State of California
AIR RESOURCES BOARD

Resolution 85-1

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code Sections 39700 through 39705; and

WHEREAS, an unsolicited research proposal, Number 1282-111(R), entitled "Effects of Ozone on Cellular Synthesis and Viral Replication In Vitro", has been submitted by the University of California, Davis to the Air Resources Board; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

> Proposal Number 1282-111(R), entitled "Effects of Ozone on Cellular Synthesis and Viral Replication In Vitro", submitted by the University of California, Davis for a total amount not to exceed $46,819.

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code Section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

> Proposal Number 1282-111(R), entitled "Effects of Ozone on Cellular Synthesis and Viral Replication In Vitro", submitted by the University of California, Davis for a total amount not to exceed $46,819.

BE IT FURTHER RESOLVED, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein in an amount not to exceed $46,819.

I hereby certify that the above is a true and correct copy of Resolution 85-1, as adopted by the Air Resources Board.

Harold Holmes, Board Secretary

ITEM NO.: 85-3-4(b)1
DATE: 2-21-85

State of California
AIR RESOURCES BOARD

ITEM: Research Proposal No. 1282-111(R) entitled "Effects of Ozone on Cellular Synthesis and Viral Replication In Vitro".

RECOMMENDATION: Adopt Resolution 85-1 approving Proposal No. 1282-111(R) for funding in an amount not to exceed $46,819.

SUMMARY: Strong circumstantial evidence indicates that exposure to ozone at ambient levels increases susceptibility to respiratory infections. However, studies on this effect using human subjects and animal models are technically difficult and ethically limited. The use of cultured cells offers the opportunity to obtain key information on how pollutants influence the susceptibility to infection.

The proposal is designed to study how ozone affects different cell types. The major objectives are to determine effects of ozone on: 1) early markers of damage in cells; 2) replication of human and animal viruses; and 3) the interferon molecule and on the ability of cells to produce and respond to interferon. Interferon is a naturally produced compound important in the process the human body uses in fighting viral infections.

This is a novel experimental system which could be used for other gaseous pollutants or combinations of pollutants. The project will explore the effect of ambient levels of ozone on respiratory viruses in order to provide information for decisions on the risks of ozone. The expected result is a better understanding of the mechanism of air pollution damage.

State of California
AIR RESOURCES BOARD

Resolution 85-2

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code Sections 39700 through 39705; and

WHEREAS, an unsolicited research proposal, Number 1279-110(R), entitled "Development of a Humidification System for Use in Field Studies of Air Pollution Effects on Crops", has been submitted by the University of California, Riverside to the Air Resources Board; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

> Proposal Number 1279-110(R), entitled "Development of a Humidification System for Use in the Field Studies of Air Pollution Effects on Crops", submitted by the University of California, Riverside for a total amount not to exceed $49,928.

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code Section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

> Proposal Number 1279-110(R), entitled "Development of a Humidification System for Use in the Field Studies of Air Pollution Effects on Crops", submitted by the University of California, Riverside for a total amount not to exceed $49,928.

BE IT FURTHER RESOLVED, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein in an amount not to exceed $49,928.

I hereby certify that the above is a true and correct copy of Resolution 85-2, as adopted by the Air Resources Board.

Harold Holmes, Board Secretary

ITEM NO.: 85-3-4(b)2
DATE: 2-21-85

State of California
AIR RESOURCES BOARD

ITEM: Research Proposal No. 1279-110(R) entitled "Development of a Humidification System for Use in Field Studies of Air Pollution Effects on Crops".

RECOMMENDATION: Adopt Resolution 85-2 approving Proposal No. 1279-110(R) for funding in an amount not to exceed $49,928.

SUMMARY: This is a proposal to design, construct and test a pilot humidification system for use with the ARB open-top field chambers at the Statewide Air Pollution Research Center at U.C. Riverside. Proponents will determine the operating characteristics of the pilot system, including required amounts of water, steam generating capacity, humidity profiles in the chambers, and software for computer monitoring and regulation of humidity levels. The proponents will also conduct a small pilot study on the interaction of humidity and ozone on alfalfa and prepare a plan for building and operating a humidification system suitable for the further study of pollutants on plants.

There is evidence that ambient humidity can have a major influence on the amount of injury to plants which results from any given exposure to air pollutants. This influence has not been taken into account in most earlier research on the effects of air pollution on plants, and it poses a major problem in integrating results from different studies. The influence of environmental factors, including humidity, on plant response to air pollution has been identified in the plan for the new five-year program to assess crop losses as a critical input for determining and explaining the impacts of air pollution on crops. This plan was recently approved by the Air Resources Board. A research facility in which humidity can be experimentally controlled will be needed in order to perform research to fill information gaps on how humidity interacts with pollutants to affect plants.

State of California
AIR RESOURCES BOARD

Resolution 85-7
February 21, 1985

WHEREAS, the Air Resources Board has been directed to design and implement a comprehensive program of research and monitoring of acid deposition in California pursuant to Health and Safety Code Sections 39900 through 39915; and

WHEREAS, a solicited research proposal, Number 052-8, entitled "Effects on Steel of Acid Deposition by Gases, Particles, Fogs and Dew", has been submitted by Desert Research Institute, Nevada; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Scientific Advisory Committee on Acid Deposition has reviewed and recommends for funding:

> Proposal Number 052-8 entitled "Effects on Steel of Acid Deposition by Gases, Particles, Fogs and Dew", submitted by Desert Research Institute, Nevada for a total amount not to exceed $61,195.

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code Section 39906, hereby accepts the recommendation of the Scientific Advisory Committee on Acid Deposition and approves the following:

> Proposal Number 052-8 entitled "Effects on Steel of Acid Deposition by Gases, Particles, Fogs and Dew", submitted by Desert Research Institute, Nevada for a total amount not to exceed $61,195.

BE IT FURTHER RESOLVED, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein in an amount not to exceed $61,195.

I hereby certify that the above is a true and correct copy of Resolution 85-7, as adopted by the Air Resources Board.

Harold Holmes, Board Secretary

ITEM NO.: 85-3-4(b)3
DATE: February 21, 1985

State of California
AIR RESOURCES BOARD

ITEM: Research Proposal No. 052-8 entitled "Effects on Steel of Acid Deposition by Gases, Particles, Fogs and Dew".

RECOMMENDATION: Adopt Resolution 85-7 approving Proposal No. 052-8 for funding in an amount not to exceed $61,195.

SUMMARY: The Kapiloff Acid Deposition Act requires the California Air Resources Board to assess the economic impact of acid deposition upon materials as part of a comprehensive research program to determine the nature, extent and potential effects of acid deposition in California. The major objective of the materials damage research program is to distinguish the portion of materials damage which is caused by acid deposition from the damage that is induced by non-acidic pollutants or normal weathering in the absence of air pollutants. Additional objectives include: 1) identification and possible quantification of the major synergistic, additive, and antagonistic relationships between degradation agents; and 2) identification of materials that are significantly affected in California and determination of damage functions for those materials with respect to acid deposition.

The Request for Proposals (RFP) indicated that several proposals addressing various facets of the problems may be funded. A total of eleven proposals were received in response to the RFP. The Scientific Advisory Committee (SAC) approved two complementary studies to initiate the material damage research program. These studies would be performed by the Desert Research Institute (DRI) and the Environmental Monitoring & Service, Inc. (EMSI). DRI's study is discussed here; EMSI's study is discussed in Resolution 85-8.

The Desert Research Institute (DRI) would perform a comprehensive laboratory study using galvanized steel and coated carbon steel as the test materials. The proposed study would quantify the rate of corrosion for these materials by gaseous nitrogen dioxide and nitric acid. The materials damage would be investigated under varying conditions of pollutant concentrations,

temperatures and humidities. The quantitative analysis of the damage will be assessed by determining the surface properties using electrochemical and spectroscopic measurements.

The original proposal by DRI offered to study the effects of gaseous sulfation, gaseous nitration, particles, fogs and dew on steel. The SAC, however, approved only the gaseous nitration portion at this time. This study would be useful to the Board by providing direct comparison of corrosion rates by natural and anthropogenic pollutants. Such information would be extremely useful in determining the cost-benefits of emission controls with respect to the materials damage. The study would also provide mechanistic insight on the corrosion chemistry and physics of gaseous nitration of metals.

State of California
AIR RESOURCES BOARD

Resolution 85-8
February 21, 1985

WHEREAS, the Air Resources Board has been directed to design and implement a comprehensive program of research and monitoring of acid deposition in California pursuant to Health and Safety Code Sections 39900 through 39915; and

WHEREAS, a solicited research proposal, Number 054-8, entitled "Investigation of the Effects of Acid Deposition on Materials", has been submitted by Environmental Monitoring & Services, Inc. to the ARB; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Scientific Advisory Committee on Acid Deposition has reviewed and recommends for funding:

> Proposal Number 054-8 entitled "Investigation of the Effects of Acid Deposition on Materials", submitted by Environmental Monitoring & Services, Inc. for a total amount not to exceed $297,562.

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code Section 39906, hereby accepts the recommendation of the Scientific Advisory Committee on Acid Deposition and approves the following:

> Proposal Number 054-8 entitled "Investigation of the Effects of Acid Deposition on Materials", submitted by Environmental Monitoring & Services, Inc. for a total amount not to exceed $297,562.

BE IT FURTHER RESOLVED, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein in an amount not to exceed $297,562.

I hereby certify that the above is a true and correct copy of Resolution 85-8, as adopted by the Air Resources Board.

Harold Holmes, Board Secretary

ITEM NO.: 85-3-4(b)4
DATE: February 21, 1985

State of California
AIR RESOURCES BOARD

ITEM: Research Proposal No. 054-8 entitled "Investigation of the Effects of Acid Deposition on Materials".

RECOMMENDATION: Adopt Resolution 85-8 approving Proposal No. 054-8 for funding in an amount not to exceed $297,562.

SUMMARY: The Kapiloff Acid Deposition Act requires the California Air Resources Board to assess the economic impact of acid deposition upon materials as part of a comprehensive research program to determine the nature, extent and potential effects of acid deposition in California. The major objective of the materials damage research program is to distinguish the portion of materials damage which is caused by acid deposition from the damage that is induced by non-acidic pollutants or normal weathering in the absence of air pollutants. Additional objectives include: 1) identification and possible quantification of the major synergistic, additive, and antagonistic relationships between degradation agents, and 2) identification of materials that are significantly affected in California and determination of damage functions for those materials with respect to acid deposition.

The Request for Proposals (RFP) indicated that several proposals addressing various facets of the program may be funded. A total of eleven proposals were received in response to the RFP. The Scientific Advisory Committee (SAC) approved two complementary studies to initiate the materials damage research program. The two studies would be performed by the Environmental Monitoring and Services, Inc. (EMSI) and Desert Research Institute (DRI). EMSI's study is discussed here; DRI's study is discussed in Resolution 85-7.

The research plan proposed by EMSI includes a combined field and laboratory study. EMSI would study five economically important materials. Ten one-month long laboratory chamber experiments would be conducted to investigate the effects of natural weathering and the relative effects of individual and combinations of aerometric parameters with continuous wet/dry cycles. In addition, a twelve-month field exposure program would

be initiated at four California sites to distinguish the portion of materials damage caused by acidic pollution from that caused by natural weathering. EMSI would also monitor ambient nitric acid concentrations and relative humidity. Other aerometric data will be obtained from an existing monitoring network.

This comprehensive laboratory and field study would be useful to the Board in providing valuable information on the direct comparison of corrosion rates caused by natural and anthropogenic pollutants. Such information would be very useful in determining the cost-benefit of emission controls with respect to the materials damage for a number of economically important materials in California.

BUDGET SUMMARY

ENVIRONMENTAL MONITORING & SERVICES, INC.

"Investigation of the Effects of Acid Deposition on Materials"

BUDGET ITEMS:

Salaries	$ 33,722		
Supplies/ Materials	24,015		
Other Costs	6,120		
Travel	8,594		
Consultant/ Subcontractor	113,797*		
TOTAL, Direct Costs			$186,248
TOTAL, Indirect Costs			111,314
		TOTAL PROJECT COST	$297,562

* Consultant (Prof. Norbert Baer) -- $ 4,000

Subcontractor (Rockwell Science Center)

Salaries and Benefits	$37,987
Indirect Costs	48,780
Other Costs	9,847
General & Administration Costs	13,183
TOTAL, Subcontractor	$109,797
TOTAL, Consultant/Subcontractor	$113,797

State of California
AIR RESOURCES BOARD

Resolution 85-9
February 21, 1985

WHEREAS, the Air Resources Board has been directed to design and implement a comprehensive program of research and monitoring of acid deposition in California pursuant to Health and Safety Code Sections 39900 through 39915; and

WHEREAS, a solicited research proposal, Number 049-7, entitled "Pulmonary Function and Symptomatic Responses of Asthmatics to Ambient Acid Atmospheres", has been submitted by the University of California, Irvine, to the ARB; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Scientific Advisory Committee on Acid Deposition has reviewed and recommends for funding:

> Proposal Number 049-7 entitled "Pulmonary Function and Symptomatic Responses of Asthmatics to Ambient Acid Atmospheres", submitted by the University of California, Irvine, for a total amount not to exceed $453,052.

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code Section 39906, hereby accepts the recommendation of the Scientific Advisory Committee on Acid Deposition and approves the following:

> Proposal Number 049-7 entitled "Pulmonary Function and Symptomatic Responses of Asthmatics to Ambient Acid Atmospheres", submitted by the University of California, Irvine, for a total amount not to exceed $453,052.

BE IT FURTHER RESOLVED, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein in an amount not to exceed $453,052.

I hereby certify that the above is a true and correct copy of Resolution 85-9, as adopted by the Air Resources Board.

Harold Holmes

Harold Holmes, Board Secretary

ITEM NO.: 85-3-4(b)5
DATE: February 21, 1985

State of California
AIR RESOURCES BOARD

ITEM: Research Proposal No. 049-7 entitled "Pulmonary Function and Symptomatic Responses of Asthmatics to Ambient Acid Atmospheres".

RECOMMENDATION: Adopt Resolution 85-9 approving Proposal No. 049-7 for funding in an amount not to exceed $453,052.

SUMMARY: The Kapiloff Acid Deposition Act provides that the Air Resources Board establish a research program to evaluate the possible health consequences of acidic pollution in California air. A Request for Proposals (RFP) was issued to solicit proposals that would begin a program to study the possible health effects. The range of approaches suggested in the RFP included epidemiological studies, controlled exposures of human or animal subjects, in vitro testing, and studies of carcinogenic and mutagenic potential. The RFP encouraged the development of new methods to study complex acidic atmospheres in California. Eight proposals were received in response to this RFP. Three were selected for funding by the Scientific Advisory Committee. The selection included an epidemiological study (presented in this summary), a human clinical study and an animal exposure study.

This proposal, for an epidemiology study, would monitor 100 carefully-selected asthmatics for one year with the objective of relating daily symptoms and lung function changes to measured urban pollution. The selection of asthmatics was made because, as a group, they represent a significant part of the population who are sensitive to the effects of air pollution. In addition, protocols to evaluate effects on asthmatics have become highly developed. Subjects would be selected from the Irvine/Costa Mesa area of Orange County, which has moderate air pollution, including acid components and their precursors. The fogs of highest acidity measured in the State have occurred in this area.

This study would use both routinely collected air quality data, specially collected data on particulate matter (PM_{10}) and fog acidity. Additional data would be obtained by using a specially designed continuous

sulfate-sulfuric acid analyzer. Statistical analysis would involve a "time-series" approach, in which the response of individuals is considered over time in relation to pollutant exposure. Such methods have been successfully employed in related studies of the effects of air pollution on human subjects exposed to ambient air pollution.

The results of this study would provide an assessment of how atmospheres containing acidic components affect the health of a large group of sensitive subjects. The experimental plan should allow the investigators to apportion the relative effects of the important individual components of the acidic atmospheres.

The Scientific Advisory Committee recommended that the air monitoring portion of the work be carried out by the Air Resources Board rather than UCI and that funds requested by UCI be used to support the increased ARB monitoring effort.

BUDGET SUMMARY

University of California, Irvine

"Pulmonary Function and Symptomatic Response of Asthmatics to Ambient Air Atmospheres"

BUDGET ITEMS:

Salaries	$173,131	
Equipment	43,298*	
Supplies	8,084	
Travel	9,090	
Consultants	13,600	
Subcontracts	35,594*	
Other Costs	51,107	
TOTAL, Direct Costs		$333,904
TOTAL, Indirect Costs		119,148
TOTAL PROJECT COST		$453,052

*These two items are related to air quality monitoring and sample analysis. The Scientific Advisory Committee recommended removal of these activities from the scope of work presented in this proposal. A portion of these funds will be used by the Board's Haagen-Smit Laboratory to perform the needed tasks.

State of California
AIR RESOURCES BOARD

Resolution 85-10
February 21, 1985

WHEREAS, the Air Resources Board has been directed to design and implement a comprehensive program of research and monitoring of acid deposition in California pursuant to Health and Safety Code Sections 39900 through 39915; and

WHEREAS, a solicited research proposal, Number 050-7, entitled "Respiratory Effects of Acid Containing Multicomponent Pollutant Atmospheres", has been submitted by the University of California, Irvine, to the ARB; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Scientific Advisory Committee on Acid Deposition has reviewed and recommends for funding:

> Proposal Number 050-7 entitled "Respiratory Effects of Acid Containing Multicomponent Pollutant Atmospheres", submitted by the University of California, Irvine, for a total amount not to exceed $264,672.

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code Section 39906, hereby accepts the recommendation of the Scientific Advisory Committee on Acid Deposition and approves the following:

> Proposal Number 050-7 entitled "Respiratory Effects of Acid Containing Multicomponent Pollutant Atmospheres", submitted by the University of California, Irvine, for a total amount not to exceed $264,672.

BE IT FURTHER RESOLVED, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein in an amount not to exceed $264,672.

I hereby certify that the above is a true and correct copy of Resolution 85-10, as adopted by the Air Resources Board.

Harold Holmes, Board Secretary

ITEM NO.: 85-3-4(b)6
DATE: February 21, 1985

State of California
AIR RESOURCES BOARD

ITEM: Research Proposal No. 050-7 entitled "Respiratory Effects of Acid Containing Multicomponent Pollutant Atmospheres".

RECOMMENDATION: Adopt Resolution 85-10 approving Proposal No. 050-7 for funding in an amount not to exceed $264,672.

SUMMARY: The Kapiloff Acid Deposition Act provides for the Air Resources Board to establish a research program to evaluate the possible health consequences of acidic pollution in California air. A Request for Proposals (RFP) was issued to solicit proposals that would begin a program to study the possible health effects. In the RFP the range of approaches included epidemiological studies, controlled exposures of human or animal subjects, in vitro testing, and studies of carcinogenic and mutagenic potential. The RFP encouraged the development of new methods to study complex acidic atmospheres seen in California. Eight proposals were received in response to this RFP. Three were selected for funding by the Scientific Advisory Committee. The selection included an epidemiological study, a human clinical study, and an animal exposure study (presented in this summary).

The objective of this proposed study is to assess the possible adverse effects of inhaled complex acidic air pollutant mixtures on the respiratory system of rats. The investigators plan to generate a complex atmosphere using ozone, NO_2, SO_2, $MnSO_4$, $(NH_4)_2SO_4$ and carbon aerosol as starting reagents. This complex atmosphere reacts in the chamber to produce an acid-rich particulate atmosphere. Important components of the atmosphere would be studied in simple combinations and alone. In addition, a H_2SO_4-HNO_3 atmosphere would also be utilized. Three different concentrations of the multi-component mixture would be used in order to evaluate the dose-response nature of any observed effects.

The health effects end points that would be measured include several different indicators of respiratory system status and injury. Changes in breathing

pattern would be assessed using methods similar to those used in human studies. Tissue injury and lung cell death would be evaluated by radio tracer techniques which measure the rate of DNA incorporation into tissue. Cellular damage to the deep lung would be measured by quantitative changes in cell types present in the air sacs where gas exchange occurs. Clearance rates of inhaled radio-labeled particles from the lung would be followed for up to 30 days to determine whether the test atmospheres affect particle removal. Possible changes in the lung fluids present in the lung of the test animals would be evaluated by gas chromotography. Lung fluids contain many essential components important in defense against infectious agents, as well as components necessary to provide lubrication and prevent collapse of the air sacs.

Findings from this study are intended to provide an initial assessment of the acute effects of such atmospheres.

BUDGET SUMMARY

University of California, Irvine

"Respiratory Effects of Acid Containing Multicomponent Pollutant Atmospheres"

BUDGET ITEMS:

Salaries	$74,789	
Equipment	36,651*	
Supplies	31,860	
Travel	4,200	
Consultants	5,600	
Other Costs	45,995	
TOTAL, Direct Costs		$199,095
TOTAL, Indirect Costs		65,577
TOTAL PROJECT COST		$264,672

*Equipment budget includes a number of items in a new device to make simultaneous measurements of the pulmonary function of eight rats.

EQUIPMENT DETAIL:

8 Ultra low differential pressure transducers	$ 4,464
8 Pneumotachographs	1,760
4 Validyne CD19 Carrier Demodulators	1,492
4 Validyne Flow Integrators	4,400
1 Validyne 10 channel module case	1,886
Gould Recorder, 8 channel Gould	16,533
4 General Purpose Amplifiers Gould	3,520
2 Universal Amplifiers	2,596
	$ 36,651

State of California
AIR RESOURCES BOARD

Resolution 85-11
February 21, 1985

WHEREAS, the Air Resources Board has been directed to design and implement a comprehensive program of research and monitoring of acid deposition in California pursuant to Health and Safety Code Sections 39900 through 39915; and

WHEREAS, a solicited research proposal, Number 051-7, entitled "The Roles of pH, Titratable Acid and Specific Chemical Composition in Mediating Effects of Acid Aerosols on the Airways", has been submitted by the University of California, San Francisco, to the ARB; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Scientific Advisory Committee on Acid Deposition has reviewed and recommends for funding:

> Proposal Number 051-7 entitled "The Roles of pH, Titratable Acid and Specific Chemical Composition in Mediating Effects of Acid Aerosols on the Airways", submitted by the University of California, San Francisco, for a total amount not to exceed $125,457.

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code Section 39906, hereby accepts the recommendation of the Scientific Advisory Committee on Acid Deposition and approves the following:

> Proposal Number 051-7 entitled "The Roles of pH, Titratable Acid and Specific Chemical Composition in Mediating Effects of Acid Aerosols on the Airways", submitted by the University of California, San Francisco, for a total amount not to exceed $125,457.

BE IT FURTHER RESOLVED, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein in an amount not to exceed $125,457.

I hereby certify that the above is a true and correct copy of Resolution 85-11, as adopted by the Air Resources Board.

Harold Holmes, Board Secretary

ITEM NO.: 85-3-4(b)7
DATE: February 21, 1985

State of California
AIR RESOURCES BOARD

ITEM: Research Proposal No. 51-7 entitled "The Roles of pH, Titratable Acid and Specific Chemical Composition in Mediating Effects of Acid Aerosols on the Airways".

RECOMMENDATION: Adopt Resolution 85-11 approving Proposal No. 051-7 for funding in an amount not to exceed $125,457.

SUMMARY: The Kapiloff Acid Deposition Act provides for the Air Resources Board to establish a research program to evaluate the possible health consequences of acidic pollution in California air. A Request for Proposals (RFP) was issued to solicit proposals that would study possible health effects. The RFP indicated that a wide range of approaches would be considered: epidemiological studies, controlled exposures of human or animal subjects, in vitro testing, and studies of carcinogenic and mutagenic potential. In addition, the RFP encouraged the development of new methods to study complex acidic atmospheres in California. Eight proposals were received in response to this RFP. Three were selected for funding by the Scientific Advisory Committee. The selection included an epidemiological study, a human clinical study and an animal exposure study. The human clinical study is presented in this summary.

The objective of this study is to clarify the nature of the human pulmonary response to inhaled acidic materials. This proposal addresses several basic unanswered questions that could provide guidance for future studies of human responses to acid aerosols. These questions are: 1) Does the chemical composition of an acid aerosol influence human response, independent of pH; 2) Does an un-buffered acid produce a different pulmonary response than buffered acids of the same pH; and 3) What are the pulmonary effects of aerosols with differing pH?

Ten carefully characterized asthmatic subjects would be used in each experiment. The subjects would be exposed for brief periods to acid aerosols, sulfites and SO_2. The study would use well-established, non-invasive techniques to assess the pulmonary responses of the exposed subjects. Previous studies by this research

group have shown this number to be sufficient to provide statistically valid findings using these proposed methods.

In order to determine what changes may be occurring in the lung at the cellular level, guinea pigs would also be exposed to these various acid aerosols, with and without sulfite and SO_2. The use of animals in this study allows for a more direct assessment of the actual sites of injury and mechanisms of response. Possible effects to be assessed would be bronchoconstriction (airway tightening), airway injury and lung tissue leakage.

The rationale for this approach is that, before any investigators begin an acid-by-acid study of inhaled acids, the basis of the response to acidic insult should be determined. The results of this study will provide the type of basic information that will be useful to guide future research activities into the health effects of acidic materials. It would also provide information on how asthmatics are affected by acidic pollutants.

BUDGET SUMMARY

University of California, San Francisco

"The Roles of pH, Titratable Acid and Specific Chemical Composition in Mediating Effects of Acid Aerosols in the Airways"

BUDGET ITEMS:

Salaries	$66,758		
Equipment	10,665*		
Supplies	8,990		
Travel	1,600		
Other Costs	9,206		
TOTAL, Direct Costs			$ 97,219
TOTAL, Indirect Costs			28,238
		TOTAL PROJECT COST	$125,457

*Equipment is needed for 1) the measurement and automatic computer acquisition of data on airway changes; 2) observation of tissue injury; and 3) the laboratory preparation of reagents. This equipment is listed below:

EQUIPMENT DETAIL:

Microscope	$ 3,515
Electronic protractor	1,100
IBM PC	1,910
Printer	470
A/D convertor	1,300
pH meter	950
2 Differential pressure transducers	900
Pneumotachygraph	520
	$10,665