CAIP specializing in such pertinent fields as parasitology and immunology; tropical medicine and public health; economics of health care and development; and agricultural and sanitary engineering, among others. Liaison will also be maintained with the malaria efforts of such key US and international organizations as the relevant regional and technical bureaus and missions of AID; the Centers for Disease Control; the National Institutes of Health; the Walter Reed Army Institute of Research; IOM/NAS; and WHO.

African Collaborators

The AAAS African malaria strategies project demands close collaboration with African social scientists, natural scientists, engineers, and health professionals, and with their home institutions and professional associations. Africans best understand local conditions and will therefore bring to the

project unique perspectives derived from years of first-hand experience studying and controlling malaria. In turn, in this partnership activity and others carried out under the aegis of the AAAS Sub-Saharan Africa Program, the active participation of African professional societies and other scientific organizations can facilitate and enhance institution-building and the development of specialized human resources in the region. AID, WHO, and numerous other non-African organizations, public and private, provide invaluable technical assistance and support to African countries in their fight against malaria, but as outsiders their role is necessarily limited in scope and duration. Ultimately it is African researchers and health specialists who are--and will continue to be--relied upon by their own governments and communities to find ways to ameliorate local malaria problems. Efforts such as this collaborative project, which is designed to utilize and strengthen African scientific and technological capacity, are able to contribute to the long-term sustainability of malaria prevention and control programs on the continent.

Leadership

AAAS has already named a chair for the US steering group, Dr. William Sawyer, who is both a physician and microbiologist, with extensive administrative experience and deep familiarity with developing country medical/scientific issues. Dr. Sawyer is no stranger to Africa; he was a key participant in the 1984 Grand Bassam Seminar, noted earlier, where he established a working relationship with leading African scientists from universities and institutes throughout the continent. (A copy of Dr. Sawyer's *curriculum vitae* is included in Attachment 5.)

At the same time AAAS has recently initiated preliminary discussions with African scientific counterparts concerning prospective participation in this collaborative project. Dr. Thomas Odhiambo, a Kenyan scientist of world renown who is both director of the International Centre for Insect Physiology and Ecology (ICIPE) and president of the African Academy of Sciences, enthusiastically endorses launching a multidisciplinary science-based attack on Africa's enormous malaria problem, and having AAAS spearhead this partnership work. Although Dr. Odhiambo's many commitments preclude his serving as chair of the African steering group, he has already pledged ICIPE cooperation in the malaria strategies project and provided suggestions concerning steering group members. Similarly, AAAS has already received expressions of interest and offers of collaboration from the directors of African operations with malaria programs such as the Kenya Medical Research Institute and the Tanzanian Institute for Medical Research, Dr. Davy Koech and Dr. W.L. Kilama, respectively.

Project Management

Dr. Amy Wilson, Director of the AAAS Sub-Saharan Africa Program, will serve as principal investigator and project manager for the AAAS malaria strategies project, for which we request AID support. She is also the designated principal investigator at AAAS for the AID grant housed in the Office of the Science Advisor, which supports selected AAAS activities aimed

at strengthening science and technology capacity for development. (We expect this proposed malaria project to be funded under that grant, number DPE-5543-G-SS-8057000, as described immediately below, under Funding Mechanism.) Dr. Wilson has had more than a decade of experience in Washington managing international science and engineering programs and has traveled extensively in the developing world. In the upcoming African malaria strategies project, Dr. Wilson (.50FTE) will be assisted by a Senior Program Associate (.20 FTE) and Research Assistant (1.00 FTE), as well as support staff personnel (.50 FTE). The senior program associate slot in the AAAS Africa Program is currently unoccupied. Until that vacant position is filled, outside consultants, with appropriate technical expertise, will be used to augment AAAS staff assigned to the malaria project. Both Dr. Wilson and Research Assistant Carole Mitnick bring French language capability to the project; Ms. Mitnick is an exceptionally well-qualified linguist who recently taught in France. (See Attachment 5 for staff biographical information.)

AAAS and AID: More than a Decade of Cooperation

AID and AAAS have maintained an active, multifaceted cooperative relationship since the early 1970s. The most ambitious undertaking, the AAAS Science, Engineering and Diplomacy Fellowship Program, has been conducted in collaboration with the Department of State since 1980 and AID since 1982. The growing Fellowship program provides a special public policy learning experience through its demonstration of the value and practicality of scientific and technological understanding in dealing with certain foreign policy problems. In addition to the Diplomacy Fellows Program, AAAS has worked cooperatively with AID on a variety of other activities in recent years, especially in Latin America and Asia, and now increasingly in Africa. AID provided partial support for the 1984 African Regional Seminar on the Role of Scientific and Engineering Societies in Development, noted earlier in this proposal. In 1988 the Africa Bureau at AID made a three-year supplementary grant to the AAAS Sub-Saharan Africa Journal Distribution Program (which receives principal funding from the Carnegie Corporation of New York and additional funding from the Ford Foundation) that has supported monitoring and evaluation activities, under the guidance of an Advisory Committee.

Funding Mechanism

In effect since 1988, AID Grant Number DPE-5543-G-SS-8057-00 is expected to be the mechanism under which the proposed AAAS Africa malaria strategies project will be funded. This grant, an extension of more than a decade of productive AAAS-AID collaboration, provides AAAS support for selected activities that supplement the ongoing AAAS effort to strengthen science and technology for development. Specifically, the AID grant enables AAAS and its affiliated societies to plan and execute projects that perform the following general functions:

(1) Use the networking capacities of AAAS and its affiliates to provide efficient, expert advice and consultation of value to AID, to developing country institutions and governments, and to scientific and engineering communities in the US and the developing world.

(2) Convene workshops, conferences, symposia, and other meetings addressing critical issues concerning science, technology, and development in areas where AAAS and its related scientific and engineering organizations have a significant comparative advantage.

(3) Initiate, expand, and maintain networks of scientific and engineering organizations and individuals that contribute to institution-building in the developing world.

(4) Plan and manage specialized science- and technology-related programs capitalizing upon the essential operating mode and attributes of AAAS and its affiliated organizations.