NOTICE: When government or other drawings, specifications or other data are used for any purpose other than in connection with a definitely related government procurement operation, the U. S. Government thereby incurs no responsibility, nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.
FINAL REPORT

DETECTION OF HUMANS

IN

CONCEALED PREPARED POSITIONS

Prepared for
Limited War Laboratory
Aberdeen Proving Ground

THE BIOSEARCH COMPANY
BOSTON, MASSACHUSETTS

JULY, 1963
OUTLINE OF CONTENTS

A. PREFACE
B. INTRODUCTION
C. HUMAN ATTRIBUTES AND CONTRASTS
   I. Chemical Attributes
      a. List of chemical substances produced by man.
      b. Additional data on specific body products.
      c. Other supporting information; ethnic, etc.
   II. Physical Attributes
      a. Electromagnetic radiation.
      b. Sound and vibration.
      c. Electrical
      d. Magnetic
      e. Radioactivity
      f. Body configuration and cross sections
D. ENVIRONMENTAL MODIFICATION OF SIGNALS FROM MAN
   I. Systematic descriptions of bioenvironment
   II. Chemical Substances in Environment and Substance Transmission
      a. Measurements in air.
      b. Substances from animals; excretions, scents.
      c. Plant substances
      d. Chemical substance transmission in air.
   III. Physical signals in environment and their transmission
      a. Electromagnetic radiation
      b. Sound and vibration
      c. Electrical and magnetic fields
E. SENSING AND DETECTION OF HUMAN ATTRIBUTES
   I. Introduction
   II. Biosensing (Living tissue as detector).
      a. General comments
      b. Specific chemoreceptor studies
      c. Chemosensing by isolated non-chemoreceptor tissue
      d. Receptors for mechanical, radiant, electrical energy, etc.
   III. Chemical Products Sensing by Chemical and Physical Means
      a. General comments
      b. Chemical Procedures.
      c. Physical Methods.
   IV. Physical Signal Sensing
      a. General comments
      b. Electromagnetic radiation
      c. Sound and vibration
      d. Other: radioactive, electrical, magnetic, etc.
      e. Physical systems considerations
F. OTHER RELATED INFORMATION
   I. Stress and induction of behavioral responses
   II. Other Types of Studies on Human Spotting and Data Transmission
   III. BW and CW Detection problem similarities
   IV. Other background sources in several areas.
G. SUGGESTED FURTHER WORK
H. BIBLIOGRAPHY
A. PREFACE

This report was prepared in accordance with the requirements of United States Army Contract DA-019-AMC-0122-R, and with the approval of the U.S. Army Limited War Laboratories, Aberdeen, Md.

Dr. Max Krauss, Chief of Biological Research at the Limited War Laboratories, has been the Technical Project Monitor for this work. Mr. Stephan Fedak, Deputy Chief, R&D Branch, Boston Army Procurement District, was the Contracting Officer's Representative and also provided liaison with the Army Procurement Office at Aberdeen, Md.

The technical analyses were done by an interdisciplinary group, with participants in physics, chemistry, biology, medicine, biophysics, and various engineering disciplines. This report was written by Dr. Alfred T. Kornfield.

Grateful acknowledgment is expressed for the special assistance provided by Mr. Fedak and the Boston Procurement District staff, for the technical counsel and aid of Dr. Krauss and personnel at the Limited War Laboratories, and to all of the Biosearch Co. professional and technical personnel who contributed so ably to this report.

THE BIOSEARCH CO. BOSTON.

Dr. A. T. Kornfield, President.
B. INTRODUCTION

To examine the capabilities of biosensing techniques for the detection of humans in concealed positions, this study concerned itself with a review of the diverse attributes of man yielding signals, the signal modifications in environment, and various sensing concepts.

About 2000 references are cited, selected from an aggregate of about 8000 with the balance rejected as irrelevant or of no value. Resources used included over 30 document and book collections—the Harvard Libraries (the medical and Cambridge complexes); MIT group; Boston Medical; Boston Public; Boston Univ; Tufts Medical; New York Public; ASTIA (DDC) reprints and their NY regional center film collection; QMR&E Library, Natick; Army Chemical Lab Library, Edgewood; Air Force Cambridge Res Lab Library.

In considering human signal sources and attributes, emphasis was placed on assembly of a catalog of chemical substances excreted through all body portals; for comparative analysis, other human physical attributes and signals were set down (emission, reflection, proximity properties), resulting in an inventory of most of the major signals produced by man.

Environmental modification of chemical signals from man, by substances from plants and animals, weather effects, etc; was augmented also by comparative data on effects of environment on physical signal transmission.

Sensing techniques examined highlight biosensing (defined as the use of living material as transducer or pickup, in isolated form, for chemical or physical signals, analogous with physical sensor devices. A large aggregate of possibilities is presented for consideration, emphasizing chemosensing, which offers the most potential of all of the biosensors for the major problem solution. The plausibility of the biosensing concept must rest on evidence presented, of ability to maintain material alive, to conveniently gather reproducible input/output data from it, and to find performance properties superior to physical or chemical sensing. Comparative data on chemical and physical sensing of chemical substances and physical phenomena is presented.

From the short effort completed, three things have resulted. One is this report, serving as a source book, aiding the reader in going further in exploring in depth any concept cited, and in further analysis of complete detection systems of biological, chemical, or physical nature, as grounded in known human properties. The second result is the series of recommendations for further work, based on the findings in the study, suggesting experiments on promising techniques, particularly on biosensing, also reviews and analyses to make up for data deficiencies uncovered in the literature. The third result is the provision of an "idea" book here, with a variety of speculative possibilities presented, for detection, but set off clearly from those documented concepts stated.

Pursuit of a more thorough analysis across the span of all of the areas presented would be desirable, highlighting the promising areas set forth in the recommendations; this could aid in bringing the Limited War Laboratory effort more rapidly towards the goal of a suitable field detection instrument for concealed humans.
C. HUMAN ATTRIBUTES AND CONTRASTS

I. Chemical Products.

On the following pages will be found a list of major chemical substances excreted in urine, in feces, and from the skin. These are readily traceable to sources of quantitative data for each substance, permitting the reader to go further in analysis of detection of concealed humans by chemical products emitted.

In addition to the list, supplementary data and comments follow, on skin products (sweat, sebum, etc.), their alteration by skin bacterial action, the attraction of animals by their odors; also provided are additional data on urine products, g.i. tract excretions, and expired air.

Ethnic and regional comparisons of these products are presented, and regional diet and nutritional data source information is cited. Notes on related closed-cabin-ecology studies and on human tissue chemical composition are given.

a. List of Major Chemical Substances Produced by Man.

The tables which follow have the following features: the first section lists over 400 specific chemical substances of low molecular weight, produced as indicated from one or several of the three body channels as feces, urine, or skin products (from eccrine, apocrine, sebaceous glands, etc.). The short second section contains a mixed collection of hormones, enzymes, other high molecular weight substances, etc. The third section lists the references from which can be obtained quantitative data on each substance measured, from the body channel indicated.

To Use the Tables:

Note that each specific chemical name is accompanied by symbols indicating the body excretory channel, and reference codes to be looked up in the reference list in the third section.

Example: Alanine, total ...... S-AG, U-12HBU.(taken from Table).
S-AG= Sweat or Skin, ( in reference AG).
U-12HBU=Urine, (in references 1, 2, H, B, U).
Turn to third section of table, note that code AG cites page 223 of (Kuno-56)listed in biblio at end of report; #1 cites page 363 of (Altman-61), etc.
# CHEMICAL SUBSTANCES EXCRETED BY MAN

## Section 1. Specific Substances of Low Molecular Weight

<table>
<thead>
<tr>
<th>Substance</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic Acid</td>
<td>S-AC</td>
</tr>
<tr>
<td>Acetoacetic Acid</td>
<td>U-12</td>
</tr>
<tr>
<td>Acetone Free</td>
<td>U-12E</td>
</tr>
<tr>
<td>Acetic Acid</td>
<td>U-2</td>
</tr>
<tr>
<td>Adenine</td>
<td>U-12</td>
</tr>
<tr>
<td>Adipic Acid</td>
<td>U-2</td>
</tr>
<tr>
<td>Adipic Acid, Alpha Amino</td>
<td>U-2B</td>
</tr>
<tr>
<td>Adrenalin</td>
<td>U-2</td>
</tr>
<tr>
<td>Alanine Conjugated</td>
<td>U-2</td>
</tr>
<tr>
<td>Alanine Total</td>
<td>S-AG, U-12HBU</td>
</tr>
<tr>
<td>Alanine Beta</td>
<td>U-2U</td>
</tr>
<tr>
<td>Aldosterone</td>
<td>U-1</td>
</tr>
<tr>
<td>Allantoic</td>
<td>U-12BHJ+AA+AC</td>
</tr>
<tr>
<td>Aluminum</td>
<td>F-5Y U-12FH+AC</td>
</tr>
<tr>
<td>Amines Primary</td>
<td>U-2</td>
</tr>
<tr>
<td>Amines Aromatic Fraction</td>
<td>U-2</td>
</tr>
<tr>
<td>Amino Acids, Free</td>
<td>U-AA+AC</td>
</tr>
<tr>
<td>Amino Acids Total</td>
<td>S-6BKLSTV+AG U-1BHJ+AA</td>
</tr>
<tr>
<td>Amino Acidic Acid</td>
<td>U-H</td>
</tr>
<tr>
<td>Amino Sugars</td>
<td>U-H</td>
</tr>
<tr>
<td>Ammonia</td>
<td>S-67BLTv+AG F-5BFZ U-12BFH+AA+AC</td>
</tr>
<tr>
<td>Androgens, Male</td>
<td>U-1</td>
</tr>
<tr>
<td>Androgens, Female</td>
<td>U-1</td>
</tr>
<tr>
<td>Androsterone</td>
<td>U-1</td>
</tr>
<tr>
<td>Anserine</td>
<td>U-2</td>
</tr>
<tr>
<td>Anthranilic Acid</td>
<td>U-2</td>
</tr>
<tr>
<td>Arabinose</td>
<td>U-2</td>
</tr>
<tr>
<td>Arginine, Free</td>
<td>U-BH</td>
</tr>
<tr>
<td>Arginine Combined</td>
<td>U-2B</td>
</tr>
<tr>
<td>Arginine Total</td>
<td>S-6BL+AG F-58R U-12BHJ+AB+AC</td>
</tr>
<tr>
<td>Arsenic</td>
<td>S-F F-5AF U-1F</td>
</tr>
<tr>
<td>Ascorbic Acid</td>
<td>S-6DLv+AE+AG F-5D U-12D+AC</td>
</tr>
<tr>
<td>Ascorbic Acid Dehydro</td>
<td>S-3+AG U-2</td>
</tr>
<tr>
<td>Asparagine</td>
<td>U-2U</td>
</tr>
<tr>
<td>Aspartic Acid, Free</td>
<td>U-1BH</td>
</tr>
<tr>
<td>Aspartic Acid Combined</td>
<td>U-2B</td>
</tr>
<tr>
<td>Aspartic Acid Total</td>
<td>S-AG U-12BHJ+AB</td>
</tr>
<tr>
<td>Benzoic Acid, Para-Amino</td>
<td>S-3LD+AG F-59D U-125D</td>
</tr>
<tr>
<td>Benzoic Acid, Meta-Hydroxy</td>
<td>U-2</td>
</tr>
<tr>
<td>Benzoic Acid, Para-Hydroxy</td>
<td>U-2</td>
</tr>
<tr>
<td>Benzoic Acid, Three-Methoxy-Four-Hydroxy</td>
<td>U-2</td>
</tr>
<tr>
<td>Beryllium</td>
<td>U-2</td>
</tr>
<tr>
<td>Bicarbonate</td>
<td>U-2</td>
</tr>
<tr>
<td>Bilirubin</td>
<td>S-E U-15EH</td>
</tr>
<tr>
<td>Biotin</td>
<td>S-6DL F-9DS U-12D+AC</td>
</tr>
<tr>
<td>Bismuth</td>
<td>S-V</td>
</tr>
<tr>
<td>Bromine</td>
<td>S-V+AG U-12F</td>
</tr>
<tr>
<td>Butyric Acid, Alpha-Amino</td>
<td>U-2</td>
</tr>
<tr>
<td>Butyric Acid, Amino</td>
<td>U-U</td>
</tr>
<tr>
<td>Butyric Acid, Amino-ISO</td>
<td>U-2</td>
</tr>
<tr>
<td>Calcium</td>
<td>S-67FLTSV+AG F-5AGXZ U-125FHJX+AC</td>
</tr>
<tr>
<td>Caproic Acid</td>
<td>S-AG</td>
</tr>
<tr>
<td>Caproic Acid, Alpha-Keto-ISO</td>
<td>U-2</td>
</tr>
<tr>
<td>Chemical</td>
<td>Code</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Caprylic Acid</td>
<td>S-AE</td>
</tr>
<tr>
<td>Carbonic Acid</td>
<td>F-NW</td>
</tr>
<tr>
<td>Carboxamide</td>
<td>U-2</td>
</tr>
<tr>
<td>Carnosine</td>
<td>U-2</td>
</tr>
<tr>
<td>Carnitine</td>
<td>U-2</td>
</tr>
<tr>
<td>Carnosine</td>
<td>U-5</td>
</tr>
<tr>
<td>Carotenes</td>
<td>U-2</td>
</tr>
<tr>
<td>Catecholamines</td>
<td>U-2</td>
</tr>
<tr>
<td>Cathepsin</td>
<td>S-67FLS<em>AG F-5AFGKZ U-12FHJX</em>AC</td>
</tr>
<tr>
<td>Chloride</td>
<td>S-4</td>
</tr>
<tr>
<td>Cholesterol Total</td>
<td>S-4*AG</td>
</tr>
<tr>
<td>Cholesterol DEHYDRO</td>
<td>S-6DLTV U-12DH*AC</td>
</tr>
<tr>
<td>Cholesterol ESTERS</td>
<td>U-2</td>
</tr>
<tr>
<td>Choline</td>
<td>U-2</td>
</tr>
<tr>
<td>Cinnamic Acid, PARA-HYDROXY-</td>
<td>U-2</td>
</tr>
<tr>
<td>Cinnamic Acid, THREE-METHOXY-FOUR-HYDROXY</td>
<td>U-2</td>
</tr>
<tr>
<td>Cinnamoyl-Glycine, PARA-HYDROXY-</td>
<td>U-2</td>
</tr>
<tr>
<td>Citric Acid</td>
<td>U-2</td>
</tr>
<tr>
<td>Citrulline FREE</td>
<td>U-5B</td>
</tr>
<tr>
<td>Citrulline COMBINED</td>
<td>U-16</td>
</tr>
<tr>
<td>Citrulline TOTAL</td>
<td>S-L<em>AG U-12BH</em>AC</td>
</tr>
<tr>
<td>Cobalamin</td>
<td>S-3</td>
</tr>
<tr>
<td>Cobalt</td>
<td>S-37BLSTV<em>AG U-12BHJ</em>AA*AC</td>
</tr>
<tr>
<td>Copper</td>
<td>F-R</td>
</tr>
<tr>
<td>Coproporphyrins</td>
<td>U-2</td>
</tr>
<tr>
<td>Corticoids</td>
<td>U-2</td>
</tr>
<tr>
<td>Creatine</td>
<td>S-AG, U-12BH<em>AB</em>AC</td>
</tr>
<tr>
<td>Creatine Phosphate</td>
<td>U-12</td>
</tr>
<tr>
<td>Cresol, PARA</td>
<td>U-2</td>
</tr>
<tr>
<td>Cysteine</td>
<td>S-18H</td>
</tr>
<tr>
<td>Cystine FREE</td>
<td>U-2</td>
</tr>
<tr>
<td>Cystine COMBINED</td>
<td>U-2</td>
</tr>
<tr>
<td>Cystine TOTAL</td>
<td>U-2</td>
</tr>
<tr>
<td>Diketogluconic Acid</td>
<td>U-2</td>
</tr>
<tr>
<td>Ergothionine</td>
<td>U-2</td>
</tr>
<tr>
<td>Ergothionine, CONJUGATED</td>
<td>U-2</td>
</tr>
<tr>
<td>Estradiol</td>
<td>U-1</td>
</tr>
<tr>
<td>Estriol</td>
<td>U-12</td>
</tr>
<tr>
<td>Estrone</td>
<td>U-2H</td>
</tr>
<tr>
<td>Ethanolamine</td>
<td>S-8</td>
</tr>
<tr>
<td>Fat Neutral</td>
<td>U-2</td>
</tr>
<tr>
<td>Fat Unsaponifiable</td>
<td>S-TK</td>
</tr>
<tr>
<td>Fat TOTAL</td>
<td>S-M F-G*AF</td>
</tr>
<tr>
<td>Fatty Acids FREE</td>
<td>S-81 F-5C</td>
</tr>
<tr>
<td>Fatty Acids HYDROXY</td>
<td>S-8CS F-5CGZ*AF U-H</td>
</tr>
<tr>
<td>Fatty Acids UNSATURATED</td>
<td>F-5C</td>
</tr>
<tr>
<td>Fatty Acid ESTERS</td>
<td>F-5C</td>
</tr>
<tr>
<td>Fatty Acids COMBINED TOTAL</td>
<td>S-AG F-5ACGZ</td>
</tr>
<tr>
<td>Fatty Acids TOTAL</td>
<td>S-18CS F-5CGZ*AF U-H</td>
</tr>
<tr>
<td>Ferulic Acid</td>
<td>U-2</td>
</tr>
<tr>
<td>Ferulic Acid, DIHYDRO</td>
<td>U-2</td>
</tr>
<tr>
<td>Flavines</td>
<td>U-2</td>
</tr>
<tr>
<td>Fructose</td>
<td>U-2</td>
</tr>
<tr>
<td>Folic Acid Group</td>
<td>S-3DLTV F-59D U-12D*AC</td>
</tr>
<tr>
<td>Formic Acid</td>
<td>U-12E</td>
</tr>
<tr>
<td>Fluorine</td>
<td>S-V</td>
</tr>
<tr>
<td></td>
<td>U-12F*AC</td>
</tr>
<tr>
<td>Compound</td>
<td>Formula</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>GALACTOSE</td>
<td>U-2</td>
</tr>
<tr>
<td>GLUCOSE</td>
<td>S-TAGTV+AG U-25EH</td>
</tr>
<tr>
<td>GLUCURONIC ACID</td>
<td>U-2H</td>
</tr>
<tr>
<td>GLUTAMINE</td>
<td>S-AG+ U-2HU</td>
</tr>
<tr>
<td>GLUTAMINE, PHENYLACETYL-</td>
<td>U-2</td>
</tr>
<tr>
<td>GLUTAMIC ACID, FREE</td>
<td>U-1BH</td>
</tr>
<tr>
<td>GLUTAMIC ACID COMBINED</td>
<td>U-2B</td>
</tr>
<tr>
<td>GLUTAMIC ACID TOTAL</td>
<td>S-AG+ U-12BH*AB</td>
</tr>
<tr>
<td>GLUTARIC ACID</td>
<td>U-2</td>
</tr>
<tr>
<td>GLUTARIC ACID, ALPHA-OXO-</td>
<td>U-2</td>
</tr>
<tr>
<td>GLYCERIC ACID</td>
<td>U-2</td>
</tr>
<tr>
<td>GLYCERIMIDES</td>
<td>U-2</td>
</tr>
<tr>
<td>GLYCINE FREE</td>
<td>U-AD+</td>
</tr>
<tr>
<td>GLYCINE TOTAL</td>
<td>U-125BHU</td>
</tr>
<tr>
<td>GLYCOXYAMINE</td>
<td>U-2*AA</td>
</tr>
<tr>
<td>GLYCOLIC ACID</td>
<td>U-2</td>
</tr>
<tr>
<td>GLYOXYLIC ACID</td>
<td>U-2</td>
</tr>
<tr>
<td>GUANIDINE</td>
<td>U-H</td>
</tr>
<tr>
<td>GUANIDINOACETIF ACID</td>
<td>U-1H</td>
</tr>
<tr>
<td>GUANINE</td>
<td>U-12</td>
</tr>
<tr>
<td>GUANINE, N-METHYL-</td>
<td>U-12</td>
</tr>
<tr>
<td>GUANINE, ONE-METHYL-</td>
<td>U-2</td>
</tr>
<tr>
<td>GUANINE, SEVEN-METHYL-</td>
<td>U-12</td>
</tr>
<tr>
<td>GUANINE, EIGHT-OH-SEVEN-METHYL</td>
<td>U-12</td>
</tr>
<tr>
<td>HIPPURIC ACID</td>
<td>U-12BHJ<em>AA</em>AC</td>
</tr>
<tr>
<td>HIPPURIC ACID, ORTHO-AMINO-</td>
<td>U-2</td>
</tr>
<tr>
<td>HIPPURIC ACID, ORTHO-HYDROXY-</td>
<td>U-2</td>
</tr>
<tr>
<td>HIPPURIC ACID, META-HYDROXY-</td>
<td>U-2</td>
</tr>
<tr>
<td>HIPPURIC ACID, PARA-HYDROXY-</td>
<td>U-2</td>
</tr>
<tr>
<td>HISTAMINE</td>
<td>S-T*AG F-Z U-12</td>
</tr>
<tr>
<td>HISTAMINE, N-ACETYL-</td>
<td>U-2</td>
</tr>
<tr>
<td>HISTAMINE, THREE-METHYL-</td>
<td>U-2</td>
</tr>
<tr>
<td>HISTAMINE, ONE-THREE-DIMETHYL-</td>
<td>U-2</td>
</tr>
<tr>
<td>HISTAMINE, ONE-METHYL-</td>
<td>U-2</td>
</tr>
<tr>
<td>HISTIDINE FREE</td>
<td>U-1BH</td>
</tr>
<tr>
<td>HISTIDINE COMBINED</td>
<td>U-2B</td>
</tr>
<tr>
<td>HISTIDINE TOTAL</td>
<td>S-3BLV+AG F-5BR U-12BH*AB</td>
</tr>
<tr>
<td>HISTIDINE, ONE-METHYL-</td>
<td>U-2U</td>
</tr>
<tr>
<td>HISTIDINE, THREE-METHYL-</td>
<td>U-2</td>
</tr>
<tr>
<td>HISTIDINE, METHYL-, CONJUGATED</td>
<td>U-2</td>
</tr>
<tr>
<td>HOMOGENTISIC ACID</td>
<td>U-H</td>
</tr>
<tr>
<td>HYDROCORTISONE, TETRA</td>
<td>U-1</td>
</tr>
<tr>
<td>HYDROGEN</td>
<td>F-NW</td>
</tr>
<tr>
<td>HYDROGEN SULFIDE</td>
<td>F-NR</td>
</tr>
<tr>
<td>HYDROXYPROLINE FREE</td>
<td>U-BH</td>
</tr>
<tr>
<td>HYDROXYPROLINE COMBINED</td>
<td>U-B</td>
</tr>
<tr>
<td>HYDROXYPROLINE TOTAL</td>
<td>U-BH</td>
</tr>
<tr>
<td>HYDROXYTYRAMINE</td>
<td>U-5</td>
</tr>
<tr>
<td>HYPOMITHINE</td>
<td>U-1</td>
</tr>
<tr>
<td>HYPOXANTHINE</td>
<td>U-1</td>
</tr>
<tr>
<td>HYPOXANTHINE, ONE-METHYL-</td>
<td>U-1</td>
</tr>
<tr>
<td>IMIDAZOLE DERIVATIVES</td>
<td>F-5B U-1BH<em>AA</em>AC</td>
</tr>
<tr>
<td>IMIDAZOLE-FOUR-ACETIC ACID</td>
<td>U-2</td>
</tr>
<tr>
<td>IMIDAZOLE-ACETIC ACID</td>
<td>U-2</td>
</tr>
<tr>
<td>IMIDAZOLE ACETIC ACID, ONE-METHYL-</td>
<td>U-2</td>
</tr>
<tr>
<td>IMIDAZOLE-ACETIC ACID, THREE-METHYL</td>
<td>U-2</td>
</tr>
<tr>
<td>IMIDAZOLECARBOXAMIDE, FIVE-AMINO-FOUR-</td>
<td>U-2</td>
</tr>
<tr>
<td>Substance</td>
<td>Abbreviations</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Indican</td>
<td>U-125BHJ<em>AA</em>AC</td>
</tr>
<tr>
<td>Indigotin</td>
<td>U-H</td>
</tr>
<tr>
<td>Indole</td>
<td>F-R</td>
</tr>
<tr>
<td>Indole-acetamide</td>
<td>U-2</td>
</tr>
<tr>
<td>Indole-acetic acid</td>
<td>U-E</td>
</tr>
<tr>
<td>Indole-acetic acid, methyl ester</td>
<td>U-2</td>
</tr>
<tr>
<td>Indole-acetic acid, three-hydroxy-</td>
<td>U-2</td>
</tr>
<tr>
<td>Indole-acetic acid, five-hydroxy-</td>
<td>U-2</td>
</tr>
<tr>
<td>Indole-acetylglutamic acid</td>
<td>U-2</td>
</tr>
<tr>
<td>Indole-acetylglutamine</td>
<td>U-2</td>
</tr>
<tr>
<td>Indole-acrylic acid</td>
<td>U-2</td>
</tr>
<tr>
<td>Indole-three-carboxylic acid</td>
<td>U-2</td>
</tr>
<tr>
<td>Indole-lactic acid</td>
<td>U-2</td>
</tr>
<tr>
<td>Inositol</td>
<td>S-6DLVT*AG U-125DH</td>
</tr>
<tr>
<td>Iodine</td>
<td>S-3FLV<em>AG U-12FH</em>AC</td>
</tr>
<tr>
<td>Iron</td>
<td>S-37FLV<em>AG F-5AF U-125FH</em>AC</td>
</tr>
<tr>
<td>Ketosteroids</td>
<td>U-AC</td>
</tr>
<tr>
<td>Kynurenic acid</td>
<td>U-2</td>
</tr>
<tr>
<td>Kynurenone</td>
<td>U-2H</td>
</tr>
<tr>
<td>Kynurenone, N-acetyl-</td>
<td>U-2</td>
</tr>
<tr>
<td>Kynurenone, three-hydroxy-</td>
<td>U-2</td>
</tr>
<tr>
<td>Lactic acid</td>
<td>U-2</td>
</tr>
<tr>
<td>Lactose</td>
<td>U-2</td>
</tr>
<tr>
<td>Levulinic acid, delta-amino</td>
<td>F-5AFGX<em>Z U-125FX</em>AC</td>
</tr>
<tr>
<td>Lead</td>
<td>U-1BH</td>
</tr>
<tr>
<td>Leucine free</td>
<td>U-2B</td>
</tr>
<tr>
<td>Leucine combined</td>
<td>S-6BL<em>AG F-5BR U-12BH</em>U*AB</td>
</tr>
<tr>
<td>Leucine, free</td>
<td>S-6 U-1BH</td>
</tr>
<tr>
<td>Leucine, iso, free</td>
<td>U-2B</td>
</tr>
<tr>
<td>Leucine, iso, combined</td>
<td>S-L<em>AG F-5BR U-12BH</em>U*AB</td>
</tr>
<tr>
<td>Leucine, iso, total</td>
<td>U-H</td>
</tr>
<tr>
<td>Lipids</td>
<td>U-2B</td>
</tr>
<tr>
<td>Lysine free</td>
<td>S-6 BL<em>AG F-5BR U-12BH</em>U*AB</td>
</tr>
<tr>
<td>Lysine combined</td>
<td>U-1BH</td>
</tr>
<tr>
<td>Lysine, total</td>
<td>U-2B</td>
</tr>
<tr>
<td>Lysine, hydroxy</td>
<td>S-67FLSTV<em>AG F-5AFGX</em>Z U-12FHJX*AC</td>
</tr>
<tr>
<td>Magnesium</td>
<td>U-2</td>
</tr>
<tr>
<td>Malic acid</td>
<td>U-2</td>
</tr>
<tr>
<td>Malonic acid</td>
<td>U-2</td>
</tr>
<tr>
<td>Mandelic acid, three-methoxy-four-hydroxy</td>
<td>U-2</td>
</tr>
<tr>
<td>Mandelic acid, para-hydroxy</td>
<td>U-2</td>
</tr>
<tr>
<td>Manganese</td>
<td>S-367FLTV<em>AG F-5AFY U-125FH</em>AC</td>
</tr>
<tr>
<td>Mercury</td>
<td>S-AG, F-5F U-25F</td>
</tr>
<tr>
<td>Methane</td>
<td>F-NRW</td>
</tr>
<tr>
<td>Methionine free</td>
<td>U-1BH</td>
</tr>
<tr>
<td>Methionine combined</td>
<td>U-B</td>
</tr>
<tr>
<td>Methionine, total</td>
<td>S-AG, F-2 U-12BH<em>U</em>AB</td>
</tr>
<tr>
<td>Methyl ethyl ketone</td>
<td>U-2</td>
</tr>
<tr>
<td>Methyl mercaptan</td>
<td>F-R</td>
</tr>
<tr>
<td>Myoinositol</td>
<td>U-H</td>
</tr>
<tr>
<td>Niacin</td>
<td>U-1*AC</td>
</tr>
<tr>
<td>Nickel</td>
<td>F-5AF U-125F*AC</td>
</tr>
<tr>
<td>Nicotinamide</td>
<td>U-12</td>
</tr>
<tr>
<td>Nicotinamide, N-methyl</td>
<td>U-12D</td>
</tr>
<tr>
<td>Nicotinamide, six-pyridone</td>
<td>U-2</td>
</tr>
<tr>
<td>Nicotine</td>
<td>S-V</td>
</tr>
<tr>
<td>Chemical</td>
<td>Formula</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Nicotinuric acid</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Nitrates</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Nitrogen Amide</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Nitrogen, Non-Protein Total</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Nitrogen Total</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Ornithine</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Ornithine Free</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Oxalic acid</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Pantothenic acid</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Phenol</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Phenol Ethereal Sulfates</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Phenols Volatile</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Phenic Acid, Ortho-Hydroxy</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Phenylecetic Acid, Meta-Hydroxy</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Phenylecetic Acid, Para-Hydroxy</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Phenylhydracrylic Acid, Para-Hydroxy</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Phenylalanine Free</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Phenylalanine Combined</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Phenylalanine total</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Phenyllactic Acid, Para-Hydroxy</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Phenylpropionic Acid, Meta-Hydroxy</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Phenylpropionic Acid, Para-Hydroxy</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Phosphorus, Inorganic</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Phosphorus, Organic</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Porphobilinogen</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Porphyrins</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Potassium</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Pregnanediol</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Proline Free</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Proline, Combined</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Proline</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Proline, Hydroxy-, Conjugated</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Proline, Hydroxy-, Total</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Propionic Acid</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Propionic Acid, Para-Oxypheyl</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Purine Bases</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Purine, Six-Succino-</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Putrescine</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Pyridoxal</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Pyridoxamine</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Pyridoxic Acid, Four-</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Pyridoxine</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Pyrimidine</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Pyruvic Acid</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Quinolinic Acid</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Quinolone, Four-</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Quinolone, N-Methyl-Four-</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Resorcylic Acid, Alpha</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Ribose</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Ribulose</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Salicylic Acid</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
<tr>
<td>Salicyluric Acid</td>
<td>$^{5-3DLTV}AG F-59D U-0+AD$</td>
</tr>
</tbody>
</table>

12.
<table>
<thead>
<tr>
<th>Substance</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sarcosine</td>
<td>U-2</td>
</tr>
<tr>
<td>Scyllitol</td>
<td>U-H</td>
</tr>
<tr>
<td>Selenium</td>
<td>U-1F</td>
</tr>
<tr>
<td>Serine Free</td>
<td>U-1BH</td>
</tr>
<tr>
<td>Serine Combined</td>
<td>U-2B</td>
</tr>
<tr>
<td>Serine Total</td>
<td>S-AG, U-12BH</td>
</tr>
<tr>
<td>Silicon</td>
<td>S-15F</td>
</tr>
<tr>
<td>Silver</td>
<td>S-AG, F-5FY, U-5H, AD</td>
</tr>
<tr>
<td>Skatole</td>
<td>S-K R</td>
</tr>
<tr>
<td>Skatole, Ethereal Sulfates of SODIUM</td>
<td>S-KT</td>
</tr>
<tr>
<td>Squalene</td>
<td>S-3FLSTAEAG, F-5AGXZ, U-125FHJX, AC</td>
</tr>
<tr>
<td>Stearic Acid</td>
<td>U-1AD</td>
</tr>
<tr>
<td>Steroids Adrenal</td>
<td>S-AG</td>
</tr>
<tr>
<td>Steroids Alpha-Keto-</td>
<td>U-1</td>
</tr>
<tr>
<td>Steroids Seventeen-Hydroxy-</td>
<td>U-1</td>
</tr>
<tr>
<td>Steroids Seventeen-Keto-</td>
<td>U-1</td>
</tr>
<tr>
<td>Succinic Acid</td>
<td>U-2H</td>
</tr>
<tr>
<td>Sucrose</td>
<td>S-KT, U-2H</td>
</tr>
<tr>
<td>Sulfates Inorganic</td>
<td>U-2</td>
</tr>
<tr>
<td>Sulfur Inorganic</td>
<td>U-1FHAC</td>
</tr>
<tr>
<td>Sulfur Organic</td>
<td>U-H</td>
</tr>
<tr>
<td>Sulfates Ethereal</td>
<td>S-K, U-12CF, AD</td>
</tr>
<tr>
<td>Sulfates Indolyl</td>
<td>U-AC</td>
</tr>
<tr>
<td>Sulfates Total</td>
<td>S-TVAG, U-2</td>
</tr>
<tr>
<td>Sulfur Total</td>
<td>S-3FLAG, F-56AFXZ, U-1FHJX, AC</td>
</tr>
<tr>
<td>Syringic Acid</td>
<td>U-2</td>
</tr>
<tr>
<td>Tartaric Acid</td>
<td>U-2</td>
</tr>
<tr>
<td>Taurine</td>
<td>U-12BH</td>
</tr>
<tr>
<td>Taurine, Conjugated</td>
<td>U-2</td>
</tr>
<tr>
<td>Tetrahydrocortisol</td>
<td>U-1</td>
</tr>
<tr>
<td>Theophylline</td>
<td>U-1</td>
</tr>
<tr>
<td>Thiamine</td>
<td>S-3DLVAG, F-59D, U-125D, AC</td>
</tr>
<tr>
<td>Thiamine Di-Phospho-</td>
<td>S-AG</td>
</tr>
<tr>
<td>Thioctic Acid</td>
<td>U-2</td>
</tr>
<tr>
<td>Threonine Free</td>
<td>U-1BH</td>
</tr>
<tr>
<td>Threonine Combined</td>
<td>U-2B</td>
</tr>
<tr>
<td>Threonine Total</td>
<td>S-6BLAG, F-5BR, U-12BH, AB</td>
</tr>
<tr>
<td>TIN</td>
<td>F-5FY, U-12FHAC</td>
</tr>
<tr>
<td>Tocopherol</td>
<td>S-M</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>S-4CMS, U-2</td>
</tr>
<tr>
<td>Trigonelline</td>
<td>U-1D</td>
</tr>
<tr>
<td>Trimethylamine Oxide</td>
<td>U-2</td>
</tr>
<tr>
<td>Tryptamine</td>
<td>U-2</td>
</tr>
<tr>
<td>Tryptamine, Five-Hydroxy-</td>
<td>U-2</td>
</tr>
<tr>
<td>Tryptophan Free</td>
<td>U-1BH</td>
</tr>
<tr>
<td>Tryptophan Combined</td>
<td>U-8</td>
</tr>
<tr>
<td>Tryptophan Total</td>
<td>S-6BLAG, U-12BH, AB</td>
</tr>
<tr>
<td>Tryptophan N-Acetyl-</td>
<td>U-2</td>
</tr>
<tr>
<td>Tryptophan N-Methyl-Five-Hydroxy</td>
<td>U-2</td>
</tr>
<tr>
<td>Tyramine Free</td>
<td>U-1BH</td>
</tr>
<tr>
<td>Tyramine Three-Hydroxy-</td>
<td>U-2</td>
</tr>
<tr>
<td>Tyrosine Free</td>
<td>U-2B</td>
</tr>
<tr>
<td>Tyrosine Combined</td>
<td>S-6BLAB, U-12BH, AB</td>
</tr>
<tr>
<td>Tyrosine Total</td>
<td>U-H</td>
</tr>
<tr>
<td>Urate</td>
<td>S-37KLSTUVAEAG, F-12BHJ, AA, AC</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Compound</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uric Acid</td>
<td>S-37BKLSTU<em>AE</em>AG U-12BHJ<em>AA</em>AC</td>
</tr>
<tr>
<td>Uric Acid, One-Methyl-</td>
<td>U-2</td>
</tr>
<tr>
<td>Uric Acid, Seven-Methyl-</td>
<td>U-2</td>
</tr>
<tr>
<td>Uric Acid, One-Three-Dimethyl-</td>
<td>U-1</td>
</tr>
<tr>
<td>Urobilin</td>
<td>U-1KE+AC</td>
</tr>
<tr>
<td>Urobilinogen</td>
<td>F-2KEGZ U-125EH+AC</td>
</tr>
<tr>
<td>Urocanic Acid</td>
<td>U-2</td>
</tr>
<tr>
<td>Uroerythrin</td>
<td>U-2</td>
</tr>
<tr>
<td>Uroporphyrins</td>
<td>U-2H</td>
</tr>
<tr>
<td>Valine Free</td>
<td>U-2B</td>
</tr>
<tr>
<td>Valine Combined</td>
<td>S-6BL+AG F-5BR U-12BHO+AB</td>
</tr>
<tr>
<td>Valine Total</td>
<td>U-2</td>
</tr>
<tr>
<td>Vanillic Acid</td>
<td>U-12</td>
</tr>
<tr>
<td>Xanthine</td>
<td>U-2</td>
</tr>
<tr>
<td>Xanthine, Hypo-</td>
<td>U-2</td>
</tr>
<tr>
<td>Xanthine, One-Methyl</td>
<td>U-2</td>
</tr>
<tr>
<td>Xanthine, One-MethylHypo-</td>
<td>U-2</td>
</tr>
<tr>
<td>Xanthine, Seven-Methyl-</td>
<td>U-2</td>
</tr>
<tr>
<td>Xanthine, One, Seven-Dimethyl-</td>
<td>U-2</td>
</tr>
<tr>
<td>Xanthurenic Acid</td>
<td>U-2</td>
</tr>
<tr>
<td>Xylose</td>
<td>U-2H</td>
</tr>
<tr>
<td>Xylulose</td>
<td>F-5AF U-12FH</td>
</tr>
<tr>
<td>Zinc</td>
<td></td>
</tr>
<tr>
<td>Substance</td>
<td>Code</td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>ACETOPHENONE O-SULFATE, TWO-AMINO-THREE-OH</td>
<td>U-2</td>
</tr>
<tr>
<td>ACIDS VOLATILE TOTAL</td>
<td>S-L F-5</td>
</tr>
<tr>
<td>ACTH</td>
<td>U-2</td>
</tr>
<tr>
<td>ALBUMIN</td>
<td>S-KT UAC</td>
</tr>
<tr>
<td>ALCOHOLS BRANCHED CHAIN</td>
<td>S-4M</td>
</tr>
<tr>
<td>ALCOHOLS STRAIGHT CHAIN</td>
<td>S-4M</td>
</tr>
<tr>
<td>AMYLASE</td>
<td>U-2H*AC</td>
</tr>
<tr>
<td>BACTERIA</td>
<td>U-H</td>
</tr>
<tr>
<td>BACTERIAL SUBSTANCES</td>
<td>F-G</td>
</tr>
<tr>
<td>BILE PIGMENTS</td>
<td>U-12</td>
</tr>
<tr>
<td>CADAVERINASE</td>
<td>U-2</td>
</tr>
<tr>
<td>CARBONIC ANHYDRASE</td>
<td>U-2</td>
</tr>
<tr>
<td>CATALASE</td>
<td>U-2</td>
</tr>
<tr>
<td>CITROVORUM FACTOR</td>
<td>U-12</td>
</tr>
<tr>
<td>ENZYMES</td>
<td>F-Z U-H</td>
</tr>
<tr>
<td>FERULOYL-GLYCINE-FIDRINOLYSIN</td>
<td>U-2</td>
</tr>
<tr>
<td>GLUCURONIDASE</td>
<td>U-2</td>
</tr>
<tr>
<td>GLYCOPROTEINS</td>
<td>U-H</td>
</tr>
<tr>
<td>GONADOTROPHINS</td>
<td>U-2</td>
</tr>
<tr>
<td>HEMOGLOBIN</td>
<td>U-H</td>
</tr>
<tr>
<td>HISTAMINASE</td>
<td>U-2</td>
</tr>
<tr>
<td>HYDROCARBONS AROMATIC</td>
<td>U-AD*</td>
</tr>
<tr>
<td>INSULIN</td>
<td>U-2</td>
</tr>
<tr>
<td>LIPASE</td>
<td>U-2</td>
</tr>
<tr>
<td>LIPOPROTEINS</td>
<td>U-2</td>
</tr>
<tr>
<td>MALTASE</td>
<td>U-2</td>
</tr>
<tr>
<td>MELANOCYTE STIMULATING HORMONE</td>
<td>U-2</td>
</tr>
<tr>
<td>MELANOTOXIN</td>
<td>S-AG*</td>
</tr>
<tr>
<td>METHEMOGLOBIN</td>
<td>U-H</td>
</tr>
<tr>
<td>MUCOPROTEINS</td>
<td>U-H</td>
</tr>
<tr>
<td>MYOHEMOGLOBIN</td>
<td>U-H</td>
</tr>
<tr>
<td>NORADRENALIN</td>
<td>U-2B</td>
</tr>
<tr>
<td>PARAFFINS</td>
<td>S-CS</td>
</tr>
<tr>
<td>PARATHYROID</td>
<td>U-2</td>
</tr>
<tr>
<td>PHOSPHATASE, ACID</td>
<td>U-2</td>
</tr>
<tr>
<td>PLASMALOGENS</td>
<td>U-2</td>
</tr>
<tr>
<td>PROTEIN</td>
<td>F-AZ U-1BH*AC</td>
</tr>
<tr>
<td>RIBONUCLEASE</td>
<td>U-2</td>
</tr>
<tr>
<td>SOAPS</td>
<td>F-CS</td>
</tr>
<tr>
<td>UROCHROMES</td>
<td>U-2</td>
</tr>
<tr>
<td>UROKINASE</td>
<td>U-2</td>
</tr>
<tr>
<td>UROPEPSIN</td>
<td>U-H</td>
</tr>
<tr>
<td>UROPEPSINOGEN</td>
<td>U-2</td>
</tr>
<tr>
<td>WAXES</td>
<td>S-4CS</td>
</tr>
<tr>
<td>Code Symbol From Table</td>
<td>Excretion Product</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>1</td>
<td>U</td>
</tr>
<tr>
<td>2</td>
<td>U</td>
</tr>
<tr>
<td>3, 4</td>
<td>S</td>
</tr>
<tr>
<td>5, 6</td>
<td>U, F, S.</td>
</tr>
<tr>
<td>7</td>
<td>S</td>
</tr>
<tr>
<td>8</td>
<td>S</td>
</tr>
<tr>
<td>9, A</td>
<td>F</td>
</tr>
<tr>
<td>G, H</td>
<td>U, F</td>
</tr>
<tr>
<td>J, K</td>
<td>U, S</td>
</tr>
<tr>
<td>L, M, N, P, Q</td>
<td>F, S</td>
</tr>
<tr>
<td>R</td>
<td>F</td>
</tr>
<tr>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>T</td>
<td>S</td>
</tr>
<tr>
<td>U</td>
<td>U</td>
</tr>
<tr>
<td>V</td>
<td>S</td>
</tr>
<tr>
<td>X, Y, Z, AA, AB, AC, AD, AE</td>
<td>U, F</td>
</tr>
<tr>
<td>AF</td>
<td>F</td>
</tr>
<tr>
<td>AG</td>
<td>S</td>
</tr>
</tbody>
</table>
Notes on the Use of the Chemical Substance Tables

Data were sought which would include "normal values" (eg. Spector-Handbook of Biological Data-1956; Sunderman-Normal Values in Clinical Medicine-49). These are supposed to take into account these factors: measurements are made within the North Atlantic (American and European) community, on healthy adults, on normal mixed diets, with environment, rest, workload, intake, and adaptation conditions standardized to common conditions at the time of measurement, and so described.

In general, each reference (eg. Spector-56) provides such information as: mean value and dimensional units, statistical dispersion of values, analytic technique, conditions of experiment, and further reference to original method source paper. For some references, the author has simply assembled values from a number of good sources cited. The reader may gain added confidence in a mean value of amount of a given substance produced, by combining values from several sources cited in the table.

Caution must be exercised, in extrapolating from the values obtainable from these sources, under temperate conditions, to those circumstances involving high temperature, workload, water or food pattern alterations, or other stresses, which can greatly change the amounts of released substances. Additional help on this may be obtained from references cited in this report on changes in body products under heat stress conditions.

For supplementary data on other urine, feces, skin products not in table, see discussion pages on these substances which follow.

Utilization of the data in various studies suggested in this report would be aided by arranging the substances in the table into categories based on major chemical structural groups and arrangements. This can help in study of separation processes (eg based on solubility, mobility, diffusion, reaction specificity, etc), on analysis of spectral properties, on matchup with specific biosensor chemosensitivities, etc. Another useful grouping would rank the substances in order of absolute amount from all channels, released into environment, on a daily basis (eg. total chlorides from feces, urine, skin/day). The top group might be selected for preliminary analyses of system sensitivities, etc. The same grouping can be used to aid in selection of substances which would show high contrast ratios with other materials in environment, or are uniquely identifiable as produced by humans or higher animal organisms. These could include, for example, low molecular weight hormones liberated in trace quantities such as steroids, adrenalin and catecholamines; it should also consider substances poorly defined chemically (and not on the table), of high molecular weight, including proteins & polypeptides, lipopolysaccharides, which even in minute traces can be identified as unique to the individual and species by serological methods.
b. Additional Data on Specific Body Products.

1. Skin Products

(a). Sweat.

Supplementary data on sweat composition includes the following: Iron (Consolazio-63B), (Mitchell-49), vs diet (Johnston-50); Calcium (Consolazio-52), (Johnston-50) (Mitchell-62A); Sodium (Bulmer-54), (Consolazio-63-B); Potassium (Bulmer-54), (Consolazio-63-B); Chloride (Ladell-48). For Nitrogen compounds (Mitchell-62A), (Consolazio-63A, 63C), vs. diet protein and salt (Cuthbertson-34). On other composition factors: for salt composition (Werner-52), (Gibbs-62A); composition and colligative properties (Foster-61); solute excretion rate, physiological factors (Barrueto-59), (Bass-59).

Source data on sweat composition and volume also exists in papers on thermoregulation. See evaporation studies (McCutcheon-55), (Taylor-53A, 53B); rate and discharge patterns (Albert-51), (Peiss-51); for responses to high temperatures, see (Lloyd-61), salt and water endocrine control (Collins-63); high temperature responses as function of humidity (Lyburn-56), and of acclimation (Dill-38) (Von Heyningen-49). For studies of desert responses, see (Adolph-47), for other temperature effects (Lloyd-61).

For other related references on sweating: for measurement, see (Robinson-54B), drugs altering sweat mechanisms (Randall-55), skin evaporation with inactivated sweat glands (Pinson-47), sweat glands as extra-renal regulators of chemical substances (Schwartz-60), comparative physiology (Schuman-62), sweating in illness (Lobitz-61), lack of ethnic differences claimed in basic sweating pattern (Hansen-61), and recent general reference (Schuman-62).

(b). Sebum.

Supplementary data on this special glandular secretion includes the following: Sterols: cholesterol (Boughton-57), others (Brooks-56) (Spector-56), (Ramanathan-58) (Boughton-59) (Horacek-59). For fatty acids: straight chain saturated and unsaturated, with under 20 carbon atoms, see (Boughton-59) (Javes-56) (Spector-56); including caproic and caprylic (Eller-41); capric (Decanoic) (Jones-56). No branched chain or hydroxy fatty acids are seen in Spector's listing. Some fatty acids on skin are believed to be derived from sebaceous gland lipids, split on skin by lipase in normal bacterial flora (Strauss-59). Other Lipids: triglycerides (Horacek-59), di and tri glycerides, waxes (Haathi-61A), phospholipids (Wheatley-53), choline lipids and plasmalogens (Horacek-59), other unsaponifiable fractions (Boughton-59A, 59B). Alcohols: straight and branched chain (Spector-56), others (Boughton-59). Squalene: (Mackenna-50) (Wheatley-53) (Spector-56) (Ramanathan-58), (Haathi-61A). Other hydrocarbons: (Spector-56).

For other sources of information on composition, for that from individual glands, see (Suskind-51), for composition independent of dietary factors (Ramanathan-58) but altered in disease (Schmidt-Nielson-51) (Wheatley-56), and for survey (Mackenna-52).

For homeostatic control of sebum production, and its alteration by endocrines, see (Hershey-59) (Horacek-59); for relation to sex hormone activity (Strauss-56), alteration in output in females by drug Enovid (Strauss-63), and in males vs. male and female sex hormone administration and castration. These latter
responses give rise to the interesting speculation that sebum and its gland are remnants of a scent communications organ (Schaffer-37)(Wheatley-56), of the type described for various animals and discussed in this report, and that the gland product as released (or unmasked by bacterial action on skin) matches active and existing chemoreception processes in man, with perhaps a subconscious perception of the event, and consequent action in human relationships. (Note that the perfumer's blends include animal scent substances; Norbert Wiener calls perfumes 'exterior hormones'). Human sebum products are believed by various tracking dog handlers to be the principal class of substances produced by man and smelled by the dog in tracking. (See Biosensing, Dogs). One class of important experiments with sebum which must be carried out is to prepare quantities of whole sebum, or its fractions (chromatographed, etc) for use in controlled dog tracking experiments.

For other information on the sebaceous gland; for its biology, see (Rothman-54)(Kuno-56)(Kilgman-58)(Shelmire-59). For analytic methods, for early quantitative determination (Emanuel-36, 38), for collection techniques, see (Van Heyningen-52)(Strauss-51); for modern gas chromatographic micro-analysis of many sebum products, see (Hahti-62), who also uses infrared detection with one chromatograph (Hahti-61A).

(c). Skin Product Alteration by Bacterial Action..

The normal skin bacterial flora, described by (Levans-50), is one agent responsible for the transformation of known groups of substances released from the several glands, into a time-dependent uncertain mix of chemical substances, requiring further identification by chromatography, etc. Bacterial lipases are claimed to split fats into fatty acids, and contribute to odor (Strauss-59). See also (Strauss-56). Other non-bacterial enzyme degradation, autolysis, probably contributes other fragments to this brei.

(d). Skin Products Attracting and Repelling Animals..

For many mosquito studies on skin products, see (Brown-51,56), (Rahm-57A, 57B), for mechanisms of attraction: see (Rahm-57A, 58B), for individual human differences sensed (Brouwer-59, 60), for identification of the specific palpa and tarsal chemoreceptors involved (Rahm-58A), for skin amino acids as major attractants (Brown-61A), including lysine (Brown-61B). For other mechanisms of attraction of mosquitoes to humans, see (Mer-47), (A Parker-48), (Willis-47, 48), (Thompson-55).

For a study of human skin products, particularly serine, repelling fish (salmon), see (Idler-55).

(e). Human Odor from Skin.

For body odor in man, its reception, significance, control, see (Neuhaus-61), for human individuality in odor (Laird-35)(Lohner-24). For individual and ethnic difference studies, see (Eller-41)(Adachi-03)(Laloy-04A, 04B).

(f). Other Sources of Data on Skin Properties and Products.

For reviews on skin, see (Markowitz-42)(Rothman-54)(Kuno-56)(Sherley-58). For eccrine gland studies, see (Lobitz-61) and apocrine glands (Sherley-60); for factors affecting secretion process (Kerslake-54)(Kawahata-53), for neural regulation and emotional stimuli (Kennard-63); and for other skin physiological data (Lemaire-56). For apocrine secretion correlates with sex hormones, see (Straus-56), and for induction of asthma by skin products, see (Jamieson-47).
2. Urine Products

For supplementary data on urine components: for basic amines, see (Scriber-59); amino acids (Stein-53) (Evered-54, 56) (Soupart-59) and their seasonal changes (Hale-59), polypeptides (e.g. aspartyl, glutamyl) (Buchanan-63). For protein trace concentrations quantitatively determined in normals, see (Tidstrom-63). For 17-OH-corticosteroids (including pregnandiol), see (Garlock-63).

For other papers of utility in this study: for Ca and Mg vs. galactose input, see (Heggeness-60); for aldosterone vs. heat acclimation (Fletcher-61), electrolytes vs. cold diuresis (Bass-54); for other dietary influences (Sargent-56). For a good sequence of papers identifying urine components in closed cabin wastes, see (Ingram-57, 58A, 58B, 58C, 61, 62).

3. Fecal Products.

For additional data on composition: for sterols, see (Aylward-62); for other common lipids (Watson-37) (Gordon-57), also measured in S. African whites and Bantus (Antonis-62). For bile acids vs. diet fat (Gordon-57) (Haust-58). For Ca & P in Africans (Holemans-62). For several references identifying fecal solids and liquids in closed recycling systems, see (Ingram-58A, 58B, 58C, 62).

For g.i. gases, composition and quantity, see (Kirk-49) (USAF Handbook of Bioastronautics). For colonic amounts, see (Fries-66), alteration with diet in rats (Hedin-62) (Whitehair-62); for formation vs. diet in humans, Japanese (Kodama-49); for volume in the whole g.i. tract (Blair-43, 47B) and in colon (Fries-66), for alterations with altitude (Steggerda-47, 55).

4. Respiratory Products.

For normal persons breathing atmospheric air of standard composition, the only products archived in the literature are the usual \(O_2, N_2, H_2O, CO_2\) for expired air, even in the literature of closed system studies; and no information on other substances enters the combined chemical substances tables. Information available turns out not to be directly applicable, on expired products under other circumstances; in disease states (e.g. acetone in diabetics) (Steward-61); g.i. and respiratory products expired deriving from unusual foods (e.g. garlic) (Haggard), and substances expired after the detoxification and excretion of drugs and poisons (as described in the several handbooks of toxicology).
c. Other Supporting Information on Body Products

ii. Ethnic and Regional Differences in Human Products

Some data providing ethnic comparisons and geographic regional measurements (other than North Atlantic values), on urine, feces, skin products and certain physical properties, are set down on the following pages. Such data were found to be sparsely scattered through the literature, and should be considered illustrative but not complete. They were obtained in an intensive search for "normal values" tables and lists from other regions, using a variety of Boston and East Coast reference collections. To go further, the reader might seek regionally published medical teaching texts on biochemistry and physiology, clinical pathology, civil hospital center and military medical service manuals on clinical lab technique, normal values, experience data.

Except for data obtained by authors carrying out comparative ethnic studies, it is hard to determine whether values are related basically to ethnic considerations, and if experiments balanced out factors of climate, workload, health vs disease, body size and weight, diet, various adaptations, and considered other experimental standard conditions. Only if the true controlled-experiment ethnic base data can be extracted from these papers and others by the same productive authors, a table of values could be built for each group for comparison with "North Atlantic normals" in attempt to unearth significant differences in individual components concentration, or mixture concentration profiles.

Urine Components: Ethnic comparisons were made, for amino acids: in Europeans, Malaysians, Chinese (who showed high taurine (McEvoye-Bowe-61), in Chinese vs. caucasoids with diet ruled out (Chinese show higher alanine, lysine, tyrosine, histidine, B-amino isobutyric acid) (Sutton-55). Comparisons were made, for 17-Ketosteroids and creatinine in Indians, Chinese, Malaysians, Negrito, Senu (Lugg-57), for 17-Ketosteroids in North and South Indians, Europeans and African negroes (Barnicot-62). To compare nitrogen products and vitamins for several groups, Interdepartmental Committee on National Nutrition for National Defense Surveys of: Thailand, Ethiopia, Lebanon, etc. For various minerals, (traces of (Mn, Cu, Pb, Al, etc) in French Americans, various Mexican groups including Indians see (Kehoe-40) who relates these values to the mineral distribution in the soil where these individuals spent their early life. This can be an important "tracing tag".

For specific regional measurements: for India, for nitrogen fractions, for urea, creatinine, ammonia, as function of diet, see (Ramamurti-55) for amino acid, urea and ammonia values (Phansaekar-54) for other nitrogen (Gokhale-63). For 17-Ketosteroids, in normal and under-nourished (Ramachandran-56); North vs. South Indians (Barnicot-52); for relation to estrogens, pregnandiol (Patwardhan-57) and (Friedman-51), (Bharadwaj-57) and other studies related to serum Na and K (DasGupta-56). For adrenalin and other catecholamines, see (Subrahmanyan-60)(Sheth-62). For creatinine see (Lugg-57), sulfur (Pathak-61); chlorides (Ramanathan-60).
For Japanese, for amino acids see (Muratar-59) and related genetic studies (Iwata-59); 17-Ketosteroids (Jap. Nat. Inst. Nut. -60); Ca (Ishizawa-62); Na and K (Fujioka-60); various bases (Yamamoto-59); and general urinalysis (Saito-60) (Fujii-56).

For Chinese, for amino acids (lycine, alanine, taurine, glutamine, cystine, B-amino isobutyric acid) see (McEvoye-Bowe-62) and (Sutton-55) whose measurements are cited under ethnic comparisons. For alpha-keto acids (puruvic, alpha-keto glutaric acid (Liu-62); creatine (Bowress-58); 17-Ketosteroids (Bowress-58) (Lugg-57), thiamine (Li-62); Coproporphyrin (Dept. of Indust. Health, Szechuan, China-60).

For Malaysians, for amino acids (McEvoye-Bove-61), 17-Ketosteroids (Lugg-54,57).

For Africans, 17-Ketosteroids (Barnicott-52) and in West Africans, 5-hydroxy-indole-acetic acid (Foy-62).

Fecal Components: For ethnic comparisons, for minerals in French, Americans, various Mexican groups, see (Kehoe-40) discussed under Urine.

For specific regional measurements: for Africans; K and P (Holemans-62); South Africans, bile acids (Lewis-57), lipids vs. diet in whites vs. Bantus (Antonis-62); Japanese: intestinal gases, related to diet (Kodama-49); for Ethiopia, Lebanon, Thailand proteins, other nitrogen, vitamins (see (Interdept’l ctee. Nut. Nat. Def.) papers cited earlier.

Skin Products: For regional measurements: India; sebum composition (Ramanathan-58), iron (Hussain-59, 60; NaCl with heat and exercise (Ramanathan-56). For Africans; nitrogens, as ammonia, urea (Darke-60).

For ethnic comparisons, of sweat gland distribution differences in Eskimos; Negroes, Caucasians see (Kawahata-61) and see material under biosensing, human smell for papers discussing ethnic odor differences.

Physical Properties

Skin spectral reflectance ethnic comparisons were made, for white vs. negro in the visible region (Buttner)(Kuppenheim-52), (Pfleiderer-62), in the infra red (Wright-34)(J Hardy-56)(Buttner)(Kuppenheim-52) (Pfleiderer-62) and in the ultraviolet (Jacquez-55A) (Pfleiderer-62). For similar measurements, in Japanese: for visible and IR, see (Jacquez-55D), for UV see (Jacquez-55A); For Mexicans, see (Lasker-54). For other spectrophotometry for skin color see (Weiner-52) skin color used to study inheritance (Harrison-56); for spectral reflectance differences with age, sex, race, see (Edward-39).

Other Ethnic Comparisons in Biological Data:

For heat acclimation comparisons vs. anthropological difference (Newman-55), Europeans vs. Asians (Adam-53) white vs. American negro (Baker-58B) and white settlers in tropics (Price-39), for others, see (Baker58B) (Strydon-63). For various diseases, ethnic, sex, race, vs. host factors (Damon-62), disease ecology (May-58, 61A), psychiatric ecology (Meerloo-59). For Far East malnutrition ecology (May-61B).
2. Regional Diet and Nutrition Data Sources.

Data set down in the combined substance table and supplementary lists derives chiefly from people under normalized conditions, including mixed diets of North Atlantic countries (European and American). In looking for excretory products data and diet data from other world regions, extensive review of the past and present world literature in many document collections, and in at least fifty periodical titles in nutrition, metabolism, dietetics, etc., has not revealed much information presenting human excretory products in orderly array, directly related to diet or diet modifications, except in malnutrition states.

To explore further available information on dietary influences on body product, the reference sources set down in this section may prove of value, beyond their first review for this report. To go further with the problem, the reader must seek data going beyond generalized nitrogen balance studies which represent most of what is set down about body products in these papers. Ethnic and Regional Difference data referred to in the adjoining section probably are contaminated with a major factor relating to diet composition, which a discerning reader may be able to separate out for significant diet and body product correlations. Additional references from the same productive authors listed should be consulted, and the pursuit of indigenous texts, manuals and other publications, in the manner described in the Ethnic section, is recommended.

For Far East data on diet and nutrition: for Indonesia, see (Postmus-55); Thailand (US-ICNND-61); Malaya (Leong-52); India (Wittfogel-57); (Hussain-51); China (Wittfogel-57)(Worth-63); Formosa (Jolliffe-56) & Chinese Nationalist Army (Pollock-56); Pollack's is an especially good series of several papers in a symposium on Far East nutrition, with metabolic, anthropological, and clinical approaches, including limited balance and excretion studies.

For other regional data, for studies of the Interdepartmental Committee on Nutrition for National Defense, consult Dr. Arnold Schaeffer at National Institute for Arthritis & Metabolic Diseases. For tropical nutrition, see (Nicholls), (NY Acad of Med. -60). For regional protein malnutrition studies, see long series of papers by Dr. Nevin Scrimshaw, of MIT Dept. of Nutrition. For other malnutrition data, on starvation, see (Keys-50)(Gilman-50); and for Far East malnutrition (May-61).

For other general references on nutrition and its correlates: see the food encyclopedia (Ward-41), biblio (Bakker-58), general text (Jolliffe-62), and comparison of world's food (Bennett-54); for food habit research, see (Bottlieb-61), & habit origins (Renner-44); unusual foods (Black-53), meat taboos (Simmons-61), other strange food customs (Harris-62), balance in strict vegetarian diet (Guggenheim-62); for environment effects on food habits and intake, see (Peryam-60), for nutrition and climatic stress (Spector-54A) (Buskirk-57) and high temperature nutrition (Salganik-59).

For food chemistry, see (Jacobs-51); chemical composition tables (Chatfield), and comparative data (Harris-48); for trace elements in foods (Underwood-56). For nutritional biochemistry and status studies, see (Lowry-52), (Bourne-53), (McCance). For protein needs and excretory products, see (UN-WHO), (Spector-54-B0 (Allison-60). For survival ration needs, see (Roth-43) (Davies-55).

Data have been sought for additional definition of human body products, from those studies of closed environment systems where such information is of great significance in the design of life support controls and recycling and recovery systems for certain substances. For general studies for extraterrestrial bases, see (Holbrook-58) (Bates-61), on aerospace cabins (Konecci-59), (Clamann-58), on Soviet space systems (Gazenko).

For environment (gas and vapor) composition, including human products: for space cabin contaminants measured by gas chromatography revealing much organic detail, see (McKee-63). For submarine environment, contaminant measurement, data and techniques, see the many papers of (Nestler-58, 59), (Platt-60A, 60-B) (Ramskill-60); others on organic contaminant identification (Johnson-56, 62), (Thomas-60) (Umstead-60), and (Miller-60). Of special value is the chemical analysis and description of non-human sources of contamination in submarine environments (foods, tobacco smoke, lubricants, plastics, etc) by (Arnest-61).

For design information relating to closed environment human products and atmosphere composition, see (Chasen) (Palevsky-57) (Bursak-60) (McCandles-60), (London-62) (Dryden-56) (US-ASTIA-Bib-62). For waste disposal for recycling of identifiable components, for feces (Goldblith), comprehensive studies of (Ingram-56, 58A, 58B, 62), also (Goeke-59) (DesJardins-60). For closed system water purification and other recovery, see (Fair-54) (Konikoff-60, 61) (Bennett-58), (Ingram-58C) (Zeff-59) (Gohm-61) (Rich-61) (Mancinelli-63), extensive review (Pipes-NRC), and other papers on urine recycling (McNeil-54) (Moir-59) (Sendroy-59) (Hawkins-58) (Ingram-61).

For contributions which these measurements procedures used by some here can make to the human products sensing problem, see (Chemical Products Sensing, Physical Methods), in this report.

4. Human Chemical Composition.

Information on this attribute of human tissue can aid in study of remote sensing systems involving physical links related to atomic and molecular composition, described elsewhere herein (e.g. x-ray fluorescence, radioactivation analysis, reflectance spectroscopy in all regions).

For general chemical composition, see Handbook of Biological Data (Spector-56), & (Piron-Reatequi-61).

It would be desirable to look beyond the studies of (Kehoe-40) who investigated variations in human excretory products (trace minerals) related to soil composition of environment where subjects had grown up, into review of body composition for the same minerals correlated with environment of origin.
II. Physical Attributes.

a. Electromagnetic Radiation Contrasts

1. Infrared
For skin spectral reflectance measured to 1 micron (U), see (Jacquez-54, 55B) (Kuppenheim-52) who shows White max. 0.7-0.8U, Negro max. 0.9U. Further out to 2.5U, (Jacquez-55D) claims 55% total reflectance to 1U, 5% beyond to 2.5U, with all Negro-Japanese-White differences under 1.2U, and (Hardy-56) describes angular variations, in isolated skin. For data to 10. U and 3.5U Negro peak versus White skin, see (Buttner) and for earlier data to 14. U for Negroes and Whites see (Hardy-34A). For other diffuse data see (Clark-53).

For transmission and absorption data (from which reflectance may be inferred), to 2U, see (Hardy-34); to 2.5U (Pfleiderer-62); for skin reaction from 1R (Hardy-54) including heating (Hendler-57).

For skin spectral emission, 1-14U, showing emissivity over 0.99 for White and Negro skin above visible, see (Hardy-34A) (Wright and Telkes-34), and 1-15U in isolated skin, White and Negro (Hardy-56). For "IR!" radiometry of whole body for clothing design, see (Veghte-61) discussed as "thermography" (Barnes-63).

For nervous system emission speculation, see (U.S.A.F. Procurement Office, Aerospace Med. Lab., Dayton) invitation for study on possible emission of "non-thermal" 1R from CNS.

2. Visible
For skin spectral reflectance, see (Buettner-37) (Goldzieher-51) (Derkson-52), (Kuppenheim-52), (J. Weiner-52B) (Jacquez-54, 55A, B), (Hardy-56) (Harrison-56), good work of (Buckley-61), A. F. Special Weapons studies (Derkson-54); for diffuse reflectance (Krolak-55) and changes after sunlight exposure (Edwards-39).

For skin spectral transmission data, see (Hansen-48), annual report lists of Naval Materials Lab, Brooklyn Navy Yard on Simulated Weapon Thermal Pulse Studies.

For clothing and personal equipment data, see (Krolak), also QM Laboratories clothing and textiles reports in their annual lists of publications.

3. Ultraviolet
For skin reflectance from 200 MU to edge of visible, 8% total reflectance stated by (Goldzieher-51), describing in detail bands seen due to amino acids (e.g. tyrosine) at 290 MU, also proteins, nucleic acids, hemoglobin, melanin, and carotene, UV excitation adds 20% to reflectance in non UV regions (Jacquez-54) who from 200 MU up finds no Japanese, White or Negro reflectance differences, but hemoglobin bands common to all at 420 and 600 MU, (Jacquez-55A). For other reflectance spectrophotometry of different skin layers after UV erythema, see (Jansen-53).

For skin transmission data 220-360 MU, see (Runge-62) and UV transmission through various skin layers (Bachem-29) (Hansen-48A, B), and UV skin spectrometry (E. Edwards-51).

For interesting property, after 250 MU excitation of skin (isolated), free radical production, measured by Electron Spin Resonance (ESR) (Norins-62).
techniques. This contrast factor could give rise to possible new class of non-contact detection methods (see Physical Methods for Chemical Analysis, in this report).

4. Microwave and RF
For skin reflectance (data quite hard to isolate from the wealth of diathermy absorption and action data), 70% reflectance, at 1.27, 3 and 10 cm. (like water) claimed (England-49, 50). From 3-300 cm. reflectance 60%-100% stated (Maskalenno-58). For other 3-300 cm. measurements (Nieset-61). 50%, from 3-75 cm. inferred from absorption cross section data (Anne-61).

For body absorption data (for inference of other reflection properties) see (Rajewsky-38), (Saito-60), (Anne-62). For mechanisms (Schwan-56A, B) including coupling and interactions in diathermy Schwan has published much on dielectric constant and conductivity by differences in various isolated tissues (Schwan-54), and 3-75 cm. measurements in human "phantom" replicas (Anne-61).

For clothed person reflectance in cm. and mm. regions (radar cross-sections) and properties of anti radar detection clothing, see (U.S. Army QMR and E Procurement Office) for recent invitations for proposals to study these, and for background reports which preceded these IFP's.

For body emission, the normal heat emission from man with maximum radiation in the near infrared, has a continuous "tail" into the microwave region, discernible from background with a sensitive microwave radiometer (see Physical Sensing).

For speculative information of RF excitation of man producing "heterodyned" radio signal emitted from brain see (Cazzamalli-25). A book reprinting several years of his work, published in Italian in 1960 is reported to exist by ERDL personnel (M. Gale, Mine Detection Branch).

Note that microwave and tissue interactions are involved when ESR (electron spin resonance) techniques are used to view free radicals produced in skin by UV excitation (see UV above).

Also speculative is the suggestion that CNS produces very low frequency (under 1KC) low intensity radiated signals. No observations were seen published on checking this hypothesis with currently available nanovolt sensitivity very low frequency receiving equipment and amplifiers, such as are used for atmospheric whistlers, geophysical seismic electric and magnetic field data, solid state phenomena, etc.

5. X-ray Contrast
No specific data on reflection or back-scattering can be reported here, but a potential contrast factor lies in the human body elemental composition, abundances of certain elements (e.g. calcium and phosphorus) in certain special configurations (skeleton) perhaps atomically distinguishable by x-rays from other organic and mineral background.

Encouragement derives from ERDL study reports (Forges-58) (Gravitt-62) on x-rays for mine detection (e.g. for mercury, etc. in the explosive accessories). Signal return possibilities from tissue include x-ray fluorescence techniques (x-ray return signals in back-scatter at longer wavelengths than exciting beam of 220 KV energy, and characteristic of certain
elements, requiring very stable high intensity X-ray source, energy-sensitive detector, etc.); and elastic (Rayleigh) back scattering, again using sources over 100 Kv. It may be worthwhile in a short study to examine intrinsic factors of X-ray contrast in humans; parameters which govern their excitation and their detectability in background; and the available possibilities for obtaining the required new sources (of high intensity, narrow beam, pulsed, narrow band, highly stable—perhaps all in a fashion describing a hypothetical coherent X-ray laser source); also suitable detectors.

b Sound and Vibration Contrasts
For human body surface sound reflection data, given as 1-2% for 1-20 Kc/s, see (Ackerman-62). Further inferences on reflection may be made from papers on: mechanical impedance of body surface (Franke-48, 49, 51A, 51B), (Von Gierke-50, 52, 59), (Ostreicher-50), (Ludwig-50), and other reports listed in those report summaries from (USAF Bioacoustics Lab-WADD-60), and CHABA (Committee on Hearing and Bioacoustics) report list (Whitcomb-63). For other data on ultrasonic interactions, see (Lehman-53), (Kelly-57), (Heuter-58).

On sound emission: human movement creates sound; not only walking, etc., but activity "at rest" (to change weight and contact pressure distribution, circulation return— a series of obligatory movements, without which discomfort and actual lesion develop, as in bedridden paralytic decubitus ulcers). While measurements of such noises would seem to be easy, no good systematic data on this could be found, even in search on exaggerated movement, among disturbed persons, as might be recorded in the psychiatry journals. Possible sources include Human Engineering data (e.g. Franklin Institute and Case Institute of Technology various studies on body-seat contact pressures and measurements), information from rehabilitation and physical therapy sources.

Normal respiration contributes a very minor sound background, except after very intense exercise. There was sought without success data on normal respiratory external airborne sound measurements; none appear in major respiratory normal or pathological physiology sources. Perhaps sound spectrogram data are to be found in back files of acoustical journals (e.g. JASA) and speech communication periodicals (e.g. Bell Lab Tech Jnl.).

Ejection of blood from the heart produces a body recoil pattern externally measured clinically as the BCG (ballistocardiograph). See (von Wittern-53), many papers of Isaac Starr. This signal level is much to low to excite micro seisms which would be detectable even in the ground immediately around the man.

No characteristic data have been found on noises of daily tasks, food preparation, weapons handling, except the few on shipboard crewspace noise listed under Environmental Modifications. For other data on sound and vibration contrasts, see section on Interaction of Sound with Humans, under "Behavioral Responses".

c Electrical Properties.
Internal sources of systematic biopotential pattern observed include the heart, various muscles, brain, etc. with signals manifest in skin surface measurement of repetitive signals in some cases, at millivolt levels (electrocardiogram), microvolt levels (muscle electromyogram, eye electroretinogram, eeg). No non-contact or remote observation techniques for these phenomena have been found explicitly reported in the literature to date.

No other human electric field emission or pattern is reported, although
it is claimed (Burr-49) that electric fields are produced around nerve tissue (isolated nerve, 150 microvolts measured at 1 cm), and that persistent electrical field configurations found around organisms and within them are associated with growth patterns, etc (Burr-34).

No published data were found on human disturbance of natural earth electrical fields (described under Environmental Modifications...), or remotely measurable interactions with strong fields applied to surroundings. Such information might reasonably be obtained experimentally by placing humans in the environments of sensitive terrestrial electric field observatory instruments, as maintained as several Federal Geophysical research stations.

For other data on human and animal electrical interactions, see Electrosensing (under Biosensing) and Electric Signals Inducing Sensation (under Induction of Behavioral Responses).

d. Magnetic Properties.

Search of the literature reveals no data reported on human production of magnetic fields, although (Morrow-60) describes measurements of magnetic fields around neurons, in isolated nerve. Contact should be made with the Proceedings of the Annual Biomagnetics Conferences (Barnothy-62), the continuing reviews on biomagnetism (Alexander-61), (Jacobius at Library of Congress).

No data are available on human disturbances of the natural geomagnetic field or its rapid minor fluctuations, or detectable interactions with strong applied magnetic fields, as measured remotely. Simple field experiments, on such possibilities and on the detection of the human inhomogeneity in the surround, might be carried out, for example, in the vicinity of the subgamma-sensitivity magnetometer array at Boston College, where observatory for geomagnetic fluctuations is maintained for Air Force; one should look into experiments possible with aid of Naval personnel involved in sea surveillance magnetometer instrument development (Naval Research Lab; Naval Air Devel. Center, Johnsville).

For other data on living organism behavioral responses to magnetic fields (without identification of discrete sensors), see Magnetic Field Sensing, under Biosensing; for magnetic fields inducing human sensation, see Induction of Behavioral Responses in this report.

e. Radioactivity.

Natural radioactive isotopes in human tissue emit signal (K$^{40}$, also C$^{14}$, Cs$^{137}$, Ca$^{45}$), described by many (Hirsch-55) and measured on large groups for control data on fallout (Onstead-60). Though the low signal is normally measured in the laboratory in low level systems compensated for background, and with long time integration, improvement in detection theory and instruments may bring observation of human self-emission into the realm of possibility for close ranges, for elements of higher abundance in tissue than in environment, and those with certain emission peculiarities.

Radioactivation of specific chemical elements in body to yield radiation and particle emissions with characteristic energy and decay patterns, has its counterpart in chemical analysis techniques (described under Physical Methods of Chemical Analysis). This has been a sensitive technique for body products brought to the measuring apparatus (Tobias-49).
Phosphorus, Potassium, Sodium are thus observed (Reiffel-57); Strontium, Barium, and many trace elements (Harrison-55). Also see radioactivation analysis biblio (Gibbons-57); nuclear radiation interactions with optical, thermal, electrical and other physical properties of solids (Gex-61), and neutron radiography techniques (Schultz-61).

One may speculatively consider exploitation of these concepts, by remote illumination of subject, with bright collimated beam of suitable high energy radiation or particles, penetrating air for useful ranges, for which relatively large absorption cross sections exist in elements characteristically abundant in man (relative to environment), with back-scattering and re-emission of usable levels of some different characteristic emission, efficiently sensed by detector with appropriate background discrimination properties and response time. Encouragement in part (for the detection aspect can derive from analyses made over several years, of practical radioactive all-weather glide-path landing aids for aircraft (Haefner-62). These provide, for ground-to-plane path lengths to several hundred feet, sharply defined spatial patterns and beams, allowing adequate glide angle resolution, with measurement response times short enough for useful attitude and glide path control, without aircrew hazard from received radiation. In their case, they used Co\(^{60}\) pellet sources, in small lead boxes with collimation apertures, planted on ground. In the case here, human stimulated emission return will be extremely low level, unless the analysis considers delivery of very large radiation of particle fluxes to the target (and these may in themselves be incapacitating).

f. Body Profile and Geometry

A variety of active and passive observational techniques require knowledge of body configuration and its projected area presented at various positions of rest and work. For these Human Engineering data, consult (Hertzberg-56), (Hansen-58). For effective human radiating area (applied to IR studies) see (Bohnenkamp-56), (Gruber-51). Similar data are obtainable on effective physical cross-sections, from sources cited herein on "Electromagnetic Radiation Contrasts".

29
D. ENVIRONMENTAL MODIFICATION OF SIGNALS FROM MAN

Analysis of remote detection of some human signal or property must consider distortion of this signal in environment due to background "noise", and transmission loss factors. To get at this problem source data are available and cited below, on bioenvironment (animal and plant) systematic description; chemical environment background (from animals and plants) and chemical transmission factors; physical environment: background and transmission, for electromagnetic, acoustic and seismic, and electric and magnetic field properties of earth. Radioactivity background is not discussed because of the common availability of source information.

I. Systematic Descriptions of Bioenvironment.

Systematic data are available for various regions of the world on gross and fine structure of the flora, fauna, mineral, topographic, other geological, climatological nature of the environment. Where additional structural detail was needed, specific classification systems were set up for vegetation and for land forms (Dansereau-58) (Wood-61) (Carr-62D). These were reviewed and tested at the Waterways Experiment Station (U.S. Army Waterw. Exp. Stat. -61), (Maxwell-62). Such structural detail may include dimensions (height, crown, stem, diameter, shape) distribution (spacing, canopy cover, arrangement) leaf nature and seasonal change. These give the analyst some idea of background environment structure to examine more closely for detection contrast. Bio-ecology sources can also provide data on indigenous animal types, density, movements; biological handbooks (e.g. Spector-56) yield info on excretory products composition.


II. Chemical Substances in Environment and Chemical Substance Transmission.

Substances in environment which may obscure the chemical signal from the concealed man include animal excreta and scent substances, plant materials, chemical products from equipment (e.g. weapons, foods, clothing).

a. Measurements in Air

Air observations for chemical particulates and vapors are made routinely; for pollutants (McCabe-52) (McQuillett-55) (Taber-58); for organics in city air (Jacobs-57); and biologicals (Amdur-61); and in extensive measurements in various locales by Army personnel from Dugway Proving Ground, Edgewood and Detrick, Maryland (e.g. sampling of airborne particles) (U.S. Army Biological Labs-53, 56); by A. E. C. for effluent analysis (U.S. A. E. C. Div. Reactor Devel Air Cleaning Conf. -60); P. H. S. Taft Sanitary Engineering Center.
From such sources at least two kinds of data can be obtained: archives of materials in air, and capabilities of air background measurement techniques. For information on instruments and standards and Air Pollution Handbook, see (Amer. Conf. Indust. Hygiene-62).

b. Substances from Animals

1. Excretory products
   Metabolic excretory product composition and quantity for specific animals in large part is set down in Handbook of Biological Data (Spector-56) (e.g. pp. 247). One must turn to the regional ecology and animal geography studies to determine in a given locale what animals, their density and movements exist, in order to assess this total chemical pool of excreted products. Such data will allow assessing chemical interference levels of substances similar to human wastes (deposited on ground or in air), their "contrast ratios" (amount of a substance from air in environment/total amount from all other sources), and determination of chemical products really unique to man.

2. Scent products
   Animal "scent" substances are produced by many species (see description under Biosensing); in most cases, released from a specific gland into environment, onto ground, trees or into air. These substances are sensed by the chemoreceptors, sometimes in phenomenally low concentrations, and influence the behavior of a member of the same or other species, for food finding, warning, navigation, territorial marking, mating. This is a widespread communications system in nature, and has been poorly studied to date, perhaps awaiting the analytical biophysicist's approach. Such "scent" substances (many are well described chemically) may present background interference in environment, or can yield clues for selected biosensors to sensitivities to selected substances found in human chemical output.

c. Plant Substances
   Plant chemical substance backgrounds in environments of interest are not so easy to find and describe. It is possible that those investigating utility of higher plants in closed ecological systems (U.S.A.F., N.A.S.A., Boeing, Martin-Marietta, Electric Boat, etc.) would have collected such products, though no descriptions of plant excretions into air have been found.

   Subjective observations of flower fragrances, wood and leaf mold scents, not to speak of crushed grass and broken stems, may have their counterparts in perfumer's chemical description of floral fragrances, and the soil microbiologist and plant physiologist descriptions of processes and products of soil decomposition.

d. Chemical Substance Transmission in Air
   Transmission properties of air environment. Once particles, droplets
aerosol, or vapors of human products enter air, their movements in air are subject to considerable uncertainty, with mechanisms only partly understood. For analyses, see (Lettau) and other Ft. Huachuca work; (U.S. Army Chem. Corp Symposium-54) and other Edgewood, Detrick, and Dugway indexes of reports relating to dissemination and detection of chemical and biological agents, aspects of movement of substances through jungle canopy (Bendix-63); general references on micrometeorology (Sutton-53) (Geiger-57) and chapter on micrometeorology in Handbook of Meteorology. Further references on air, weather and climate include (Napier) (Gerson-55) (Stephens-52) (U.S. Smithsonian Institution Tables) (U.S. A. F. Air Weather Service Tech. Reports List-1963).

Illustrative of data on chemical substances produced from equipment, etc. are those of (Arnest-61) on submarine atmosphere contaminants. Similar observations could be made, but do not seem to be repeated for chemical products of personal equipment - from weapon lubricants, power source fuels and exhaust, clothing, garbage.

III. Physical Signals in Environment, and Their Transmission.

Detection of physical attributes and signals of man, discussed in Sections C and E, require knowledge of corresponding environmental properties. For analysis, sources are cited below on electromagnetic properties of bioenvironment, air and terrain; sound, vibration and electrical and magnetic fields of earth.

a. Electromagnetic Radiation

Many sources of data are available on space based (image pattern) and time based (movement pattern) electromagnetic properties of environment, over the spectrum from RF to gamma, for self emission, reflection and scattering, and transmission.

1. Bioenvironment properties

Faunal populations have been photographed and studied from the air (Buckley-57); and animals and plants photographically compared in visible and infrared for fall versus winter color. (Maniffen-53), maps of color regions of the world (Chambers-56), visibility in U.S. forests (Drummond-56), conditions in tropical rain forests (Richards-52), and military geography data (Mason-57), and alteration of foliage environment by chemical means (Coates-63) represent other information sources.

Spectral reflectance data are available - visible and infrared measurements include 400-650 milлимicrons (ΜΜ) with some 710-900 ΜΜ, at low altitudes, for wide varieties of terrain, identified in 300 categories, set up in 11 basic types (Krinov-47) (Penndorf-56); 500-3000 ΜΜ aerial spectra for trees and groves (Martz-56); 400-1000 ΜΜ leaf and soil sample measurements (Keegan-56) and Canadian conifer spectra (Hindley-57). In extension into ultraviolet, 250-2000 ΜΜ data are at hand on rocks and vegetation and changes after root damage (Dwornik-E. R. D. L. -62).
Other animal color studies by biologists include (Pycroft-25)
(Stephenson-46) (Fox-63); camouflage (Thayer-18), compare this with combat
soldier camouflage study (Humphreys-62); adornment (Hingston-33), and
adaptive coloration (Cott-57).

2. Radiation transmission by air.
Observation remotely (e.g. paths up to 1 Km.) of some electromagnetic
radiation contrast property of humans, from radio to gamma spectral
regions, requires knowledge of air transmission obtainable from the special
sources of data set down by spectral region below. Other general sources
include U.S.A.F. Handbook of Geophysics for Air Force Designers, Survey
of Radiation in the Air (Shaw-58), and of absorption of sun radiation (Dickson-53).

In the Microwave regions air does not uniformly transmit; for
absorption at 8 millimeters see (Nicoll-51); and for 8.6 mm. transmission
in 3-12 mile air paths see (Tollbert-53). Other marked absorption bands
exist at 1.0 and 1.64 mm., with better transmission at 1.3 mm., 2.1 mm.,
3.0 mm. and 1 centimeter. Chief absorption is due to oxygen (Meeks-63)
and water vapor. See (Rogers-51), for solar millimeter radiation attention
see (Theissing-56). These are only illustrative examples.

Infrared transmission in air is good in a few "window" regions
(e.g. 1.05, 1.25, 1.7, 2.3, 3.75-4.25, 10 microns (λ)). For the good water
absorption data 1-10 μ see (Wyatt-62); and 0.8-1.3 μ (Schotland-62A), 0.4-2.3 μ
for long air paths (Knestrick-61) and in near IR (Howard-50); and far IR
(Elasser-38) (Cowling-43). For CO₂ in near IR see (Howard-50). For other
IR data, to 1 μ see (Bayley-62); to 3 μ (Curcio-61); and others (Howard-G.R.D.)
(Elder-53); (Hilsum-48); (Dunkelman-52) (Larmore-56).

In the visible region air is a good transmitter. See the atlas of
air absorption, 5400-8520 μ (Curcio-55); scatter data of 0.4-3 microns
(Curcio-61); long path data 0.4-2.3 μ, (Knestrick-61); the good study of
30-10,000 Angstroms (A) absorption coefficients (Bayley-62), also others
on air attenuation (Deirmenjan-52) (Stewart-52); slant visibility (Goldberg-52);
and contrast reduction (Duntley-48); visibility biblio (Weiner-52A).

In the ultraviolet air transmits moderately well to 3000 μ, below
which ozone if present will absorb (2200-3000 μ). Transmission is poor
below 2200 μ. due to water, O₂, CO₂, N₂ absorptions. Data from 100-3000μ.
are given for these substances in good studies (Holland-62); and from 30-10,000 μ.
(Bayley-62). See data on scatter in the middle UV (Ban); extreme UV properties
of oxygen (Aboud-55); water vapor (Watanabe-53A); (Johannin-Giles-54), and
other data on specific gases (Watanabe-53B) and air (Hilsum-46), (Dunkelman-52).

In x-ray and gamma regions, air is essentially opaque, unless
extreme energies are involved, as at 10⁻⁴μ.(for 100 MEV gamma). See x-ray
mass absorption coefficients information (Allen-52), and the various special
weapons effects handbooks for much more comprehensive data in this region.
3. Radiation properties of terrain

For low frequencies see radar reflection data on natural surfaces by (Cosgriff-Ohio State U.) and (Newbry-60), (Kinsman-62) illustrative of vast number of available reports. For terrain responses to 8 Kmc., see (Morrow-62).

For infrared properties, see 1-6 micron spectral emissivity (Fredrickson-57), showing radiation below 3U chiefly reflected sunlight, and that from 3-6U thermal emission. His observations of rapid minor fluctuations in surface temperature can offer a possible factor of contrast relative to man. For contrast "washout" by IR background, see (Fredrickson-59). For other IR data, see the infrared symposia (IRIS) periodicals sponsored by Navy; also specs on proposed IR spectrograph devices for lunar and planetary soil composition analysis (Lyon-63).

For other spectral background data, see (Vanderheij-56); desert spectral reflectance (Ashburn-56); Nevada test soil reflectance (Hillendahl-58), the Project Michigan literature, and Project SATAN data (Sensors for airborne terrain analysis).

4. Other sources of data

Other environment radiation is described including sky background radiation measurement (Graboski-61); infrared (Bell-56); radio noise from chemical explosions (Cook) (Kosky-54) (Takakura-55); jungle radio communications (Ambra-62).

Properties of materials versus radiation will be helpful in assessing environment or human artefact emissivities etc. Some sources include: materials emissivity and reflection (Pratt and Whitney-60) (Weber-59) McDonough-60) (Hosmer-53) (Beltran-61) (Blau-58) (Holladay-60) (McMahon-50) (Gordon-56) (Bell). Additionally, on IR properties (Maki-60); 4-13U (Wood-60, 62), 2-15U (Reid-59); on microwaves and water (Posener-53); on UV and x-ray (100-1500A.) (Fivens-63); visible region (Barber-63) (Pyrne-54).

Other data on measurement techniques include: reflectance (Dunkelman-60) emissivity (Cairns-60) (Harrison-60) (Bell-55); source (field black body) (Larocca-58); other (Schotland-62A, B),

b. Sound and Vibration, Background and Transmission

For earth surface natural background acoustic noise see (Wescott-63); for other human-generated environment noises see (Bolt-52); also close quarter ship board noises (Bishop-53), and weapon noises (Doelling-59). For animal sounds see (Lanyon-60); and especially for insect sounds (Pierce-48). Air absorption in low audio ranges is discussed by (Nyborg-55) and by (Horiuchi-57) who also considers humidity effects, ultrasonic absorption (over 15 Kc/S) by (Herzfeld-59); for other air and components data such as oxygen, see (Kneser-33), for effects of temperature and water vapor on N2, O2 air absorption, see (Knudsen-53). For Audio Sound transmission and reception under combat conditions see (Waring-46).
For earth seismic background environment and geography see (Griffin-63). More general data are available in a vibration and shock environments biblio (Hercules-62); in the Shock and Vibration Symposia reports from the Naval Research Lab, The University of Michigan's Project Michigan work on combat surveillance (especially on seismic signatures of human devices). For other related data on acoustic sources see biblio of (Thurston-59); data on underwater sound background study techniques (Marsch-61)(Barber-62) and work of Melpar on personnel sensing.

c. Electrical and Magnetic Field Background Phenomena

If any electrical and magnetic attributes of man are to be sensed remotely by non-radiative methods, the sources below will provide some data on natural earth background conditions. Also worth looking into are possibilities that detection might be accomplished by man's distorting these electric and magnetic patterns of natural origin or others deliberately induced in ground and air.

1. Earth currents

Signals measurable vary from 10 MV./Km. at low latitudes to 400 MV./Km. at high latitudes and are measured over a bandwidth from d.c. to radio frequencies; average values on which various pulsations are superimposed (Ward-O.S.R.-62) affecting magnitude, direction and sense, with low frequency variations (under 1 C/Sec.) highly correlated with geomagnetic disturbances (Ungstrup-62) (Hessler-59) (Linehan-61) (Fleming-39), also changing with season, temperature, humidity, lightning, etc., and in presence of industrial devices, underground water.

Earth currents are typically measured with electrodes placed in ground, in North-South or East-West pairs, in one measurement 1000 feet apart (Fleming) (Hopkins-60). Proper electrodes must be chosen to avoid contact potential, polarization (Law-59) local effects.

2. Electrical Resistivity of Earth

This is separately measurable and contributes negligibly to earth current measurements. Typical resistivity measurements can be made with a known current applied to outer pair (100 feet apart), and EMF measured on inner pair, with electrode commutation to compensate for polarization, etc. A nominal value of 5 million ohm-centimeters (Fleming) may vary widely with moisture and other surface conditions.

3. Air-to-Earth Current

This is measured along a vertical line, between plate on ground and plate on horizontal wire above (Kasemir-51) or pair of horizontal plates in air. It is about $3 \times 10^{-16}$ amperes/CM$^2$ close to ground, requiring sensitive electrometer equipment (commercially available.) This current varies with height (Chalmers, p. 142) (Schonland-53).
4. Other Air Properties

Air ionization (Israel-51) about 1.8 ion pairs/cc/Sec. close to ground, chiefly derives from ground radioactivity ($^{40}$K, radon gas) (Schonland-53), with contribution by cosmic rays (Chalmers-57). This varies rapidly with altitude. Charge separation in air can be found after rainstorms and various atmospheric disturbances (L. Smith-59) (Friburger-61). Also as of this date, intense air ionization may be induced remotely, in a small volume of air, briefly, by a pulsed laser beam (see popular account in July, 1963 Scientific American).

5. Geomagnetism

Classical data on steady pattern (Fleming-39) (Rooney-49) are augmented by new studies of origins, fluctuations (Law-59) (Miles-62). For details of rapid changes of a few gamma ($10^{-5}$ gauss) occurring with periods of 0.1 sec. to 10 minutes, see (Provazek-61), and the elegant work of (Linehan-61) with proton precession and other magnetometers, getting background data for Air Force, in very sensitive fixed field measurement arrays which could lend themselves nicely to experiments on disturbances induced by presence and movements of man near the sensing elements.
E. SENSING AND DETECTION OF HUMAN ATTRIBUTES

I. Introduction

This survey of specific techniques for sensing the concealed man by means other than the unaided senses, is based on consideration of those human signal properties previously discussed (emission, reflection or its transformations, influence or proximity effects). To be observed, such signals must cross the intervening space to the observer, and not remain confined or in the vicinity of the body of the target.

First emphasis here considers the specific physical or chemical variables to be sensed, and the description of various principles of physical, chemical, or biological nature for doing this. Both passive sensing and active means (after illumination of the target) are considered. Special attention is paid to the problem of measurement of very low levels of signal, and trace quantities of material from humans.

Source data given here (and also available from many commercial and military surveillance study sources), must be further examined in a systems analysis for each phenomenon which could provide a data link, to adjudge whether a physical possibility for use of the sensing effect exists; and what prediction can be made at present or for near future conditions about sensitivity, response time, specificity, other acceptance or discrimination properties comprising figures of merit. Further analysis of signal separation from noise (chemical, physical, or biological) and of recognition techniques, can consider methods of using intrinsic properties of the primary sensor or auxiliary devices to allow: pattern recognition, in space (radiation image), in time (e.g. seismic signature), for concentration (multi-substance concentration profiles), in relation to reference patterns stored within the instrument; and to allow synchronous detection (as with active systems), autocorrelation analysis, etc. Even in exploratory analysis of principles, the reader must keep in mind the ultimate problem of the use in the field action environment, and related factors of use burden (power, size, weight, mobility reduction, attention diverted from other tasks, etc.).

The material which follows will cover Biosensing (use of living material as transducer for various variables), Physical sensing, and chemical analysis methods.
II. Biosensing (Living Tissue as Detector).

a. General Comments.

The serious consideration by anyone of the use of living material as a sensing transducer requires demonstration: that specific variables can be sensed, that reproducible and stable input/output relations exist, that output signal can be conveniently collected, that the material can be kept alive and functional without inordinate effort. Only then can biosensing techniques be considered seriously for comparison with other chemical and physical instrumentation, using measurement engineering criteria of range, bandwidth, sensitivity, bandwidth, resolution, etc.

Demonstration of plausibility and utility has been carried out by many. At this point in time much is known about the living sensing process. A great deal of physical and engineering insight is being applied to describe quantitatively the transfer characteristics, internal mechanisms of the biological communication process and of sensors; and to apply knowledge obtained from observation of the living sensor process to physical design.

For general and good references on this, see: record of First Bionics Conference, Dayton, 1960, in Report # USAF-WADD-TR-60-600; also Second Bionics Conference (Bernard-62); a Third Bionics Conference held also in Dayton 1963 will be in print shortly from WPAFB. See also: Abstracts, 7th Annual Meeting, Biophysical Society, 1963.

Studies have been made on a wide variety of living receptors, sensing mechanical quantities (sound, vibration, acceleration, strain, force), radiant energy (UV, visible, IR), thermal and electrical variables, etc. They show that living receptors have many unique attributes; for some: extreme sensitivity (to quantum limits for photo receptors) (to a few molecules of chemical substance for some chemoreceptors); they are "microminiature", are self-generating (requiring no applied power, just metabolic fuel); and have a pulse-like output, pulse-rep-rate modulation, with pulses which can be counted and stored.

Use of living material for reproducible sensing of environment is not limited to special sensory receptors; as will be described later, many types of isolated tissue may serve as transducers; and these may be employed at diverse levels of biological organization (cell batches, tissue, isolated organs, etc.).

For quite specific data usable for biophysical analysis on sensing processes, consult the following analytic studies: comprehensive book (Rosenblith-62) on sensory communications, sensory energetics (J. Gray-52), comparative survey (Bullock-53) (Granit-55), internal mechanisms (Katsuki-61) (Kennedy-62), other biophysical reviews by (Davis-53, 61) (W. Loewenstein-59, 60), (Makarov-61); also biological signal and noise study (Molyneux-63), signal detection (Hack-63). All of this work was done as basic biological research, not applied to instrumentation. For bibliography on various living sensors applicable to physical design, see (Kornfield-61) and for analyses of application to BW detection, see Kornfield-62A, 62B, 63).
For information on the ease with which sensor tissue output data signals can be collected, for specific data on the related electrophysiological measurement methods, see (Ford-57), (Bures-60), (Cameron-60), (Davis-59), and for electrodes, see (Sosnow-61). See also the description of methods in papers cited on isolated receptor preparations in the pages which follow. For the detailed physico-chemical analysis of the production of bioelectric energy and its extraction from various living sources, also see (VanWinkle-62).

For a discussion of tissue culture and living material maintenance techniques, see (Cameron-60), (Merchant-60), (Parker-61), (White-61) and the large biblio of (Murray-5.3) for insect tissue culture, see (Loeb-57), (Martignoni-60).

For other good biological information sources relating to sensors, for comparative physiology, including senses (Prosser-50), (Loeb-57), sensory physiology (Von Buddenbrock-52), comparative physiology of the nervous system (Koshtoiantes-60), insect nervous system (Roeder-55), and his insect physiology (Roeder-55), reptile sensors (Kahlman-32), chicken skin sensors (Winkelman-61), mammalian skin nerve endings (Waddell-55), other skin nerve endings (HinChingLiu-62), bee communications (Haldane-54), animal navigation (J. Carthy), for drug use elucidating sensory process, see (Habgood-52), (Buchthal-54).

b. Specific Chemoreceptor Studies

1. Comments

The field of chemoreception is sampled in detail over the next several pages. There is included information on many specific studies on whole animal behavioral and electrophysiological measurement, and in isolated preparation electrical output studies. About 25 species of insects, and about 50 other animal species are included, where specific information was published, describing a receptor structure, and/or its sensitivities have been published. Other detailed sources are listed for data on dog smell sense and tracking, human smell and taste sense, and smell and odor information.

Chemoreceptors have been highlighted because of their phenomenal sensitivities and specificities, and multi-substance analysis capability, without counterpart in any physical apparatus today. We have set down the specific chemical substances used as stimuli for most of the experiments listed. From these, the reader may select those preparations for further experiment which come from animals available and indigenous to the region of interest, with specific desired chemosensitivities, and yielding convenient experimental preparations.

For a few individual chemoreceptor electrical output measurement studies, not listed in the tables, see (Hodgson-55B), (VonBuddenbrock-55B), and for administration of trace chemical stimuli by microelectrophoretic techniques to individual chemosensing cells (Baumgarten-63).

Animal scent production and its sensing deserves some comment. This is a "scent communications system"; a large number of species produce specific materials (in many cases chemically identified; eg. for beaver, over 100 substances—see Hardy-48), which are synthesized, stored, and released from a specific gland structure, so liberated into air environment, or depos-
ited in environment, there to be sensed generally by the same species, with attendant behavioral response, related to food finding, warning, territorial mapping, navigation, sex, etc. The scent mechanism has been best studied in insects, where phenomenal sensitivities to known substances have been found (e.g., 30 molecule threshold to specific substance in cockroach sensing). The airborne substance has been identified, and chemically synthesized, the chemoreceptor properties related to it studied and the whole effort exploited in the development of insect attractant insecticides, discussed elsewhere in this report. The products of animal scent glands have also been studied by the perfume chemist and industry, to obtain components for their blends, from such animals as beaver, civet cat, muskrat & shrew, although in their case without knowledge of the animal sensors. Except for these classes of studies, the literature of ecology is devoid of accurate description of the scent communication process.

In the chemoreceptor lists which follow, of insects and other species, we have included additional data on the existence and description of scent production for many species, for several reasons: it represents a chemical substance acting as "noise" or unwanted signal in the environment to which the animal is indigenous; also from the presence of a scent organ in a species one may confidently predict that a specific chemoreceptor responsive to that substance exists in that species, even though no explicit information has been set down on chemoreceptors for that species; finally in many cases the scent substance chemical components from a given animal may have their counterparts in some product of man (sebum or apocrine gland component--which have been claimed to be types of "scent communication" substances--See Schaffer-37, Wheatley-51). Experiments with the chemoreceptors of that match up species may be most profitable in quest for a human detection element.
2. Insect Chemoreception

Many good quantitative studies on a diversity of species, sampled herein, show the unique eligibility of insect chemoreceptors as controlled isolates for biosensing, because of experimental convenience (of hardy preparation, ease of individual receptor isolation, exposure to stimulus and single nerve response signal collection). The readers' selection of one or more insect tissues as experimental candidates for human substance sensing can derive from consideration of regional habitats of specific insects, their attraction to human hosts, and the match-up between the diverse sensitivities studied and human products. Specific receptor studies also including notes on scent substance emission are set down below.

The most promising of these for further work from the standpoint of knowledge of stimuli, isolation and measurement procedures are preparations of the silkworm moth, blowfly, butterfly and bee.
Chemoreception in Specific Insects

Ants: For direct study of olfaction, see (Marcus-46). Other studies in response to scent substances are cited below.

Scent production by various glands (Wilson-59, 62), with chemical factors catalogued (Wilson-58); produces alarm and digging behavior in various species (Wilson-58).

Bees: For early study on chemosensing by antenna and tarsus see (Marshall-35); for taste perception (VonFrish-34), chemosensing in general (VonFrish-50); behavior in distinguishing companions (Kalmus-52), smell sensing (Gubin-57) (Schwarz-55) (Ribbands-55); and a definitive paper on isolated antenna electrophysiological chemoreceptor measurement see (Boistel-56).

For scent glands, see (Frings-44) (Gary-62). For specific known products of queen, serving as attractants see (Gary-62). For attractant test methods see (Woodrow-58); for Bumblebee scent trail description see (Wynne-Edwards-62), and for good recent data on scent substances from bees see (Jacobson-63A).

Beetle: For early beetle olfaction, see (Richmond-27), also olfaction affecting host selection and oviposition (Crombie-41). In other behavioral studies quite early the very high sensitivity (1:10^7) to skatole demonstrated by (Abbott-27). For carrion beetle orientation to odors see (Dethier-47C).

Butterflies: For specific receptor studies; leg, sugar sensitivity see (Anderson-32), tarsa receptor to sucrose sensitivity by neural fiber electrical measurement, and in same (Takeda-61) receptors stimulation by electrical current to examine receptor internal mechanisms (Morita-59).

For scent emission and sex attractants isolated by (Inhoffen-51), see (Butenandt-55) (Gotz-57).

Cockroach: For early taste threshold studies on electrolytes and sucrose and the related receptor locations, see (Frings-46A). For diverse studies on cockroach chemoreception see Q. M. R. and E. C. Natick list of publications.

For scent substance sex attractant sources, see (Wharton-57), working over several years; for composition, see (Wharton-61), and effects of radiation and other noxious stresses, identification of one substance as 2-hexenal (Roth-56) and from a tracheal gland, paraquinone (Roth-58). Phenomenal 30 molecule threshold sensitivity (10^-20gm) of roaches to their own chemically identified scent substance is discussed by (Jacobson-63A).

Flea: Sensor physiology (Dethier-57B).

Flies:

Blowflies: Much exact work on input/output relation, specific sensitivities, internal mechanisms has been done on these, chiefly because of their experimental convenience of access. For early chemotropic behavior studies, see (Hobson-32) (Abbott-38) (Craff-45). For other response to specific substances, for alcohol series, see (Dethier-47B), aliphatic aldehydes and ketones (Chadwick-49), (Dethier-54), various carbohydrates (Hassett-50) (Hodgson-56, 57),
organic sulfur (Cragg-50B). For properties of specific receptor sites, for
tarsal receptor sensitivities see (Chadwick-47); for various contact chemoreceptors, see (Dethier-55), and olfactory receptor types and responses
(Dethier-52). For recent precise sensor observations including electrical
output signal measurement, on labellar receptor responses, see (L. Brown-62),
for water taste (Wolbarsht-57) (DeForest-61); protein (Wallis-61), NaCl
(Wallis-62), and for temperature effects on receptor mechanisms (Dethier-58).

It is seen that even where extensive studies have been made on a given
species, systematic exposure to all major chemical groups for threshold
study has not been done. Along with such experiments can be tested thresholds
to fractions of sweat, sebum, urine or feces of humans in isolated preparation
studies.

Flesh fly: For smell sense see (Steiner-32); for taste, sucrose threshold
see (Frings-54).

Fruit Flies: for chemoreception see (Begg-46), response to animal
excrement (Harrison-54); and to fermenting banana products (Reddle-63).
For scent output (male sex attractants see (Ripley).

Horsefly: for contact chemoreceptors (female) see (Frings-46B).

Sawfly: For scent substance production and chemosensitivity, see
(Coppell-60) and (Casida-63), and especially rapid response of pine sawfly
to nanogram sex attractant levels (Jacobson-63A).

Screw worm fly: For early chemosensitivities, including urea, see
(Abbott-28). For an account of scent production and sex attractant studies,
see (Jacobson-63A, B).

Walnut husk fly: For scent substances and their properties see (Barnes-58).

General comments on many other fly studies: For olfactometers, see
(Eagleson-30), for responses of flies to cattle dung and urine, see (Chorley-48).

Grasshoppers: For antenna and flagellum receptors see (Slifer-55, 56).

Locust: For specific recording in nerves from in antenna chemoreceptors,
see (Uchiyama-56).

Louse: For early chemoreception studies see (Pick-26), later (Dethier-57B).

Milkweed Bug: For recent antenna and flagellum receptor data see (Slifer-63).

Mite: For chemoreceptor electrophysiological studies, see (Elizarov-62), for
clover mite humidity sensor, see (Winston-62), other studies (Dethier-57B).

Mosquitoes: For chemoreceptors in yellow fever mosquitoes, see (Frings-50)
(Owen-61, 63), for their antenna and flagella organs (Slifer-62), for mosquito
antenna sense organ survey, see (Stewart-63). For other chemosensitivities in general (Willis-47), amino acids (Schaeffenburg-59), odors attracting for oviposition (Crumb-24) and attraction by odors of Anopheles to animals (Podomodvinov-42). Chemosensing attraction to humans has been studied by many (Rahm-57A, B, 58A, B) (Laarmans-55, 56); with specific chemical factors considered by (A. Brown-56), those components of sweat (A. Brown-51, 61B) (Thompson-55) (Owen-63), including lysine at low concentrations (Brown-61B) and other amino acids (Brown-61A). Attraction by human CO₂, etc. is considered by (Willis-48) (Reeves-53), and temperature and humidity influences by (Smart-56).

Moths:

Gypsy moth: Best chemosensor studies done in relation to its scent substance (female sex-attractant), "gyptol" isolation (Acree-53), composition analysis by chromatography (Acree-54), subsequent synthesis of fractions, and use in "attractant" insecticides such as the Department of Agriculture's "gyp lure". Male chemosensing thresholds of 10⁻¹³ gm. stated by (Jacobson-63B).

Silkworm moth: Receptors of larvae intensively studied, measurements of specific chemical stimulus by (Morita-59B), and electrical "generator potentials" measured by (Morita-59A) (continuous E.M.F. produced intracellularly in response to the chemical stimulus, and giving rise to the spike impulse output signal train seen on the receptor nerve). For carbohydrate sensitivity, see (Ishikawa-63), and for citral, lenalyl, terpin compounds see (Hamamura-61). Good isolated antenna preparation studies with various chemicals and with electrical output measurement, (Schneider-57), including exposure to one kind of scent substance emitted by this organism (Schneider-56).

For other scent substance description see (Seguin-54), and series of papers by (Butenandt-47, 62) who has defined its sex attractant function, its chemical nature.

Other Moths: For comparison of olfactory specificity of emitted-scent; sex-attractants in different species, see (Schneider-62), with further isolation by (Kecker-58) and bioassay of synthetic scents by (Block-60). For giant saturnid moth sex attractants, see (Rau-29) (Dethier-47A), early references in insect scent.

Tick: For smell and attraction to animals see (Philip-53), on chemoreceptor function see (Dethier-57B).

Tropical Water Bug: For male scent substance composition, see (Butenandt-57). Since this is used by some in S. E. Asia as a food spice this scent, if carried by a native of the area, may be detectable remotely in extremely low concentrations, its analogue of isolated chemosensing preparation from this insect.
Other Data Sources on Insects: For excellent annotated biblio on smell in insects, see (Hocking-60); for comparative physiology (Frings-48); receptor ultrastructure (Dethier-68B). For chemoreceptive behavior studies see (Brown-28) (Ingle-43), (Dethier-57A) also in parasitic insects (Thorpe-37, 38, 39). For electrophysiological measurements, see (Chapman-53) (Roys-54), Takeda-59), for internal signal conversion (from chemical input to electrical output) see (Hiromichi-59) (Morita-59A), and for other mechanisms (Dethier-48, 51, 56A).

On insect scent and attractants, see excellent recent reviews (Jacobson-63B) (Karlson-50), and older material (Cattreau-05) (Kettlewell-46). For specific receptor loci and sensitivities (Schwink-55); for certain specific attractant classes (e.g. amines, fatty acids, sulfides, NH₃) see (Green-60B).

3. Chemoreception in Various Other Animals

To the sample of specific studies cited below on chemosensing, scent production and communications, apply the same criteria cited under "Insect Chemoreception" to select hardy tested preparations for further experiment in sensing human chemical products.

Promising animal chemoreceptor preparations considering only the superior knowledge of tissue isolation, measurement, and understanding of some stimulus properties will be seen under Cat, Crayfish, Hamster, Rat, and especially Frog and Rabbit.

Alligator: For olfaction, see (Gestland-61). Scent glands "musk" secretions see (Foster-34), (Hardy-49A).

Anteater: For taste receptors see (Kubota-62).

Arthropods: For chemoreceptors terrestrial and fresh water forms, see (Hodgson-58B).

Badger: For scent glands close to anus, in some, in a pouch under tail, see (Hardy-49A) (Neil-48).

Beaver: For scent glands between anus and genitals see (Schweisheimer). For composition of products of this "perfumery animal" see (Walbaum-27) (Rosenthal-28) (Lederer-43) (Naves-34, 47) (Givaudan-49) (Arctander-60), for 100 constituents identified see (E. Hardy-48).

Birds:Condor: Smell (Gill-04).
Duck: smell (Nokte-30) and scent production (Bang-60).
Gray Goose: smell (Best-13).
Ostrich: taste and smell (Gillespie-22).
Quail, Bob White: chemosense discrimination (Frings-52).
Turkey, Wild: smell (Caton-70).
Vultures: chemosenses (Bang-60) (Leighton-28) (Lewis-28). Scent gland and "musk" production musk glands (Bang-60).
For other general data on taste and smell see (Portman-61) (Soudek-29); smell (Zahn-33) (Taverner-42) (Miller-42) (Bartsch-43) (Bang-60); for conditioned reflex studies see (Walter-43).

**Boar:** For scent glands and products see (Pocock).

**Cat:** Taste fibre response spectra (Cohen-55). For scent substance composition from civet cats see (Bennett-29) (Hardy-47A) (Naves-47) (Treatt-12) (Vandenput-37) (Arctander-60) (Bedoukian-51) (Dubois-59). For relation between scent production and sex behavior see (Stoller-61).

**Chimpanzee:** Smell (Blackman-47).

**Crabs:** Smell and taste receptors in mouth in one species (Cheesman-22); in horseshoe crab chemoreceptors (Barber-56).

**Crayfish:** Chemosensory responses to NaCl, glycine, glutamic acid (Hodgson-58B).

**Crustacea (various):** For chemoreceptors (Laverock-63); for scent substance and sex attractants (Forester-51).

**Deer:** For common deer smell sense see (Caton-70). Musk deer furnish an important source of perfume components. For scent glands, in musk deer, between naval and penis see (Naves-47). For those near eyes, hocks, toes, see (Stoller-62); for secretion see (Durvell-23) (Perry-25) (Sagarin-45) (Naves-47) (Bedoukian-51) (Schweisheimer-56) (Wynn-Edwards-62) and (Owen).

**Fish:**
- **Carp:** For taste see (Konishi-61).
- **Salmon:** For smell and taste sense, see (Hassler-57); and for repulsion by human skin serine see (Idler-55).
- **Other fish:** For discrimination of stream odors see (Hassler-51).

**Fox:** For scent glands on feet, pads, near anus, and products, see (Mivart).

**Frogs:** Experimental convenience, including sensory access, has spurred much receptor work; on taste receptors, single unit studies (Kusano-60) (Casella-61), including response to NaCl and sucrose (Kusano-60). Acetic acid (Kimura-61B). On smell receptors: olfactory nerve signal collection (Kimura-61B), receptor system microanatomy (Altner-62) response to cations versus anions (Yamashita-63).

**Goat: (Alpine)** For scent gland and products see (Bedoukian-51).

**Hamsters:** These provide convenient preparations allowing good receptor studies for taste receptor, microelectrode measurement, see (Kimura-61A).

**Invertebrates:** for chemoreceptors in general see (Hodgson-55A).
Jackass (Laughing): For taste and smell receptors see (Pocock-12).

Lion: For smell see (Oliver-30).

Martin: For scent glands (anal) and dispensing of secretion on twigs, see (Portman-61).

Mouse: For olfaction detailed behavioral and physiological studies, e.g. smell induction of neurohumoral changes affecting estrus, etc. see (Parker-61).

Nereis: For chemoreceptor responses to alcohols, see (Case-62).

Newt: (Spotted) For smell sense see (Copeland-13).

Opossum: For study of isolated olfactory epithelium, recordings on isolated nerve and essential-oil stimuli, see (Beidler & Tucker).

Rabbit: Many good olfactory studies for "electro-olfactogram" (recording in olfactory nerve tracts), see (Moncrieff-61); for study of sensor smell and taste enzymes, see (Varadi-51), for anal scent glands see (Owen) and for relation of scent production to sex activity, see (Cougard-47).

Rat: For taste receptor microelectrode studies, see (Kimura-61A).

Scorpion: for chemoreceptors, see (Alexander-57).

Sheep: For scent gland location and output, see (Hardy-49B) (Bedoukian-51).

Shrew: For lateral scent glands and territorial mapping behavior, see (Pearson-46).

Skunk: For scent glands and substances, in U.S. and European polecats, see (Hardy-49A, B).

Snake: For "olfactory" cells on tongue, see (Smith-51); for anal scent glands also see (Smith-51).

Spiders: For chemosensors, see (Abbott-27).

Toad: For direct electrical measurements on olfactory epithelium, see (Takagi-60, 61).

Tortoise (American): For scent glands see (Hardy-49A).

Turtle: For mud turtle chemosensors, see (Carr-51) (Poliakoff-U.S.S.R.-30); for musk turtle ventral scent glands, see (Risley-33).

Viper: For smell sense, see (Bauman-27, 28).
Weasel: For scent gland substances produced and "musking" scent deposition behavior, see (Neal-48).

Whales: For smell sense, see (Kellogg-28).

Wireworm: For chemosensors, specific stimulus studies, see (Crombie-47).

4. Dog Chemoreception

Dogs have proven invaluable in intrusion detection, tracking, and other observation of humans, are currently under laboratory and field study, and use for special operations, by various Defense agencies. Since our primary concern was with basic sensing processes, we have assembled here a small fraction of published material on dog tracking of humans and related subjects as a source for further analysis by the reader in our context of discussing biosensing by whole animals and isolated preparations. Most of the published work, though emerging from the pen of dog handlers of proven capability, is inexact and only generally descriptive, where factors of specific human attributes, environmental modifications of these and precise conditions of dog response are concerned. Most of the references were available and seen in the New York and Boston Public Libraries, and are probably in the Library of Congress.

For specific comments on human tracking (Budgett-37) discusses ranges, loss of track with time, masking by vegetation (e.g. by mint, willows), and enhancement by vegetation, in grass. Tracking on crushed vegetation trails is also discussed for bloodhounds by (Whitney-47, 55). (Dr. Whitney, an outstanding authority on dogs, is in Orange, Connecticut.)

For detailed discussion of skilled tracking (including New York State Police work) on new and old trails (100 hours) and long distances, see (H. Davis-56). He expresses conviction that dogs pursue traces of skin products, reaching the ground diffusing through shoes, etc., and speculates on specific chemical substances involved including such fatty acids as caproic and propionic. He describes tracking experiments using traces of known substances deposited on ground including acetic acid and salt. For similar experiments with deposited chemicals, (e.g. iso-valeronic acid) and tracking responses similar to those for humans, see (Budgett-37).

Major L. Davis of K-9 Training Agency, at Hyde, Maryland (near Baltimore), who has trained dogs for many diverse tasks, and did work on CW detection by dogs, suggests in conversation that the skin product sebum is the key factor in the tracking of man.

Simple, but definitive experiments could be conducted by any of these good dog tracker trainer groups cognizant of the chemical factors problem, using sebum of man deposited on ground or dispersed in air in various concentrations. Sebum used could be freshly obtained, from various people, or allowed to undergo normal skin bacterial decomposition, and could be used whole or in fractions obtained by chromatography (mentioned elsewhere in this report) to define exactly which chemical factors, if any, from sebum are the key ones in human tracking.
For other studies on human tracking, see (Schrmid-35), for human individual differences (Kalmus-55), and for dog breed capability differences, see (Schnitzer-62).

For other smell sense descriptive writings, see (Grassi-89) (Romanes-87, 90) (Binet-96) (Johnson-14) (Henning-19) (Bozelli-21) (Biytendijk-21) (Rudolph-23) (Warden-28) (Cramer-41), and for hounds (Rudolph-23) (Whitney-47, 55). For conditioned reflex studies on smell and taste, see (Allen-37) and for direct electrophysiological measurement of chemoreceptor (taste), see (Anderson-50).

For other general discussion of military uses of dogs, see (Meguian-20) (Going-44) (Behan-46) (Gorman-54) (Downey-55) (Waller-58) (Derringer-58) (Clapper-61), including study for certain CW agent detection (Davis-62). General narratives on police uses include (Diederich-09) (Gross-12) (Craig-24); utility of hounds (Knoche-57) (Chapman-60), and smell sense (Lohner-26) (Schrmid-35).

For descriptions of dogs, by type, for hounds, see (Sigling-28) (U.S. Lib. of Cong., Div. of Biblio. -26) (A. Smith-32) (Chapman-33) (Stancko-54) (Watts-55); and bloodhounds by (Oliphant) and (Whitney-47, 55) (Appleton-60); beagles (Denlinger-56); Doberman Pinschers (Denlinger-53).

For other general related discussions of dogs, see (Menzel-29, 30) (Mason) (L. Whitney-33) (Lyon-50); also dog encyclopedia (H. Davis-56); and animal behavior descriptions (J. Scott-58) (Dorn-57).
5. Human Chemoreceptors

Human smell and taste sense data likely will provide very little direct contribution to solution of the human detection problem. But the reader may find the few sources cited here of value, in considering human thresholds compared with animals having special sensitivities, factors modifying smell sensitivity (and possibilities of enhancement of human olfaction), and what little data there are on human smell perception of other humans.

Olfaction: For nose structure and function, see (Holmes-49) and Proetz's "The Nose", about 1954. For many threshold values see (Spector, p. 327-56), (Hessel-61), (VonSkramlik-48), for mixed organic chemicals (Rosen-62); absolute intensity judgment (Engen-59), threshold theory (Davies-55), olfaction information processing (Wright-63), and other odor evaluation (Merritt-59, 60, 61); (Crocker-52), (Amer. Soc. Perfumers-61). For 'chemical analysis' by olfaction, see (Alekseevki-41). For multiple factor smell analysis, see (Hsu-46) and especially (Schutz-61). Using many human subjects and odorants the latter's multiple factor studies isolated 18 physico chemical variables associated with human olfaction most classically suggested, including radiation spectra, surface activity, vapor pressure, boiling point, heats of combustion, refractive index, etc. For odor versus composition see (Timmermans-54). For devices for presenting odor experimentally, see (Wenzel-48, 50), Battison-62).

For factors altering olfaction sensitivity and capability, drugs (e.g. menthol, strychnine, acetylcholine), see (Skouby-54), for industrial substances, (Eolian-60). For suggestive relationships to various sexual factors, to sexual activity (Podolsky-46), olfaction changes in conditioning with androgens and estrogens (LeMagnen-49) and relation to female secondary sex characteristics (LeMagnen-48), smell sensitivity to sex hormones and their metabolites (Klock-61). For defects in smell sense after injury, see (Leigh-43), changes with temperature of the odorous substance (Kerka-56), changes with altered physiological state (LeMagnen-50).

For human smell sensing of other humans; for geographic regional odors, for Europeans, see (Adachi-03) (Laloy-04A, B), for several groups, including Japanese, French, Balkan, see (Eller-41), for human odor individuality, see (Laird-35); (Lohner-24). For other human odor sensitivities, significance, and control, see (Haggard-41) (Neuhaus-61); for human "scent-producing organs" see (Schaffer-37); and for the production of odorants on skin in normal bacterial flora there, see (Strauss-56). On other odor problems related to man, on odors and shelter habitability see (Muraoka-61) (Traffalis-55); sanitary significance of odors (Earp-23); their detection in water (Fair-34); odor control (McCord-49); especially in (casualty) evacuation aircraft (Gee-51); various others including breath garlic odor (Haggard-35); fish odor (Mangan-59), and asthma induction by urine, feces, sweat (Vamis-47).
Taste Sense: For basic concepts see (Johnston-55); chapter in Handbook of Neurophysiology (Magoun-61), Handbook of Experimental Psychology edited by S. Stevens in 1951; for compound evaluation techniques and flavor research, see (Krum-55) (Peryam-58); (Merritt-58, 59, 61), and for flavor physical chemistry see (Laymans-59). Information on human taste sense will probably contribute very little to selection and trial of other animal isolated smell and taste receptors, with human chemical products.
6. Other Specific Studies

For excellent bibliography on smell and odor, see (Airkem-52); for theories of smell, see (Jones-O.N.R.-53) (Foster-50) (Kluvler-58) (Beidler-57, 60, 61A); for enzyme theories (Kistiakowsky-50); other analyses (Middleton-56) (Mateson-44) (Bedichek-60) (Bronshtein-U.S.S.R.-50) (Beets-61) (Dravnieks-62) and new identification of physical variables (Tucker-63). For studies of smell epithelia (Baradi-57) including electrical activity of isolates (Ottoson-56); and of smell adaptation (Adrian-50). For regeneration of olfactory cells, see (Schultz-41), and old papers, on scent (Shepherd-Walwyn-26) (Bawden-01) (Hopkins-26).

Taste Sensors: For analytical papers on contact chemoreception, see (Beidler-54, 57, 60, 61A, 61C) (Bronshtein-50) (Roshupkina-54); for comparative description (Johnston-55); electrophysiological studies (Beidler-55A), on single fiber signal output (Zotterman-59) (Sato-60) (Kimura-61C), other measurement techniques (Hodgson-61). For physical chemistry (Ruben-62) including enzyme basis of taste (Koshtoiants-58) (Mateson-54); for CNS efferent control of sensor (Esakov-61); taste and smell enzymes in rabbit (Barack-5).

Interchemoreceptors: Within higher organisms, neural receptors have been identified, for osmotic pressure sensing in the head, for O2, CO2, PH sensing in carotid and aortic bodies, for glucose in liver (Russek-63). Others are suspected to exist, in the intestine (Baraz-61) and elsewhere, sensing at least those several dozen chemical variables of blood plasma known to be regulated at steady levels by homeostatic systems, responsive to stress of loading or deprivation of substances. If discrete receptors are found for high molecular weight substances (proteins, polysaccharides, etc.), amino acids, urea, these may be studied as isolated biosensing elements, to match human product output.

Other Work: For comparative physiology, see (Jahn-50) and for invertebrates (Keefe-62) and other "common chemical" senses, see (Crozier-16). For calcium relation to function (Lenhoff-59), reception in aqueous versus gas phase (Hodgson-53), for carboxylic acid cycle role in reception (Teng-61). For anatomy, (Clark-5) physical chemical factors in stimulation effectiveness of compounds (Ottoson-63), and chemoreceptive regulation of animal feeding (LeMagnen-59). For a review of chemobiosensing in application to BW detection, see (Kornfield-62A, B, C, 63). For Air Force interest in enemy troop detection by physical analog of olfactory techniques, see (U.S.A.F. Aerospace Med. Lab Procurement Office).
c. Chemosensing by Isolated Tissue Other than Receptors

In principle, all regions of a living organism have potential and actual responsiveness to chemical stimuli. In practice, tissue isolates have been prepared from most every organ, in many species, at levels of cell, tissue, organ, then exposed to chemical stimuli. For all tissue culture and life support means have been identified for easy maintenance of extended integrity. (Also some tissues can be kept in low temperature or chemical stored state for long periods.)

On various types of isolates, so supported, continuous observation of overt response (readout) appears most practically by mechanical and electrical means, with straightforward extensions of instrument engineering techniques. Observations on typical preparations illustrated show rapid responses and high sensitivities to wide range of known chemical substances.

Sensitivity augmentation is possible by proper conditioning of the animal from which the tissue was taken, as will be discussed. Some types of isolates include:

Living Skin: A few square centimeters, most easily obtained from frogs, can be set up as a membrane barrier in a simple hardy apparatus which keeps it alive and yields a large electrical signal change rapidly upon exposure to traces of a variety of known chemical substances. For experimental apparatus see (Scheer-60), (Ussing-60); for effects of specific trace substances, for example, for low molecular weight materials (steroids), see (McAfee-61); for response to high molecular weight substances (e.g., toxins from cholera organisms), see (Huber-60). Many other known trace chemicals also act to alter specific metabolic processes in this living skin, changing its permeability and ability to "pump" sodium and other substances across itself and against a concentration gradient, so altering observable voltages and "short circuit" currents always present and measurable.

Living Gut Strips and Segments:
Contraction events: A strip a few cm. long, from rabbit, or guinea pig ileal region of the intestine, easily set up in life supporting medium, contracts automatically, rhythmically, and will show big changes in length and force-time patterns (using simple strain gage transducers) on exposure to trace chemical substances. For instrumentation, preparation and other technique, see (Cook-61) and any current texts on drug bioassay. For
responses to specific low molecular weight substances, for histamine and histidine degradation products, see (Mosebach-61), for acetylcholine, see (Cook-61). Greatly exaggerated sensitivities to specific substances approaching a few molecules of very specific stimulus, may be obtained by "pre-sensitizing" the animal from which the tissue is taken with substances of interest using standard immunological procedure. This is classic for bacterial products studies (Schultz-10), more recently (Buckland-60).

In some simple definitive experiments, the antigenic enhancement properties of whole human sebum, or feces and urine extracts, could be examined by attempts to sensitize guinea pigs with these, then measurement of specific and high sensitivities of isolated ileal strips from these animals to such products. This enhancement procedure really could be applied to any of the living tissue biosensing studies discussed in this report.

Electrical events: For bigger flattened pieces of gut kept alive used as membrane barriers, the same rapid electrical signal changes and measurements described for frog skin above, result from applying trace chemical substances. For technique, apparatus, and measurements with specific substances, see (Vaughan-61 63).

**Living Blood Vessel and Heart Strips:** Strips of a few cm. cut spirally from aorta (a main vessel) of rabbit, supported in simple apparatus, change length rapidly (measurable by strain gage) on exposure to low levels of various chemicals. For technique and responses to adrenalin and related substances, see (Furchgott-53) (Helmer-57) (Briggs-61).

Cylindrical pieces of artery or aorta, stoppered at both ends, show changes in pressure-volume relations rapidly (by simple electrical manometer measurement) many chemicals (Remington-62).

Whole hearts, removed from frogs and toads in simple support and measurement systems, beat for long periods, show large changes in beat force, size (mechanically measured), when various steroid substances, etc. are applied. For toads, see (Naylor-57); for frogs, (Ware-57, 60).

**Living Bladder:** Isolated urinary bladder from toad is easily kept alive and set up for pressure-volume change measurement as a function of many different chemically identified trace substances. See (Bentley-58) (Leaf-62).

**Living Nerve Tissue:** From a few c.c. of brain tissue kept alive from various regions and species, but hard to maintain, self-generated rhythmic electrical signals easily measured change on exposure to chemicals. For human adult cerebellum tissue, see (Cunningham-61).

Handier neural tissue includes nerve and urinary bladder strip isolates from rabbit (Ursillo-61) changing response to electrical nerve stimulation as function of applied chemical substances, and similar preparations of frog sciatic nerve and skeletal muscle. Isolated segments of nerve may be used with down stream propagated electrical signal integrity altered by trace chemicals.
Bioreceptors Sensitive to Mechanical, Radiant, Electrical Energy, etc.

While chemoreceptors have dominated our consideration of biosensing phenomena plausibly usable for detection of human products in comparison with other methods, the reader should consider the capabilities of several other classes of biosensors, illustrated below, for detection of physical signals and attributes of man, in comparison, again with existing and developmental physical apparatus. These biosensors offer phenomenal sensitivities, signal variable specificities, and in microminiature form can handle some very complex signal signatures (e.g., the few moth acoustic receptors handling the wide range ultrasonic FM bat signal pattern (Roeder-61). These receptors also are self-generating, requiring no electrical power, are extremely small, have output in pulse form (which can be counted, stored and used in real-time computation). The examples only superficially touch on the literature available.

**Mechanical Energy Receptors:**

*Sound:* For moth single receptor electrical measurements, and bat signature signals, see (Roeder-61); for bat sensors, see (Griffin-59); for other insect sensors, for isolated spider leg response (VanderKloot-58); and insect ear ultrastructure (Gray-58). For other hair sensilla and tympanic organs, see Prosser, "Comparative Physiology," 1951). For single sensory unit response, cat, see (Rupert-63).

*Pressure:* For single receptor (Pacinian corpuscle) electrical output data, see (Diamond-58) (Cauna-58), for internal conversion mechanism in these from mechanical to electrical signal, see (Loewenstein-58); for hydraulic pressure receptors (deformation receptors of carotid sinus) see (Landgren-52).

*Vibration, touch:* cat hind limb vibration receptors (Hunt-61), touch receptor stimulus sensitivities (Catton-62); for touch, skin space-time pattern similarities with hearing cochlear stimulation (VonBekesy-59).

*Deformation, strain:* Stretch receptor structure and properties compared in seven insect orders (Osborne-62); for isolates from frog muscle, see (Katz-50).

*Other:* Water flow reception, lobster hair peg organs (Laverack-62).

**Radiant Energy Receptors:**

*Ultraviolet:* honeybee ocellus receptors (Goldsmith-58A), their spectral sensitivity (Goldsmith-58B), and electrical output (Goldsmith-60), cockroach ocelli (Goldsmith-58A).

*Visible light:* From huge volumes of literature, a few illustrations: species comparisons of simple single unit receptors (Wolken-59, 60), other single unit studies (Herman-63). For specific types: squid (Hagiwara-62); crayfish and lobster isolates (Kennedy-61); planaria receptors and electrical responses (Behreus-62); mollusc "neural tissue" photosensitivity (Kennedy-60).
Infrared: chiefly described for viper (Snake) facial pit organ (Block-50); as in rattlesnake (Bullock 52, 56, 57) citing threshold IR energy fluxes at 3 X 10^{-4} cal. / cm.^{2}/ sec. For most recent work, see (Beichmar-62).

Thermal (Contact Temperature) Receptors:
See analytic studies and reviews of (Hensel-60, 61), major biblio. of (Shambaugh-60).

Electrical Energy Receptors: Not listed with the classical special senses, electroreception was examined early in marine forms, in behavior of catfish to metallic rods in water (Parker-17), and other response studies (Regnait-31). More recently, studies of special electrosensing organs, by (Lissman-50, 51) on Gymnarchus, relations of sensor to low level coded electrical signal emitting organs (Lissman-58A) and to object location (Lissman-58B), to interactions with other animals (Lissman-61). Electroreceptor thresholds stated by (Machin-60) as 30 nanovolts/cm. and 3 nanoamperes current differences, for received electrical pulses of 1 millisecond duration and repetition rates to 300/sec. For more recent reviews, see (Bullock-62) (Lissman-63), for direct recording of electrical output signals from this electroreceptor (amplifier, as it were), see (Hagiwara-62A). Distinguish this communications and obstacle location transmitter-receptor system from high power electric organ action systems—see (Fessard), and many papers of Nachmanson, Grundfest on electric eel in the physiological literature for 20 years. One might expect that structural and functional analogues and potentialities, for electroreception by land forms can be unearthed in the biological literature, but cursory review has turned up only these behavioral responses to electric fields: snail movement patterns changed (Webb-60); planaria responses (Brown-62); activity pattern and oviposition rate changes in flies and other insects (Maw-61); various plant responses (Andres-60). Also studied has been human sensitivity to electrical signals applied to body surfaces in coded space, time and spectral patterns, for communication (discussed elsewhere here). If significant alterations by presence of movements of man were shown to occur in natural electric field patterns of earth and air (described elsewhere here), then pursuit of terrestrial bioelectrosensing, use of marine electrosensing isolates in experiment, would be worth doing.

Magnetic Field Sensitivities:
Mentioned for completeness, a biosensitivity to natural fields, and applied artificial fields, has been claimed based on behavioral observation in lower forms (snails, planaria, protozoa) in a series of studies over many years (Brown-59, 60A, 60B, 62A, B) (Barnwell-61). No discrete sensors have been shown to exist. Again, creation of contrast in environment by concealed human alteration of earth or induced magnetic fields could spur review of known biomagnetic field sensitivities, for comparison with physical methods. For other magnetic field sensitivities, for threshold alteration in frog nerve (Liberman-59); developmental anomalies induced in fruit fly (Mulay-62); for other methods of detecting possible effects, see (Foreman-61), for plant magnetotropisms, (Krylov-60). For other biological effects, see (L. Davis-62B), biomagnetic reviews (Alexander-61, 62).
III Chemical Products Sensing by Chemical and Physical Means

a: General Comments

We seek to observe the individual and collective products of man (see Human Attributes) after passage through environment (see Environmental Modification of Signals) by continuous measurement methods with adequate sensitivity, and specificity, if they are to be useful for detection.

Any system must include collecting means for obtaining within a reasonable time a representative sample of air (or water or soil) which might contain human products. Much effort has gone into the consideration of the micrometeorology, sampling statistics, mechanisms by those in the fields of air pollution and public health, nuclear energy, BW and CW (whose techniques are cited elsewhere in this report). (e.g. For methods of airborne material sampling, see U.S. Army Biological Labs-53); Such collection may be done with devices on the ground or in the air (for aerial sampling by helicopter see Gartrell-55, 56A, 56B).

From the large volume of air which generally has to be displaced must be totally extracted its contents of chemical product in vapor, aerosol, particle form, which may then be concentrated into a suitably small volume of liquid or gas for further separation and analysis. Extraction means, may include filtering, impingement, electrostatic precipitation, adhesion, sonic aggregation, sedimentation, thermal precipitation, condensation, etc.

Systems analyses to establish the possibility then feasibility of one or more chemical detection approaches (considering all variables of source, background, and detection) may be patterned after the methods used by analysts such as the Chemical Operations Research Group at Army Edgewood Arsenal, Md; or with the use of a theoretical model common for both physical and chemical human attributes sensing, along lines suggested under "Physical Signal Sensing", and also carried out by many groups in the physical surveillance field.

The emphasis below will be on physical techniques for chemical analysis, which show the greatest potential for fulfilling these conditions.

Separation Techniques: Whether chemical physical or biological techniques are used for the final analysis of the human product sample, separation of chemical components will probably be required. While the reader should seek data on the various chemical unit operations for separation including ion exchange, dialysis (and other membrane processes), distillation, filtration, etc. illustrative sources are provided below on the techniques of chromatography emerging as important for separation of multicomponent mixtures of macro and micro concentrations of biochemistry, and adaptable for human product separation. Some analysts may go no further in quest for a human products analyzer than a gas or gas-liquid or paper chromatographic system with the various common detector and readout adjuncts available; others would first
consider chromatography as a supporting technique, to be used with the best of other methods described in this report.

Gas chromatography sources include (Pecock-59), (Keulemans-59), (Johns-60), (Janek-60), (Giddings-62), (Symansky-62), (Purnell-62), (Varadi-63). For urine volatiles, see (Bonnichsen-62), urine aromatic acids (Williams-61), biological amines (Fales-62), for volatile toxics in blood (Curry-62). For special techniques, for dissolved gases in sea water (Swinnerton-61, 62), microanalysis of dihydroxy aromatic acids (Williams-63), micro-system with capillary column and flame ion detector (Halasz-61) and sample pyrolysis as "front end" for gas chromatography (Hayden-63).

For other gas-liquid chromatography, for hydroxy-fatty acid micro-determination, see (Kishimoto-63); fecal neutral sterols (Wells-63) high-speed techniques (Purnell-60) and use with IR spectrometer for fraction analysis (Anderson-61).

For paper chromatography, see review of (Block-58) and for automatic readout devices, see (Parke-52), for other sources, see general reference (R. Scott), amino acid autorecording (Spackman-58) organic acid microgram determination in small samples (Reddell-63).

b. Chemical Procedures

With limited time available, the review of possibilities for field identification and measurement of human chemical products did not consider at length "wet" chemical analysis. In looking further, the reader should examine the unique features of organic chemical micro-analysis techniques related to human chemical products (Edstrom-58), (Morrison-61), (Goldzieher-62), (Henry-63) (Bawden-63) some of which are not yet convertible to physical technique. Also see data on the emerging automatic analysis systems (cited elsewhere in this paper, also see the literature on autoanalyzer of the Technicon Co., papers of Dr. Raymond Jannard of Prudential Life Insurance Co).

c. Physical Methods

The methods surveyed here have the potential of high speed, sensitivity, substance specificity, wide concentration range, multi-substance handling, adaptation to reliable automatic unattended calibration and analysis. Each data source cited deals with capability for analysis of one or more specific chemical substances known to be excreted by man. Methods vary in degree of separation and purification required for substances in mixtures; as discussed in the papers listed under each method. Chromatography as a separation and preparation technique is the only one discussed herein, but the reader should consult papers of other separation unit operations (e.g. ion exchange, dialysis, filtration, adsorption, distillation). One practical solution to multi-component substance analysis is the composite analyzer, embodying several physical techniques each best in a different class of substances.
This is illustrated by submarine atmosphere and contaminant analysis (Nestler-58), (Piatt-60B) and various people at Naval Research Lab.

1. Radiation Spectroscopy

This offers presently most versatility, and libraries of data on substances properties are available. For organics see (Lang's "Absorption Spectra in UV and Visible Region" Acad. Press. NY 61), electronic spectral data (Ungrade), also see spectroscopy handbook (Clark-60B0, biological materials analysis (Mitteldorf-51) (Penner-59); reflectance spectrometry of opaque materials (Shibuti); and trace analysis by ultramicrospectro - photometry (Craig-53).
Infrared Absorption Spectroscopy: Illustrations are given of available data on substances found in human products. For amino acids, for cystine, asparagine, glutamine to 5 mg. sensitivities, see (Davies-53), also for cystine (Wright-37), and others (Scheidt-52). For purines and pyrimidines, for cytosine to 60 mg. sensitivities, see (Stimson-52), uracil and thymine at low levels (Locker-49). For carbohydrates, see Methods of Biochemical Analysis, Vol. 3. For steroids and other derived lipids, see (Blout-50, 53), (Freeman-53). For high sensitivity to carboxylic acids, see (Mitchell-56) (Pobiner-63).

For measurements of extremely small amounts, for 30 X 10^-12 gms. of hemoglobin, see (Clark-60A), and for microspectrophotometry through reflecting microscope, see (Barer-59); for review on trace measurement, see (Stewart-59). For other specialized techniques, for compact IR spectrophotometer designed for automatic composition analysis of lunar and planet soils, see (Lyon-63), for IR photometry of CO2 obtained by pyrolysis of unknown organic compounds, see (VanHall-63).

For IR spectra data collections on substances of interest here, see excellent work of (Sadtler), others of (U. S. Nat. Bur. of Standards), biblio. of IR spectra (Clark-57), gas data (Pierson-56) lipoprotein atlas (Freeman-53). For other discussion on biological materials, see (Andrasina-61); and on complex molecules (Bellamy-58).

Ultraviolet Absorption Spectroscopy: For specific classes of substances of interest such as nitrogen compounds, for amino acids, indoles, uric acids, purines and pyrimidines, see the massive spectral graphs of (Sadtler), and data of (Stimson-52). Also for purines, pyrimidines, and ribonucleic acids, see (Cheng-63). For various other organics, acetone, hippuric acid, also see (Sadtler), (Spector-56). For vitamins and such steroid hormones as estrone, androsterone, see (Loofbourow-43).

Currently, sensitivities in commercial spectrometers are claimed to 10^-8 gm. for organics. For microspectrophotometry allowing very low level measurements, for pioneer work, especially on nitrogenous biochemicals (as intracellular constituents in situ) see writings over 20 years of Caspersson at Karolinska Institute in Stockholm, and more recent adaptations, the rapid scanning "cytoanalyzer" UV microspectrophotometer also good for trace substances, made for U. S. Government by Airborne Instruments Laboratory.

Colorimetry: Visible absorption measurements in selected fixed spectral bands are made on compounds of interest to which substances must be added to produce or evoke color. Simple instruments and technique for urine, feces, etc. and extensive tables on procedures and sensitivities for specific substances are prepared by commercial instrument vendors. For automatic colorimetric analysis, see (Skeggs-57); literature on the autoanalyzer by the Technicon Co., and papers of Raymond Jonnard (Prudential Life Insurance Co. in New Jersey). For other procedures data, see (Halvorson-50), (Kruse-53); (Meites-63).
For illustrative data on specific, relevant substances, data for such amino acids as glycine to 0.4 parts per million, isoleucine 3 p.p.m., and a good general discussion, see (Meites-63). See Meites also for such sugars as xylose to 30 p.p. billion, fructose to 5 p.p.m.; also for high sensitivities for arginine (Salake-58), adenine (Davis-63); lactic acid (Tfao-52), ammonia (Kruse-53).

**Emission Spectroscopy:**

**Flame Photometry:** Measurements may be made with very high sensitivity, for specific elements from biological products, to parts per billion for some elements (Robinson-61) (Gibson-63). To the frequently measured substances sodium, potassium, also calcium and magnesium handled with simple instruments, are added others observable including Aluminum, Tin, in very low concentrations. For useful data, see Methods of Biochemical Analysis, Vol. 3.

**Electrical Discharge:** Long used for metallurgical study, technique has special utility for biological measurement. In this, it has very high ultimate sensitivity; nanograms per liter for Aluminum, Tin, Silver, Copper, Manganese, Lead (Cholak-38), and better than part per billion sensitivity for other substances. (Author unknown, for "5 P. P. B. Sensitivity, Anal. Chem. 32: 51A, 1960), also (Methods of Biochemical Analysis, Vol. 3).

Measurements of trace minerals in urine by this technique (Lead, Manganese, Copper, Aluminum, etc.) on comparative ethnic basis (French, Mexicans, Americans, certain Mexican Indians) show significant concentration profile differences directly associated with the soil mineral distribution in the area in which the individual has spent most of his life (Kehoe-40). This could be an important ethnic separation technique ("Man ist was er ist!"). While chief measurements are on mineral elements, for organic vapor emission data, see (McGrath-61B).

**Fluorescence Spectroscopy:** Excitation of substances of interest by UV yields reemitted radiation for analysis of longer wave length. Substances may fluoresce directly or require chemical treatment to produce this.

Illustrating specific fluorescences of interest and extreme sensitivities, uric acid at 0.7 p.p.m. (Duggan-57), guanine at 0.1 p.p.m. (Long-61), aromatic aldehydes and acetals (Crowell-63), arginine (Conn-59). For more data on specific compounds, see (Long - Biochemist's Handbook-61), for method, see (Udenfriend-62), (Meites-63). Claims of ultimate sensitivities to 10⁻¹³ gm. have been made.

**X-ray Spectroscopy:** Ammonia and various nitrogen-containing biochemicals can be determined in submicrogram quantities (Mathies-62) who has extensively surveyed use of this technique in biology.

**Raman Spectroscopy:** Certain samples excited with bright narrow-band visible light re-emit weak bands on slightly different wavelengths. Effect is based on special vibration-rotation properties similar to those involved in IR molecular absorption, except that one can use visible spectral observation. Previous
limited use (because its source brightness, spectral purification, detector sensitivities were not good enough), now will change with availability of very bright narrow band laser sources, ultrasensitive and synchronous detectors, etc. (see July, 1963 Scientific American for illustration of very new laser Raman spectroscopy).

For measurements on specific substances of interest on human detection, for amino acids, cystine, alanine, histidine at low levels, see (Edsall-50); for others (Nicholson-60), (Ewing-60). For related new instruments and methods, see (Mangini and others in "Advances in Molecular Spectroscopy").

Mass Spectroscopy: This technique of analysis and identification of elements and compounds by their mass offers great sensitivity and selectivity. For some, early stationery magnetic instruments can be replaced with miniaturized RF-electric field mass analyzers good enough for satellite work. Early use for element analysis, is now extended into observation of certain organic compounds, but limited to study of structure and bonding in these compounds, since each substance put in for analysis generates a very complex "fingerprint spectrum" empirically identified with the substance, with the specific instrument and its conditions of use. A mixture of organic unknowns is almost impossible to resolve and identify at the present time, but if pre-separation and purification as by gas chromatography is applied, phenomenal sensitivities are possible.

For specific substances of interest studied: for element lines catalog (Owens-62); a variety of organics (McLafferty-63); steroids (Fitches-63). For food volatiles directly analyzed (Bazinet-60) or measured after gas chromatographic separation, see (Merritt-58, 59, 61).

For other uses: for complex ions, see (Heath-62); dissolved sea substances (Benson-61); rapid reaction studies (Goldfinger-63). Good general recent references include (Ellicott-63), (Udenfriend-62), (Masica-60), (Ewald-53).

Magnetic Resonance Spectroscopy:

Electron Spin Resonance (ESR): Some interesting possibilities for detection assert themselves here. Free radicals and reaction intermediates, paramagnetic substances such as oxygen, other substances with unpaired orbital electron spin properties can be observed to phenomenally low levels, e.g. to $10^{13}$ free radicals (Commoner-58), (Crouthamel-61A) with hope of extension to $10^{9}$ free radicals.

Amino acids, polypeptides and proteins, exhibit free radical content measurable by this technique, after their irradiation with ultraviolet (Gill-62). In other experiments of (Norins-62) a dermatologist, human skin, irradiated with 250 MU UV, shows free radical production measured by ESR apparatus (with sample in a magnetic field, and illuminated with 9500 mc. electromagnetic radiation). The work was limited to isolated material, and extended observations made by low temperature thermostating. Both Gill and Norins' work should be extended to experiments in UV irradiation of intact skin on a man (arm, hand, etc.), at normal skin temperatures, then observing free radical production in suitably designed ESR apparatus.

62
Further, it would be reasonable to carry out a short theoretical study, of remote ESR observations of free radical production at skin surface, of man (at various assumed and arbitrary free radical production levels) assessing levels of excitation UV needed, and analytic illumination prospects (required magnetic and RF fields).

Other activated intermediates are observed by ESR in enzyme controlled reactions (Chance-59). Observations of such intermediates in nerve (Blois-61) have encouraged preliminary work of (Kelly-63) (at Brooklyn Polytech. Inst. for Air Force office of Scientific Research) to attempt to observe remotely by ESR (without contact electrodes on tissue) neural activity, including signal traffic. His theoretical construct revolves around assumptions derived from work of Nachmansohn, etc. an acetylcholine free-to-bound form changes associated with nerve fiber membrane alterations with signal traffic. At the time of his last available report, apparatus had not yet been completed for remote observation or experimental validations been obtained, even on isolated peripheral nerve segments. If observations of this type show significant signals due to neural activity, these should be extended to near proximity whole animal and human measurements, and tied to the theoretical analysis of far remote ESR viewing suggested above for skin.

**Nuclear Magnetic Resonance:** This technique revolves around nuclear (rather than orbital electron) interactions with applied magnetic and electromagnetic radiation fields.

For direct observation and data on specific substances of interest; for quantitative organic measurement, see (Williams-58), saturated and unsaturated fatty acids and protons in any materials (Jardetsky-62), phosphorus (Callis-50). For specific hydrocarbon (petroleum fraction) analyses, see (Williams-59B). For general references, see (Muller-56), on biological applications, see (Jardetsky-62).
Electrochemical Techniques.

For continuous measurement of certain substances produced by humans, various electrode probe sensors can offer high sensitivity, specificity, and good response time. For Na and K (glass) electrodes, see (Friedman-59, 61); and descriptions of good commercial instruments (illustrated by Beckman Co. data), also available from them for O₂, CO₂ and pH electrodes. For Ca electrode, see (Ishizawa-62). For other polarographic electrodes usable for various gases, see (Dehn-62). For discussions on polarographic measurement at very low concentrations of a wide variety of substances in solution, see recent editions of definitive review books by Heyrovsky, Lingane.

Anodic stripping techniques offer nanogram sensitivities for certain substances (Birks-60), for use with the trace components of Dead Sea brine, as example, see (Ariel-63).

Other electrodeposition techniques have extreme sensitivity and specificity for certain elements of interest (Weissenberger-60), down to micromicrograms in some measurements (Stolyarov-54).

Other Techniques.

Trace measurements of multiple components in biological material by radioactivity activation analysis is described by (Tobias-62), for heavier elements (Harrison-55) and in various places by (Udenfriend). Sensitivities of better than 10⁻¹⁵ gm. are attainable with adequate scintillation detectors. See (Crouthamel-61B) and other references in sections on Radioactivity in this report.

For extremely high sensitivity measurements, below 10⁻¹² gm. which may be necessary for some human emitted components of interest, while no documentation is provided here, the reader should look for recent papers on nucleation techniques (eg. using halide photoemulsions, Nieset films studied by Army Chemical Corps, evaporated thin film semiconductor detectors); also the phenomenon of "fluorescence quenching".
IV. Physical Signal Sensing.

a. General Comments.
Discussion in the next few pages of specific sensing techniques and sources of information, should be related to the information in sections elsewhere on physical signal properties of man, and their environmental modification. A brief discussion follows those techniques, on systems considerations in sensing. Adequate source material is believed to be available to the reader here, to carry out system analyses of several alternate systems embodying different physical phenomena, and to construct a common model describing their behavior.

b. Radiation Sensing.
Radio and Microwave Sensing.
Heat production by man results in radiant energy emission chiefly in infrared, but also in a "tail" at low levels well into the microwave. Sensitive radiometers can observe this emission relative to surround. (See Hooper). "Calculation of target temperatures in Microwave Radiometry" Naval Ord. Lab, Corona, Cal., and microwave radiometer surveys for terrain mapping (Porter-60). For radiometers see (Copeland-61), X-band phototube (Douglas Air-63) millimeter masers (Walling-62). Other microwave (thermal radiation) measurements (Dicke-46), and general sensing biblio. (Harvest-56). For auxiliary techniques, for millimeter spectroscopy on various substances (Gallagher-62), microwave spectroscopy (Strandberg), microwave absorption measurements (Salaty-59), and "active" observations are to be considered if target is to be illuminated, see (e. g. work on coherent generation of radiation in the millimeter and submillimeter range (Hakki-61) and 100 KW 3 mm. radiation sources (Sedin-62).

Infrared Sensing.
For detector data, see (Gelinas-59), passive techniques (Barnes Eng. -59), survey of (Kennedy-60) (Levinstein-62), (Kruse-63), (Wrobel-63), for uncooled 10U detectors (Drennan-63). For recent unclassified reviews of IR-visible image converters, see (Woodhead-62) also one able to view man at 150 yards on moonless night with 45 lines/mm. resolution (Franks-62).

For supporting information on IR spectrometers, on accuracy (Stewart-60), 2-16U calibration substances (Plyler-60), or air borne units, see (Brumfield-60); for far IR units (Bohn-53); for filter separation up to 16U see (Billian-63). Other data, on mineral identification and measurement, see (Tuddenheim-60); IR instruments measurement, and environment problems on Atlantic missile range (Marquis-61), pulsed modulation IR systems (Wilson-60), extremely high power coherent sources, if human subjects will require illumination (Baird-62).

For basic IR references, see (Hackforth-60), (Kruse-62), review of analytic techniques (Bentley-57), military applications (Ballard-56), see also infrared Symposia (IRIS) classified reports in ASTIA.
Visible Light Sensing.

Much data are available in the current commercial literature on a wide range of photosensors (emissive, conductive, em.f. producing), image forming pickup tubes, spectrophotometers adaptable for field measurements of properties covered in this report.

If active illumination techniques are to be considered, for reflectance analysis, movement detection, behavior disturbance induction, range finding, the following open literature sources on lasers may be of value: laser range finders (Karr-63), detection of movement by Doppler means (Emerling-61), several physical property reviews (Birnbaum-62) (Blattner-63) and (Siron-62) who provides a thorough systems analysis for sources, transmission medium, receiver target, etc.

Ultraviolet Sensing.

For detectors, 50-1500A review, see (Weissler-62), for good survey of "solar blind" detectors sensitive under 3000A, see Dunkelman's papers in 1963 NASA Report Series.

For supporting concepts, on UV-transmitting fluids for ultra-rapid shutters (Kerr electro-optic) see (Harris-62); interference filters (Klementeyev-60); 2000-3000A solar spectrum simulation (Norman-63), new UV laser (continuous wave, with piezo electric interference modulator) (Sylvania) perhaps usable in stimulation of free radical production in man (discussed elsewhere in this report).

For other data: military considerations on detector reflectance, scattering, calibration, see (LeBlanc-62); other middle UV applications (Green-62).

X-ray Sensing.

If unique human contrast properties are to be observed, at useful ranges with respect to air transmission, source data here may be helpful in analysis and detector selection: for image forming devices, x-ray camera tube (Rutherford-62), x-ray to visible light converter (Tunoe-59). See also commercial descriptions of the range of fluoroscopic image intensifiers available.

Energy sensitive detectors, will be needed to separate sharp signals deriving from human bone Ca-P or other human characteristic return from noise background. See those used by (Porges-58) and (Gravitt-62) at ERDL.

Other Radiation Sensing Information.

For specific sensing studies for terrestrial (Drummond-61) radiometry for unenclosed object temperature (Emslie-60); photodetection parameters study (Merriam-62); spectroradiometry (Marchgraders-59); remote sensing of environment, symposium (Institute Sci. Tech., U. Mich.). See, of course, also the annual lists of publications from Project Michigan on radiation surveillance detectors.

For good systems surveys over broad spectral ranges, of spectral suitability for communications, surveillance, (and discussion of all component measurements) for 30-10,000A see (Bayley-62) for UV to submillimeter, see (Chapman-61).

For other related data: reflectance spectrometry of opaque biological materials for chemical (composition) analysis (Shibati); from electromagnetic pulse sources and detection biblio. (Blank-63), electromagnetic hazards
(Triggering) of ordnance (Gallios-62), electro-optic and magneto-optic phenomena (Rung-59).

c. Sound and Vibration.
Airborne Sound.
In considering active illumination and sensing analysis, see "Human Attributes and Contrasts, Physical" for reflectance and other factors.

For sensing in active or passive systems (of human activity, etc.) in ultrasonic regions, see (Kamm-62), ultrasonic physics (Richardson-62), also L. Bergmann "Ultrasonics" in English translation. For measurements in various regions, see (Beranek), and related physical acoustics data (LuKasik-55), (Bolt-52) and Olsen at R. C. A. on "Acoustical Engineering".

For observation of behavioral changes induced by sound (not observable by sonic techniques), see "Stress and Induction of Behavioral Responses."

Seismic:
For passive observation, see seismic measurement data of (Bartunek-55), (U. S. A. F. Technical Applications Center and VELA-61), for seismic data processing (Phinney-62) and Soviet seismometry review (U. S. Lib. Congr. -61). In active observation, excitation of earth may be done by the explosive techniques of geophysical exploration, or, specific surface patterns induced by continuous excitation of vibration generator (aircraft "shaker" dynamic structural analyzer) and return anomalies due to human presence sought.

d. Other Physical Sensing.
Radioactivity:
See discussion under Human Physical attributes, Radioactivity, for active illumination sensing and passive sensing techniques, including those of special capability used for aircraft landing glide path aids.

For other references in this field copiously represented in the military measurement literature for sensors, see new nuclear radiation guide (U. S. A. F. Aerospace Med. Lab. -62) dosimetry field review (Taimuty-62), methods for assayng human radioactivity (Onstead-60) neutron radiography (Schultz-61) and neutron spectrometer (Friedland-62); reactor effluent analysis (Melgard-62).

Electric and Magnetic Field Sensing.
See discussion under Environmental Modifications, "Physical Signals" concerning measurement techniques.

"Non-Destructive Testing"
A variety of laboratory methods involve non-contact or remote observation and inferences about specific physical properties of materials (e. g. optical, mechanical, thermal electrical). These are chiefly extensions of techniques discussed elsewhere in this report, but can tell much about surface, internal structure, composition, loading, etc. Detailed analysis of some of these successful methods could suggest other physical and chemical attributes and properties of humans to be viewed remotely and perhaps other remote information-conveying methods. For general references, see handbook (McMaster-59), biblio (Briggs-62) surface motion measurement by proximal
instrumentation (Pierce-62B). For optical methods, see (Heavens-61) and photography for surface motion (Hefferman-62). For electrostatic observation of mechanical changes (movement and acceleration, pressure), see (Brookes-Smith-39). For radiography, see (Schultz). Microwave reflectance can yield quantitative evaluation of dielectric constant and conductivity of surfaces (Hochschild-63).

By sonic methods, some in ultrasonic ranges from 0.2-100 mc/s., spectroscopic techniques and return pulse contour analysis (Gericke-60, 62) and co-workers at Watertown Arsenal look for internal discontinuities and flaws in objects "illuminated;" residual stress is measured by sonic scattering (Rollins-62), and surface hardness, ultimate strength other properties may be examined. See (Morgan-63) for ultrasonic testing techniques for diverse materials. For precise analysis many methods require that transmitter-receiver be coupled to object through liquid medium, but limited analytic measurements for materials properties can be made through an air (atmospheric) link.

e. Physical Systems Considerations.

No attempt has been made to construct a human detection analytic model in this preliminary study. Further analysis will require identification and inventory of operating parameters for each of the major components of the system. A few are illustrated below:

Human target variables to be further defined can include geometric projected area, active emission and/or scattering (and reflection) coefficients and cross sections, emissivities; their spectral, geometric (e.g. angular), time dependence; polarization, energy transformation functions (fluorescence, radioactivation, etc.); for skin and also for selected clothing, metallic and conducting objects, other companion artefacts.

Environment parameters include: background-source variables (emissions, reflections of animals, plants, terrain, atmosphere) with the same factors and dependencies for human target. Other environment signal transmission parameters describe air transfer function and spectral dependence (highlighting bandpass regions), and ground transmission for seismic, electrical, magnetic signals; variations with weather (RH, temperature), time. Transmission factors must be considered for 2 way path if active illumination of subject is used; return signal transmission may be different (due to fluorescence, radioactivation, non-linearities of air for high intensity sound, etc.).

For receiver variables, consider aggregate "black box" of sensor, amplifier, signal conditioner (calibrator, wave shape, correlator, etc.) indicator device. Variables include sensitivity, amplitude range, time-based bandwidth, radiation spectral band width, spectral resolution and spectral scan pattern, optical acceptance angle, image resolution, environment scan and track variables. If observer uses active illuminant source, variables can include: total intensity, spectral distribution, degree of coherence, modulation wave form, beam angular dispersion, ratio of target to background illumination.
System variables to be derived include contrast ratios (selected human signal variables versus corresponding environment background level); energy product-integral (integrated for selected bandpass regions) taking into account (source spectral emission, target and background spectral emission and reflection, air, etc. spectral transmission receiver spectral sensitivity). Of interest are total sensitivity, working range, human contrast ratios for positive identification, angular resolution.

These are all but a preliminary and primitive point of departure for construction of a theoretical model for predicting the comparable effectiveness of various physical phenomena in human detection, and could be made broad enough to permit study of chemical variables and chemical detection systems. Military and civilian surveillance system analysts have a great number of satisfactory systems models for such analyses; they await only good information on new aspects of human emissions and contrasts.
F. OTHER RELATED INFORMATION

1. Stress and induction of Behavioral Response

In concealed enemy "illumination" by physical, chemical, biological or psychological means, may induce additional behavioral and neural responses useful for detection. Such responses may be obligatory, unavoidable, physiological, or related to the induction in enemy mind of real or fancied threat to mission and life.

Return signals from such behavioral and neural response may take the form of various direct emissions (ex: EEG changes), body movement and activity responses, or indirectly contribute by placing the enemy into a more exposed position for detection, or by alteration of his course of action, or temporary or permanent neutralization of rational behavior, remove him as a threat.

In brief form we consider specific stresses and performance changes, light, sound, movement restriction, sleep deprivation, CW alteration, other physical and chemical stimuli having psychological impact. Many initial physiological degradations discussed are but way-stops towards reduced psychological performance capability.

Light Stress... Flickering light was investigated by many as a means for degradation induction; for broad coverage of human responses, see the ERDL Flicker Symposium(Bach-57). For detail on various central nervous effects, see (Walter -49) more recently (Brazier-2 refs) including EEG changes and generation of illusion and hallucination. For other mechanisms, topographic mapping of regional brain responses see (Ulett-58). Repetitive light, also called "photic" stimulation, is used diagnostically at low light pulse repetition rates (under 15/sec) to evoke seizure activity or EEG changes in latent epileptics or those with CNS lesions. EEG response events in normals have a certain synchrony with the repetitive light stimulus, and if human neural activity could become observable by non-contact methods, remotely (discussed elsewhere in this report), a photo-stimulation-synchronous detection system might be considered for man.

In normal people at low repetition rate of pulsed light stimulation sensation is of separate light pulses up to a point of continuous light sensation (CFF at critical flicker fusion frequency). For extensive data on this, see bibliography of (Landis-53), studies of (Bartley- 37, 39, 51) prolonged stimulation effects (Alexander-59); alteration of CFF with simultaneous patterned sound stimulation (Kravkov-35A, 35B) (Knox-45A, B) (Maier-61) (Ogilvie-56). If paired flickering sources operating at different frequencies are used simultaneously, an additional sensation of visual beats (at difference frequency) is produced. (Attneave-50). These various effects described by authors above can be produced even when eyelids are closed, if source is bright enough, and for certain desired effects (behavioral alteration, neural signal return) repetitive pulsed laser beams may be considered for this purpose, with exploration yet needed of effects of stimulus pattern and waveform, other than simple repeated pulses.
Personal protectors, goggles, mask, countering this would have to be applied in advance, would obscure the use of vision for other tasks at the time, and would be an extra equipment burden not likely to be carried by enemy forces, except under total threat conditions.

Direct electrical stimulation of the head and of the eye can induce visual sensation (Bogoslowsky-37, 47A, 47B) (Bowman-35-51). No documentation has been seen of such induction by remote electromagnetic radiative or electric field action.

Another light stress involves use of a bright unexpected flash source, producing temporary incapacitation, perhaps during important viewing periods, or persisting to destroy night vision or permanent blindness.

Related Visual Capabilities Information:

Degradation must be considered in relation to standards of performance, for a given operational task. The following will provide useful sources on operational needs for vision in reconnaissance, search and detection recognition. For detectability in visual search, target factors, see (Kulp-59); and contrast as a function of illuminant spectrum, see (Nagel-56); for dark adaptation responses bibliography (Crook-53); for continuous search problems, (Delse-53) (Ericksen-54). For form discrimination (Fox-57) and its determinants (Bitterman-53) for other pattern recognition concepts see (Weisz-58), and in relation to target geometry (Steedman-60). For other visual capability in the action environment, see (Blackwell-57A, 57B), and in special problems of military aviation (Wulfeck-58). Visual presentation of information (Baker-54) and visual interpretation of photographs and fixed electronic images, see (Waldron-61) (Gwier-56) (Shenkle-56).

Sound and Noise Stress

Noise is observed to have many effects on human behavior. (Corso-50-52), (Anthony-57)(Azrin-58), for animals (Ades-53)(Ackerman-53). (Hale-53); for biological changes. Sensory changes include altered visual performance (Broadbent-54) (Loeb-54); including altered visual signal detection (Watkins-63). Noise also can produce body movement changes (Krauskopf-55), and muscle tremor (Loeb-54).

Intermittent noise has special effects, somewhat similar to flickering light. At low interruption rates it is perceived as separate pulses (flutter), fusing into continuous sound sensation at higher rates (Allen-24) (Ogilvie-56) (Gebhard-59). Interrupted sound degrades a variety of mental capabilities (Ogilvie-56) (Gebhard-59), also inducing confusion, inattention (Mowbray-56). For other CNS effects see (Smith-50), and for EEG responses and changes, see (Mimura-62).

Speech communication (production and reception) can be systematically altered. For speech jamming, see bibliography (Moyer-55), (Christman-57B) (Licklider-57), and (Stewart-58). Stewart also discusses antijamming procedures.

Sound and noise sensation, and disturbances due to them, can be induced in man with RF energy directly beamed at the head. See (Frey-61A, 61B, 62),
using fairly low energies, a variety of frequencies and modulation patterns. (This might be classified as Radiation Stress, RF Reception, etc).

High intensity audio or ultrasonic airborne sound has distinctive effects on living material, close to the sound source, unfortunately not observable afar (more than a few feet) because of the limited properties of air to conduct this energy (non linearities at higher amplitudes).

High intensity vibration. Special effects on man, surveyed by (Edwards-50) (Coermann-60) (Goldman-52, 61).

Related Hearing Capability Information
For normal performance capability data, for noise detection, see (Green-60A) sound localization (Snow-54) (United Research-62); accuracy in gun fire localization (U. S. Army ORO-58); and localization capability with conflicting hearing and visual cues (Witkin-52). For hearing vs. vision, for communications see (Cheatham-50), (Day-50), (Henneman-54).

Other Stressors
For temperature effects, for low temperature, see (Carlson-54), (Rodahl-57A) human temperature limits, (Wing-63), (Fenning-54). Heat regulatory responses (Newburgh-59).

For sleep deprivation effects (100 hrs.), see (Edwards-41), psychological changes (Murray-56), other impaired performance (Williams-59). For work-rest schedule change effects (Ray-60), (Chiles-61). For altered daily patterns and performance effects (Brindley-54).

For restriction of movement and confinement, effects on exploratory behavior (Montgomery-53), perceptual function changes, see (Ormiston-61), and responses of captives (Biderman-61A, 61B). For sensory deprivation and behavior see (Wheaton-59), (Leiderman-61) and effect in visual processes (Heron-56) for sensory isolation and confinement biblio. see (Weybrew-60).

Many drug agents offer possibilities of incapacitating potential (see any good recent pharmacology compendium such as Goodman and Gilman). With these and newer psychopharmacological materials (see "Psychopharmacology" published by U. S. National Research Council) there are manifold possibilities for promoting detection by physiological alteration and CNS sharp edged "chemical dissection" for behavior distortion, not to be catalogued here. Documentation of specific potential agents, and supporting techniques and possible modes of use having tactical worth related to the detection problem are kinds of information best sought from such sources as the restricted accessions lists and card catalog of holdings of the Army Chemical Laboratory at Edgewood, Md., Army Biological Laboratory at Detrick Md., etc.

For other drugs affecting performance see one biblio. (Trumbull-58).

For thirst data see (Wolf-58).
Microwave Stressor Effects: Functional disablement and death without pathology is reported for Rhesus monkeys, by Dr. P. Bailey of NIH - National Institute for Neurological Diseases and Blindness; with similar results reported, using 300 mc. carrier, 500-1000 cycle sine modulation (see Bach, p. 82 U.S.A.F. 3rd Annual Triservice Conf. on Microwave Hazards). For sleep induction by pulsed RF see (Burhan-59). Visual system damage includes lens opacity and tissue degeneration, for 3 cm. data, see (Buchanan-61) (Susskind-51); at 10 cm. (Carpenter 59, 62). For other CNS degradations see conditioned response experiments of (Jaski-61). For induction of hearing sensation see (Frey-61A,B, 62). For skin damage see (Novaro-50). For other hazards see reviews (Turner-62) (Schwan-56A, 59) (Hines-52) (Jaski-61); for pathological and physiological changes (Herrick); for effects on isolated tissues (Schwan-57B) and on specific organs (Myrtenko-62A) other local effects (Myrtenko-62B).

Responses to Applied Electric Fields: Electric signals can induce visual sensation (with electrodes applied to head). Fairly low power is involved see (Schwarz-38) for quantitative data re stimulus quality, adaptation (Schwarz-40A,40B,47) (Motokawa-49,50A), certain resonance effects (Motokawa-50B), selective color stimulation (Motokawa-52). For the specific eye and CNS structure responsible for electrosensitivity, see (Brindley-55) and for sensation induced in dioptically blind (retina intact but cornea, lens opaque) see (Barnard-47).

Electrostimulation techniques for hearing are being investigated by (Intelectron-63). Electrical sensitivities of skin presently are only exploited in communications studies with all variables of voltage, current, waveforms and spatial patterns available from this. See (Anderson-51), (Hawkes-59A,59B), (Fouke-62). No direct attempts have been made to use remote electrical methods for inducing some of the bizarre sensations or hallucinatory responses relative to the common special senses described above. Direct or remote electrostimulation as a stressor has the potential of inducing a variety of degradation responses. (See wide range of papers and monographs on Electro Shock in the psychiatric literature). But some of the effects set down are interesting enough to explore the parameters and mechanisms for remote induction of behavioral response by electrical means.

Other Comments on Psychological Stressors: A good starting point for review of disabling techniques can consider the inverse of those factors found to promote survival and stable behavior in disaster situations, as those below, modified from (Smith and Cox-57) studying reduction of human stress after irradiation, and (Torrance-53) on survival psychology: many specific physical or chemical stressors can be used to induce one or more of these actions: impose new situations, unfamiliar to enemy, and designed to make certain of his training worthless; keep him as ignorant of his true situation inducing his disorientation if possible; (see Withey-56 - reaction to uncertain threat). Induce fear, panic, anxiety, insecurity as to his future situation. For source references: on anxiety,
initiation, its communication and interpersonal management (Ruesch-49), anxiety induction and intellectual function (Beier-51); fear-arousing communications (Janis-53), anxiety and hysteria dynamics (Eysenck-57); deception detection (Ellson); seek to reduce his belief in his own effectiveness and his resolve and determination, induce personal conflict, reduce confidence in his leadership; seek to modify his action, either immobilizing him, or forcing hasty action.

Magnetic Field Stressor Actions: No definitive data on human degradations in exposure to strong magnetic fields was seen in the literature although preliminary explorations by (Beischer 62A, B) in such exposures have begun. For induced visual sensation see (Swinton-II) for quantitative analysis strength-duration data, typically at 900 gauss, 60 cycles (Barlow-47).

For other speculations on human responses to magnetic field stresses see (Hansen-48A), who postulates the autonomic nervous system as the mediator of such effects (Hansen-49), other vague physiological effects statements (Thompson-10) (Fleishman-22).

Other Behavioral Responses to Stress: Vigilance can be defined as attention to a task involving important infrequent events. (e.g. for anti-submarine warfare bibli. - see McGrath-61A). For vigilance reduction, see (Frazer-52) (Wade-61) and for general neglect of attention to changes in surroundings, see (Berlyne-51).

For fatigue sensation and performance impairment, behavioral and physiological changes, see biblio. (Bevan-57) for measurement (Motakawa-48) and induction, see (Bowan-52), for skilled performance degradation, see (Bartlett-41), and biblio. (U.S. Joint Service Steering Committee for Human Eng'g.), for other effects, see (Univ. of Md. Psychol. Dept-52).

Various odd behavioral responses, biblios. of military psychiatry (Roos-59, 63); ecology of psychiatry (Meerloo-59).

Other Changes in Response to Stress: For general reviews see (Grinker-45) (Lazarus-52) (Harris-56) symposia (Tyhurst-50) and others (Klier-60) (Renbourn-61), biblio. (USASTIA-Bib.-62) (U.S. Army Med. Service Grad. School-53) physiological and behavioral measures (Noterman-55), biblio. on development of stress-sensitive tests (Iller-53) decrement in aircraft stress (Finan-49)c basic performance capacity study (Spector-61), desert survival responses (Howard-53).

Heart rate in anxiety (Dean-58) and CV changes related to religious practice (King-57); conditioned heart rate response, control (Bersh-57).

Skin secretory changes under emotional stress have been classically studied (C. Darrow-34) also by (Conklin-51)(Johnson-59) by measurements of skin resistance and other electrical changes (e.g. GSR or galvanic skin response). Such changes will affect the pattern of released chemical substances, also in changes of surface conductivity, skin blood distribution etc. may be observable as electromagnetic radiation emission or reflection changes.
II Some Other Human Spotting or Remote Data Transmission Problems

Casualty Location:
Even when individuals are equipped with small beacon transmitters, and are deployed around the terrain in stationary semi-concealed positions, simulating casualties, it is difficult to find them: (See records of survival location experiments conducted by Stanford Research Institute at Army Combat Development Experiment Center in Calif., with average locating time 1/2 hour (U.S. -CDEC-61). Urgent desire of Army Surgeon General's Office to locate personnel (casualties) quickly because of hemorrhage etc. despite difficulties of security, enemy decoys, radio propagation, has promoted studies chiefly of manually and autotriggered active emitters (radios) carried by all, (eg. 265 mc., a few milliwatts, 500 yard range). While we cannot hope to put active emitters on enemy ("bell the cat"), broader surveys of various active and passive information links for casualty location have been undertaken; this information and the experimental procedures used in deploying concealed casualties under realistic tactical conditions, can be of value in conducting concealed personnel detection experiments or studying alternate locating techniques. See also (Jackson-62) and from Air Force Study on survivor locating devices, see (Matrix Corp-61).

Physiological Performance Telemetering:
To assess human biological and psychological changes at tasks in remote or enclosed environments (aircraft, satellite, underwater, land vehicle, chamber), varieties of transducers applied to the body measure biopotentials (EKG, EEG, ERG), blood pressure, respiration, temperature, newer variables; electrical signals produced modulated RF or inductive transmitters mounted on the person or wired within the environment, and remote decoding of signal is done in "real time." Only little encouragement is available for remote sensing of any of these variables, of characteristic patterns denoting human life without the transduction of each variable into a modulated RF signal. Exception would be skin temperature (and associated IR emission), perhaps other passive (reflectance and scattering) responses to electromagnetic radiation, particles cited elsewhere in this report. But the basic internal human signals, (e.g. of EKG, respiration, heat production) exist in roughly invariant pattern as long as life persists in the man and represent an interesting but presently elusive "handle" to get at for remote detection.

Animal Tracking:
Similar data on physiological conditions, and on movements are collected in recent animal studies; for radios on grizzly bears, see (Craighead) other wild animals (Lord), woodchucks (Merriam). There are similar studies on birds especially related to navigation, for fish homing (Hasler and Henderson), on monitoring of locomotor and electrophysiological activity, see (Dutky and Schechter of Dept. of Agriculture). In future human detection experiments, transmitters placed on some of the large members of the animal population in the selected area, will provide location correlates for other physical and chemical interferences with the human location principle under study.
III. BW-CW Detection Problem Similarities.

Aid in analysis and solution of the human detection problem can certainly be derived from the past and present efforts on BW and CW detection with which many points of correspondence exist. Air sampling, collection and concentrating its contents into a convenient volume for chemical, physical or biological analytic instrument, must take into account the same kinds of micrometeorological (e.g. temperature and movement gradients, turbulence) mechanical (devices) statistical (space and time sampling) and chemical problems, whether for remote observation of human chemical product, or trace amount of chemical toxic or biological pathogen. Additional similarities exist in distinguishing the agent (or human product) from background substances from animals, plants, industrial wastes, etc., and in the selection of specific and known compounds in the tissue or products of microorganisms unique to those organisms (e.g. amino sugars, D-amino acids, diamino pi melic acid, etc.) (see Wolochow-59).

For good speculative early surveys of a wide variety of techniques for BW detection, see (Bateman-51) and more definitive reviews of many possible physical and chemical principles for BW detection by a National Research Council Advisory Committee, see (Bolduan).

For a few examples of some common instrumental approaches, see particrime viable-particle stain and size distribution analyses (Nyman-62); protein analysis in air, at 10^{-9} g/l (Buban-62); determination of microorganism IR spectra (O'Connor-Dept. of Agriculture-55); determination in atmospheric paths of IR absorption by certain CW agents (LOPAIR technique); for a variety of early protein and bacterial methods (fluorescence, serologic, dyes, see (Armour Research Foundation-54); for more recent biochemical detection methods, using bacterial enzymes and fluorescent techniques. See (Mitz-62) and for exploration of chemical concentration profile procedures, see (Melpar-61). For general review of use of living materials as transducers for BW detection, see (Kornfield-62A, B, C, 63).

To get current information, consult the work in progress on new techniques by two major BW Detection System Study Contractors (Melpar-Falls Church, and Aerojet General, in California), in behalf of Ft. Detrick, Physical Defense Division; the corresponding CW Detection efforts monitored at the Army Chemical Laboratory and CBR Agency at Edgewood, the reports disseminated through DDC (formerly ASTIA) "Field of Interest Sections 3 and 3A", and the Technical Document Library resources at Army Chemical Lab and Army Biological Lab.

IV. Other Useful Information Sources.

In the course of our review, the following sources were examined, and may be useful to a reader going further in study of areas described in the report. These are not cited elsewhere in the report.
Biology: For distribution and abundance of animals, and ecology, see (Andrewartha-54), (Clarke-54), (Clements-39) (Kendeigh-61) (Aleec-49) (Odum-59), including a glossary (Carpenter-56) and animal geography (Hesse-51), (Darlington-57) (Hubbs-58) (U.S.A.F. Arctic Aeromedical Lab Publications-1962). For wild animal studies under controlled conditions see (Calhoun-56), for animal attractions and repulsions (Coleridge-20), animal orientation (Fraenkel-40); for ecology of parasites, see (Baer-51) and for host specificity (Becker-35). For insect physiology, see (Wigglesworth-53), on bumblebees (Free-59), yellow fever mosquito (Christopher-60), and other mosquitoes (Bates-49), spiders (Bristowe-58), ticks (Arthur-62), and insect control bibliography (Horrigan-51). For mammals, see field guide (Burt-47), also (Anthony-28) (Hamilton-59), mammal bioclimatology (Pruitt-56), and tropical and arctic mammal and bird heat (Scholander-50). For falcons studies as pets and hunting animals, see (Russell-40) (Momin-45) (Wood-55).

Chemical Analysis: For amino acid separation, see (Hamilton-59); for amino acid automatic analysis (Piez-60); and for amino acid handbook (Block-56). For ammonia determination, see (Connerty-57) (Henry-58) and for on detection and differentiation of glucose and amines, see (Williamson-63). For lipid biochemistry see (Devel-55), and for all the properties of water in early work, see (Dorsey-40). For general biochemical reference, see (Merck Index-60), normal clinical lab data (Mattice), big compendium on methods (Gradwohl), other standard methods (Welcher-63), industrial toxicological chemistry (Elkins-59), drug detoxication mechanisms (Williams-59A); for insect biochemistry, see (Gilmour-60).

Perfume Chemistry: related to identification by scent producing animals, chemical composition of scents, chemoreceptors and biosensing (discussed elsewhere). General references (Askinson-24) (Hoffman-48) (Pounder) (Jellinek-54) good work of (Givaudan-49); (Moncrieff-49); (Verrill-40), others on animal perfumes (Sagarin-44); (Lederer-46); musk odorant composition (Pogert-20) (Ruzieka-26), natural and synthetic musks (Dyson-31); mercaptans in cosmetics (McDonough-47); also on cosmetic materials (Keither-56) (Sagarin-57), handbooks (Greenberg-54) (Denavarre-57); and for flavors and essences (Gazan-36).

Physiology and Psychology: For some useful items consulted, see neurophysiology handbook (Magoun-60); cardiorespiratory functions, handbooks (Altman-58, 59); (Dittmer-58) (Gordon-60); gastro intestinal function (Alvarez). For environmental physiology (Glascick-60). For Physiological and Biological Data for Bioastronautics Handbook, see (U.S.A.F. School of Aerospace Medicine, Brooks A.F.B., Texas, and 19 year cumulative biblio of research reports issued by Naval School of Aviation (aerospace) Medicine (Daniel-61).


Selected Military Information Sources: For Limited War problems review by DoD task group, see (U.S. DoD. Director of Defense Research and Eng'g-61A). For limited war biblio (Halperin-61).


For other sources; jungle operations (F.M. 31-30); mountain operations (F.M. 31-72); psychological operations biblio (U.S. Army Spec. Opers. Res. Ofce.-60). Unconventional war concepts (Condit-56) and biblio (Miller-61). For counter-guerilla action by air, see (Osanka-62B), and for visual target acquisition from armored helicopter (Thomas-62). For military small group performance in isolation and stress, see (Sells-61), factors relating to successful and unsuccessful unit action (McKay-59), and for military leadership biblio. (Ruch-53).

For related Asian regional data, see Asian Guerilla movements (Hanrahan-53) and biblio. from (Army) operations Research Office (U.S. O.R.O.-54), anti-guerilla action in S.E. Asia (U.S. Navy-62). For earlier military actions in three Asian theaters, see (Barchan-O.R.O.-53), S.E. Asia (Human Relations Area Files, at Yale). For Laos communist strategy, see (Halperin-RAND) and Indonesian communist tactics (Parker-RAND-60); for S.E. Asia Combat Team Studies, see (Clark-58).
G. SUGGESTED FURTHER WORK

A useful extension of this survey, its sources and findings, can include the areas of study highlighted below. We have starred(*) those which appear most promising. These specific recommendations made do not rule out the further analysis in depth of all of the major areas touched on, and the continuing contact with the literature and active workers in each field. That further broad scale analysis is the major way to obtain all of the information needed to complete a proper comparative evaluation of the possibilities presented.

Recommendations include review efforts, analyses, or experiments, either in support of a primary concept (sebum analysis data), or in test of the primary concept itself (e.g., controlled experiments on biosensing of sebum, or of dog tracking of sebum trails). The work suggested here may be intended to make up for data deficiencies in the literature, or to present a positive outlook towards the testing of a good prospective detection concept. Where experiments are suggested, it is assumed that they will not take an inordinate amount of experimenter time and skill, that apparatus can be assembled or designed fairly easily.

On Human Attributes:
1. Assemble a collection of foreign medical teaching texts, hospital manuals, lab data books, published locally in principal geographic regions of interest, and containing indigenous "normal value" data, on urine, feces, sweat. These would be books in biochemistry, clinical lab analysis, pathological physiology, etc.
2. Carry out gas chromatographic analytic separation of whole sebum from skin of various ethnic groups, fresh and after bacterial decomposition; for use in identifying sebum components, maintaining a sebum "fingerprint" library, and making available sebum materials for sensing experiments and tracking studies.
3. Conduct simple experiments on the remote observation of disturbance by man of natural magnetic and electric field patterns, as indicated within report.
4. Conduct experiment on the observation by ESR (Electron Spin Resonance) techniques of the free radicals which may be produced by intact human skin, after excitation with UV radiation, in suitably designed equipment, and after the manner of the successful isolated skin experiments herein.
5. Make simple spectral reflectance measurements on skin of a much broader variety of ethnic groups of interest, than now found in the literature (as sampled in this report), using wide-band (Middle-UV to middle-IR) spectrophotometer, compact recording type of commercial design.
6. Assemble data on spectral reflectance, UV through IR of current clothing and special forces combat equipment, or representative samples of enemy equipment (where such measurements are not available from QMRE, ERDL, Naval Materials Lab, supplement with measurements made as in 5 above.
7. Assemble tables of "normal values", urine, feces, sweat, from the special information sources set down in 1.
8. Carry out comparative analyses of the "normal values" data from 7 above, and "North Atlantic Normal" data as found in sources contributing to the table in this report; to unearth significant differences in specific fractions, or in concentration profiles.
9. Assemble data on human reflectance and scattering of x-rays, over a wide energy band, as available from diagnostic and therapeutic radiology and health physics reference sources.

10. Review suitable literature to establish validity of hypothesis that human tissue trace mineral composition is a function of soil mineral content in the region where the human spent his years to maturity.

Environmental Background

11. Assemble data on plant contributions to the chemical background in air, from measurements of Dugway Proving Ground, other sources cited within report.

12. Arrange to receive airborne material chemical and biological samples, from regional environments of interest, either through any systematic collection and surveillance measurements made by CBR Agency, PHS, or Army Surgeon General; etc; or by providing collection equipment as extra job for assigned special forces personnel.

13. Carry out comparison of human product components and concentrations, with those from animal and plant sources (listed in report) and with plant and general environment substances in 11 and 12 above; to unearth human products which are entirely unique or have high concentration ratios (human products/other products).

Sensing

14. Conduct simple experimental series, with isolated tissue materials set up as biosensors, and exposed to selected human products. Series can include: frog skin and electrical measurement; guinea pig intestine, heart, aorta strip with mechanical contraction measurement; exposure to whole sebum or its fractions, etc. See description in report of these biosensors.

15. Carry out simple similar experiments using selected chemoreceptor isolated preparations, arranged for electrical measurement; using for example: antenna of silkworm moth, parts of blowfly, etc. Stimuli can be as in 14 above.

16. Carry out experiments in attempt to sensitize guinea pigs to human sebum and some of its fractions (from individuals and pooled sebum). If serological methods show this to be successful, prepare isolated intestine strips from some of these sensitized animals, for experiments as in 14 above, but seeking enhanced response to sebum.

17. Carry out comparative analysis to match up list of known human excreted products, with their counterparts in proven specific chemosensitivities of good chemoreceptor preparations, to obtain more suitable preparations for experiments as in 15 above.

18. Carry out short analysis of the several possibilities for ESR (Electron Spin Resonance) observation by remote means. Maintain surveillance over the work cited in report being attempted on non-contact ESR studies for signals from nerve.

19. Carry out analysis of possibilities for detection of characteristic X-ray signal return from humans, in conjunction with search for very high intensity developmental X-ray sources (perhaps x-ray lasers).

20. Prepare a good theoretical systems model, using the concepts outlined in the report, which would be useful in common for systems detecting either physical or chemical attributes, and employing physical, chemical, or biological sensing; and test out this model for predictive capability for sensitivities needed of detectors for various effects, etc.
ADAMS J A CHAMBERS R W
RESPONSE TO SIMULTANEOUS STIMULATION OF TWO SENSE MODALITIES
J EXP PSYCHOL 63 198

ADAMS T RENNIE D
THE COMPARATIVE TOLERANCE OF NEGROES AND CAUCASIANS TO A
STANDARDIZED COLD STRESS AS INDICATED BY BODY TEMPERATURE
AND METABOLIC RATE
ARRctic AEROMED LAB
TR 57-20 SEPT

ADES H DAVIS H
AN EXPLORATORY STUDY OF THE BIOLOGICAL EFFECTS OF NOISE
U OF CHICAGO, CHICAGO, ILL
ZZZ AD24685
BENOX REPORT DECEMBER 1

ZzADMIRALTY RES LAB AND TELECOMMUNICATIONS RES ESTAB
ATMOSPHERIC TRANSMISSION IN THE 1-14 MICRON REGION
ARL/R4/E600 DEC

ADOLPH E
PHYSIOLOGY OF MAN IN THE DESERT
INTERSCIENCE, NY

ADRIAN E
OLFACTORY ADAPTATION
J PHYSIOL LOND 112 38

AIRKEM, INC, NY
ODORS AND SENSE OF SMELL, A BIBLIOGRAPHY

ALBERT R E PALMES ED
EVAPORATIVE RATE PATTERNS FROM SMALL SKIN AREAS AS MEASURED
BY AN INFRARED GAS ANALYZER
J APPL PHYSIOL 4 208

ALBRITTON E ED
STANDARD VALUES IN NUTRITION AND METABOLISM
HANDBOOK OF BIOLOGICAL DATA PART TWO, PREP FOR AIBS-NRC
HANDBOOK CMTEE, PUBLISHER USAF
ZZZ AD36384
WADC REP WADC TR 52-301 DEC

ALDRICH T
A CHEMICAL STUDY OF THE SECRETION OF THE ANAL GLANDS OF
MEPHITIS MEPHITICA
J EXP MED 2

ALEKSEEVKII E
ANALYTICAL CHEMISTRY BY SMELL
TRUDY LENINGRAD KHM. TEKH INST USSR 10 116

ALEXANDER A EWER D
A CHEMORECEPTOR IN THE SCORPION
S AFRICAN J SCI 53 421

ALEXANDER H CHILES W
AN EXPLORATORY STUDY OF PROLONGED INTERMITTENT PHOTIC STIMULATION
AEROSPACE MED LAB, WRIGHT AIR DEV CENT, WPAFB, OHIO
AD233854
WADC TR-59-715 NOVEMBER

ALEXANDER H
BIOMAGNETICS
NO AMER AVIA, SPACE INFO SYS DIV, L.A., CAL

ALEXANDER H
BIOMAGNETICS - THE BIOLOGICAL EFFECTS OF MAGNETIC FIELDS
AMER J MED ELECT 1 181

ALLEE W
PRINCIPLES OF ANIMAL ECOLOGY
SAUNDERS, PHILA

ALLEN F
ON THE CRITICAL FREQUENCY OF PULSATION OF TONES
PHIL MAG 47 941

ALLEN S
TABLE OF MASS ABSORPTION COEFFICIENTS FOR X-RAYS AND GAMMA RAYS
PG 2183 IN HODGMAN, C - HANDBOOK OF CHEMISTRY AND PHYSICS CHEMICAL RUBBER PUB

ALLEN W
OLFACTORY AND TRIGEMINAL CONDITIONED REFLEXES IN DOGS
AM J PHYSIOL 118 532

ALLISON J
DIETARY PROTEINS IN HEALTH AND DISEASE

ANNOTATIONS OF SMALL GROUP RESEARCH STUDIES
ALTMAN I P
PENDLETON C TERAUDS A
HUMAN SCIENCES RESEARCH, ARLINGTON VIRGINIA
AD248440
AFOSR-TN-60-1208 HSR-RR-60/5-GN OCTOBER

ALTMAN P
ED
HANDBOOK OF RESPIRATION
CMTEE ON THE HANDBOOK OF BIOL DATA, NAT RES COUNCIL
AEROSPACE MED LAB, WRIGHT AIR DEV CENT, OHIO
AD155823
WADC TECH REP 58-352 AUGUST

ALTMAN P
ED
HANDBOOK OF CIRCULATION - VOLUME OF HANDBOOK OF BIOLOGICAL DATA
CMTEE ON THE HANDBOOK OF BIOL DATA, NAT RES COUNCIL
AEROSPACE MED LAB, WRIGHT AIR DEV CENT, OHIO
AD155823
WADC TECH REP 58-352 AUGUST

ALTMAN P
ED
BLOOD AND OTHER BODY FLUIDS
IN BIOL HANDBOOK SERIES FOR CMTEE ON BIOL HANDBOOKS, FED AM SOC EXP BIOL
WASH DC
ALTNER H
OLFAC TORY ABILITY AND THE STRUCTURE OF THE NOSE OF THE
SOUTH AFRICAN FROG XENOPUS LAEVIS
Z VERGL PHYSIOL 45, 272
ALVAREZ W
INTRODUCTION TO GASTROENTEROLOGY
HOEBER, NY
AMDUR M
PHYSIOLOGICAL RESPONSE TO ATMOSPHERIC POLLUTANTS
AM INDUST HYG ASSN J 2 2 1
AMER COMM FOR INTERNATIONAL WILDLIFE PROTECTION
THE PRESENT STATUS OF THE MUSK OX IN ARCTIC NORTH AMERICA
AND GREENLAND
AMER INST OF BIOL SCI, WASH
ANIMAL SOUNDS AND COMMUNICATION
AMER INST OF CROP ECOLOGY, WASH
DISEASES AND PESTS OF ECONOMIC PLANTS OF INDOCHINA
ARMY CHEM CORPS
DEC
AMER INST OF CROP ECOLOGY, WASH
THE PHYSICAL ENVIRONMENT, LAND USE, FARM CROPS, AND
AGRICULTURAL PRACTICES OF CENTRAL AND SOUTH CHINA, HONG KONG
AND TAIWAN-FORMOSA- WITH SOME CLIMATICALLY ANALOGOUS
AREAS IN SOUTHEAST ASIA
DEPT OF THE ARMY
DEC
AMER SOC OF PERFUMERS
EXPERIMENTAL FINDINGS ON ODOR AND OLFACTION
AMER PERFUM AND COSMET 76 39
ANDERSON A
THE SENSITIVITY OF THE LEGS OF COMMON BUTTERFLIES TO
SUGARS
J EXP ZOOL 63 235
ANDERSON A MUNSON W
ELECTRICAL EXCITATION OF NERVES IN THE SKIN AT AUDIO-
FREQUENCIES
J ACoust SOC AMER 23 155
ANDERSON D M
APPLICATIONS OF INFARED SPECTROSCOPY VI RECENT DEVELOPMENTS IN TECHNIQUES OF INCREASED SENSITIVITY FOR THE ANALYSIS OF GAS LIQUID CHROMATOGRAPHY FRACTIONS AND OTHER SMALL SCALE SAMPLES
TALANTA  B 832 61

ANDERSSON B  LANDGREN'S  OLSSON L
THE SWEET TASTE FIBRES OF THE DOG
ACTA PHYSIOLOG SCAND  21 105 50

ANDRASINA J  KRUPA C
A FILM PROCESS FOR THE INFRARED SPECTROPHOTOMETRIC MEASUREMENT IN BIOLOGICAL MATERIAL
BIOCHEM Z  335 212 61

ANDRES L
MAGNETOTROPISM IN PLANTS
NATURE  185 132 60

ANDREWARTHA H
THE DISTRIBUTION AND ABUNDANCE OF ANIMALS
U OF CHICAGO PRESS 54

ANIKINA N
ON THE ADAPTATION OF CHEMORECEPTORS
BULL EKSP BIOL MED., USSR  50 24 60

ANNE A  SAITO M  SALATI O
RELATIVE MICROWAVE ABSORPTION CROSS SECTIONS OF BIOLOGICAL SIGNIFICANCE
PROC FOURTH ANNUAL TRI-SERVICE CONF BIOL EFFECTS
MICROWAVE RADIATION  1 153 60

ANNE A  SAITO M  SALATI O
PENETRATION AND THERMAL DISSIPATION OF MICROWAVES IN TISSUES
ELECTROMED LAB UNIV OF PENNSYLVANIA
ROME AIR DEV CENT, GRIFFISS AFB, NY
AD284981 RADC-TDR-62-244 JUNE 14 62

ANTHONY A  ACKERMAN E
BIOLOGICAL EFFECTS OF NOISE IN VERTEBRATE ANIMALS
PENN STATE UNIV
WRIGHT AIR DEV CENT, OHIO
AD142078 WADC TECH REP 57-647 NOV 57

ANTHONY H
FIELD BOOK OF NORTH AMERICAN MAMMALS
PUTNAM, NY 28

ANTONIS A  BERSOHN I
THE INFLUENCE OF DIFT ON FECAL LIPIDS IN SOUTH AFRICAN WHITE AND BANTU PRISONERS
AM J CLIN NUTRIT  11 142 62

APPLETON D
THE BLOODHOUND HANDBOOK
NICHOLSON AND WATSON, LOND 57
APPLEZWEIG M
PSYCHOLOGICAL STRESS AND RELATED CONCEPTS, A BIBLIOGRAPHY
ZZDEPT OF PSYCHOL, CONN COLLEGE, NEW LONDON
ZZGROUP PSYCHOL BRANCH, OFF NAVAL RES
ZZ AD158085
TR 7 DEC

APTE S
VENKATACHALAM P
FACTORS INFLUENCING DERMAL LOSS OF IRON IN HUMAN VOLUNTEERS
IND J MED RES 50 817

ARAB Y
BEHAVIORAL RESPONSE TO ELECTRICAL STIMULATION OF
CHEMORECEPTORS IN THE BLOWFLY
J INSECT PHYSIOL 2 324

ARCTANDER S
PERFUME AND FLAVOR MATERIALS OF NATURAL ORIGIN
PUB BY AUTHOR, ELIZABETH, NJ

ARIEL M
EISHER U
TRACE ANALYSIS BY ANODIC STRIPPING VOLTAMMETRY 1 TRACE
METALS IN DEAD SEA BRINE
J ELECTROANAL CHEM 5 362

ARMOUR RES FOUNDATION, CHICAGO
METHODS FOR FIELD DETECTION OF PROTEINS AND BACTERIA
ZZCHEM CORPS BIOL LABS, FT DETRICK, MD
ZZ AD38690
LITERATURE SURVEY REP NO 2 MARCH 19

ARNEST R
ATMOSPHERE CONTROL IN CLOSED SPACE ENVIRONMENT /SUBMARINE/
ZZNAVAL MED RES LAB, NEW LONDON
ZZBUR OF MED AND SURGERY, NAVY DEPT
ZZ AD270896
REP NO 367 VOL XX NO 21 DEC 14

ARTHUR D
TICKS AND DISEASE
PERGAMON, NY

ASATON A
KERR D
AMINES IN BLOOD AND URINE IN RELATION TO LIVER DISEASE
CLIN CHEM 6 149

ASATON A
KERR D
DIURNAL VARIATIONS IN RENAL EXCRETION OF ELECTROLYTES
URIC ACID AND TOTAL AMINO N IN VARIOUS RENAL DISEASE AND IN
ESSENTIAL HYPERTENSION
CLIN CHEM 6 637

ASHBURN E
WELDON R
SPECTRAL DIFFUSE REFLECTANCE OF DESERT SURFACES
J OPT SOC AM 46 583

ASHTON E
EAYRS J
MOULTON D

OLFACTORY ACUITY IN THE DOG
NATURE, LOND 179 1069

ASKINSON G

PERFUMES AND COSMETICS—THEIR PREPARATION AND MANUFACTURE
HENLEY PUB

ATTNEAVE F
MCREYNOLDS P

A VISUAL BEAT PHENOMENON
AMER J PSYCHOL 63 107

AUTHOR UNKNOWN

CALCIUM IN SWEAT
NUTR REVIEWS 21 1

AUTHOR UNKNOWN

DOGS IN THE JUNGLE
INFANTRY J 56 33

AUTHOR UNKNOWN

FIVE PART PER BILLION EMISSION SPECTROSCOPY SENSITIVITY
ANAL CHEM 32 51A

AUTHOR UNKNOWN

PROCEEDINGS TRISERVICE CONFERENCE ON MICROWAVE HAZARDS
OF RADIATION
PLENUM PRESS NY

AUTHOR UNKNOWN

SKIN DISEASES IN THE AFRICANS
LEWIS, LOND

AUTHOR UNKNOWN

/10 TO MINUS 14TH GMS/SEC DETERMINATION BY FLAME
DETECTORS FOR ARGON/
ANAL CHEM 32 56A

AYLWARD
WILLIS

LIPID EXCRETION 1. STEROLS AND STEROL ESTERS
BRIT J NUTRIT 16 339

AYLWARD F

LIPID EXCRETION, PART TWO, FRACTIONATION OF HUMAN FAECAL
LIPIDS
BRIT J NUTRIT 16 345

AZRIN N

SOME EFFECTS OF NOISE ON HUMAN BEHAVIOR
ZAHUMA ENG LAB, ABERDEEN PROVING GROUND, MARYLAND
ZAZ AD200847
TECH MEMO 6-58 JUNE
BACH L
ERDL-TULANE SYMPOSIUM ON FLICKER
ZZDEPT PHYSIOL TULANE U AND US ARMY ENG RES AND DEV LABS
ZZZ AD255440
APRIL 6 57

BACHEM A
THE ULTRAVIOLET TRANSPARENCY OF THE VARIOUS LAYERS OF THE
HUMAN SKIN
AM J PHYSIOL 91 581 29

BAER J
ECOLOGY OF ANIMAL PARASITES
U OF ILL PRESS 51

BAIRD J
MEGAVOLT ELECTRONICS, SUB-MILLIMETER WAVE RESEARCH
ZZELECTRICAL ENGNG RES LAB, U OF ILLINOIS, URBANA, ILL
ZZELECTRONIC TECH LAB, AF SYST COMMAND, WP-AFB, OHIO
ZZZ AD293827
ANNUAL REPORT NO 3 ASD-TDR-62-1032 DECEMBER 1 62

BAKER C
VISUAL PRESENTATION OF INFORMATION
ZZAERO MED LAB, WADC, WPAFB, OHIO
ZZZ AD43064
WADC TR 54-160 AUG 54

BAKER E FOSKETT D
A BIBLIOGRAPHY OF FOOD 1936-1956
BUTTERWORTHS, LOND 58B

BAKER P
AMERICAN NEGRO-WHITE DIFFERENCES IN HEAT TOLERANCE
ZZENVIRON PROT RES DIV, QM RES AND ENG CENT, NATIC MASS
TECH REP EP-75 JUNE 58A

BAKER P
/HEAT STRESS AND ETHNIC DIFFERENCES IN RESPONSE/
AMER J PHYS ANTHROPOL 16 287 58B

BALLARD S LARMORE L PASSMAN S
FUNDAMENTALS OF INFRARED FOR MILITARY APPLICATIONS
ZZRAND CORP R-297 56

BAN G
SCATTERED RADIATION IN THE MIDDLE ULTRAVIOLET REGION -
APPENDIX 7
ZZU CHICAGO LABS
LAS-TR-E174-19 XX

BANG B G
ANATOMICAL EVIDENCE FOR OLFACATORY FUNCTION IN SOME SPECIES
OF BIRDS
NATURE LOND 188 547 60

BARADI A BOURNE G
LOCALIZATION OF GUSTATORY AND OLFACATORY ENZYMES IN THE
RABBIT AND THE PROBLEMS OF TASTE AND SMELL
NATURE 168 977 51
BARADI A BOURNE
GUSTATORY AND OLFACTORY EPITHELIA
PERFUM AND ESSENTIAL OIL RECORD 48 434 57

BARAZ L KHAYUTIN V
DIFFERENTIATION OF THE EFFECT OF CHEMICAL STIMULI ON THE
RECEPTORS AND SENSORY FIBERS OF THE SMALL INTESTINE
SECHENOV PHYSIOLOGICAL J USSR 47 59 61

BARBER G GALE R
INSTRUMENTATION FOR RESEARCH INTO UNDERWATER ACOUSTIC
PROPAGATION AND REVERBERATION
ZZADIMIRALTY UNDERWATER WEAPONS ESTABLISHMENT, PORTLAND ENG
ZZ AD294028
AUWE TECH NOTE 81/62 JUNE 62 62

BARBER S
CHEMORECEPTION AND PROPRIOCEPTION IN LIMULUS
Z EXP ZOOLO 131 51 56

BARBER S HOLMBERG G BESSER S
MEASUREMENTS OF REFLECTING PROPERTIES OF VARIOUS AIRCRAFT
COATINGS WHEN ILLUMINATED BY A LASER
ZZAVIATION ORD DEPT US NAVY ORD TEST STATION CHINA LAKE CAL
ZBBUREAU OF NAVAL WEAPONS
ZZ AD297746
NOTS TP 3114 JANUARY 63

BARER R
ASPECTS OF ULTRAVIOLET AND INFRARED MICROSPectrography
WITH THE BURCH REFLECTING MICROSCOPE
DISCUS FARADAY SOC 9.369 50 50

BARKER W BARKER S
EXPERIMENTAL PRODUCTION OF HUMAN CONVULSIVE BRAIN
POTENTIALS BY STRESS-INDUCED EFFECTS UPON NEURAL
INTEGRATIVE FUNCTION - DYNAMICS OF THE CONVULSIVE REACTION
TO STRESS
RES PUBL ASS NERV MENT DIS 29 90 50

BARLETT F C
FATIGUE FOLLOWING HIGHLY SKILLED WORK
NATURE 47 717 41

BARLOW H B Kohn H I WALSH E G
VISUAL SENSATIONS AROUSED BY MAGNETIC FIELDS
AMER J PHYSIOL 148 372 47A

BARLOW H B Kohn H I WALSH E G
THE EFFECT OF DARK ADAPTATION AND OF LIGHT UPON THE
ELECTRICAL THRESHOLD OF THE HUMAN EYE
AMER J PHYSIOL 148 376 47B

BARNARD R D
ON THE POSSIBILITY OF PRODUCING AN INTERPRETABLE VISUAL
IMAGE ON THE RETINA OF THE DIOPTRICALLY BLIND BY MEANS OF
ELECTRIC PHOSPHENES
OHIO J SCI 48 132 47

BARNES ENG CO
STUDY AND INVESTIGATION OF PASSIVE INFRARED RANGING TECHNIQUES
QTLY REP 5 AF33/616/-5094 REPT SECRET AUGUST 59

BARNES H
THERMOGRAPHY OF THE HUMAN BODY
SCIENCE 140 870 63

BARNES M
OSBORN H
ATTRACTANTS FOR THE WALNUT HUSK FLY
J ECON ENTOM 51 686 50

BARNICOT N
DAILY URINARY 17-KETOSTEROID OUTPUT OF AFRICAN NEGROES
LANCET 1 893 52

BARNOTHY M
FIRST BIOMAGNETIC SYMPOSIUM, REPORT
NATURE 193 1243 62

BARNWELL F
WEBB H
RESPONSES OF THE MUD SNAIL NASSARIUS TO EXPERIMENTAL REVERSALS IN THE DIRECTION OF VERY WEAK MAGNETIC FIELDS
BIOL BULL 121 381 61

BARRUETO R B
MEASUREMENT OF RATES OF EXCRETION OF SWEAT SOLUTES UNDER PHYSIOLOGICAL CONDITIONS
J APPL PHYSIOL 14 435 59

BARTLEY S H
THE RELATION OF RETINAL ILLUMINATION TO THE EXPERIENCE OF MOVEMENT
J EXP PSYCHOL 19 475 36

BARTLEY S H
THE NEURAL DETERMINATION OF CRITICAL FLICKER FREQUENCY
J EXP PSYCHOL 21 678 37

BARTLEY S H
SOME EFFECTS OF INTERMITTENT PHOTIC STIMULATION
J EXP PSYCHOL 25 462 39

BARTLEY S
CHUTE E
FATIGUE AND IMPAIRMENT IN MAN
MCGRaw-HILL, NY 47

BARTLEY S H
INTERMITTENT PHOTIC STIMULATION AT MARGINAL INTENSITY LEVELS
J PSYCHOL 32 217 51

BARTLEY S
PRINCIPLES OF PERCEPTION
HARPER, NY 58

BARTON F
SALIENT OPERATIONAL ASPECTS OF PARAMILITARY WARFARE IN THREE ASIAN AREAS -U
ZZARMY, OPERATIONS RESEARCH OFFICE, REPORTS 5094 REPT SECRET APRIL 53
BARTSCH P
BIRDS AND SMELL
AUK 60 271

BARTUNEK P
PRELIMINARY REPORT ON THE PROBLEM OF SEISMIC SENSING
ZCOLORADO SCHOOL OF MINES RES FOUNDATION, GOLDEN COLO
ZROME AIR DEV CENT, USAF, ROME NY
ZZ AD92620
RADC TN-56-30 SEPT 30

BASS D E
ELECTROLYTE EXCRETION DURING COLD DIURESIS
FED PROC 13 8

BASS D MAGER M BARRUETO R
EFFECT OF A VAPOR BARRIER ON RATES OF EXCRETION OF SWEAT
SOLUTES
ZZQM RES AND ENG CENT, NATICK
TR EP-103 MARCH

BATEMAN J
A SPECULATIVE SURVEY OF THE PROBLEM OF DETECTION IN
BIOLOGICAL WARFARE WITH SPECIAL REFERENCE TO THE
BIOPHYSICAL APPROACH
ZCHEM CORPS, BIO LABS, CAMP DETRICK, FREDERICK, MD
ZZ AD264219
SPECIAL REP NO 154 APRIL 10

BATES F H
RECENT ASPECTS IN THE DEVELOPMENT OF A CLOSED ECOLOGICAL
SYSTEM
AEROSPACE MED 32 12

BATES M
THE NATURAL HISTORY OF MOSQUITOES
MACMILLAN, NY

BATTISON M
SETTING OF AN OLFACTOMETER
PHYS MED BIOL 7 93

BAUMANN F
EXPERIMENTS ON SENSE OF SMELL IN THE VIPER/
REV SUISSE ZOOL 34 173

BAUMANN F
THE IMPORTANCE OF STINGS AND SENSE OF SMELL IN FOOD
PROCUREMENT OF THE VIPER
REV SUISSE ZOOL 35 233

BAUMGARTEN R BLOOM F OLIVER A
RESPONSE OF INDIVIDUAL OLFACTORY NERVE CELLS TO
MICROELECTROPHORETICALLY ADMINISTERED CHEMICAL SUBSTANCES
ARCH GES PHYSIOL 277 125

73
BAWDEN D
THE ESTIMATION OF B AMINOISOBUTYRIC ACID IN HUMAN URINE
J CLIN PATH 16 284

BAWDEN H
BIBLIOGRAPHY OF THE LITERATURE ON THE ORGAN AND SENSE OF
SMELL
J COMP NEUROL 11 2

BAYLEY D CAMPBELL J P
SPECTRAL SUITABILITY MODULATION AND DETECTION TECHNIQUES IN
COMMUNICATION WITH WAVELENGTHS BETWEEN 30 AND 10000 ANGSTROM
GENERAL PRECISION INC, PLEASANTVILLE NY
ROMAIRDEV CENT, GRIFFISS AFB, NY
AD282726
FINAL REP PART 1 RADC TDR-62-244 VOL 1

BAZINET M MERRITT C
DETERMINATION OF VOLATILE COMPONENTS OF FOODSTUFFS
2. DIRECT FRACTIONATION OF A SAMPLE ON THE MASS SPECTROMETER
AND THE USE OF LOW IONIZATION VOLTAGE SPECTRA
QMQ RES AND ENG CENT, NATICK
RES REP 11, ANALYT CHEM SERIES JUNE

BECKER E
HOST SPECIFICITY AND SPECIFICITY OF ANIMAL PARASITES
AM J TROP MED 13 505

BEDDARD F
ANIMAL COLORATION
MACMILLAN, NY

BEDICHEK R
THE SENSE OF SMELL
DOUBLEDAY, NY

BEDOUKIAN P
PERFUMERY AND SYNTHETICS AND ISOLATES
VAN NOSTRAND, NY

BEDOUKIAN P
PROGRESS IN PERFUMERY MATERIALS
AMER PERFUM AND COSMET 78 24

BEEBE-CENTER J ROGERS M OCONNELL D
TRANSMISSION OF INFORMATION ABOUT SUCROSE AND SALINE
SOLUTIONS THROUGH THE SENSE OF TASTE
J PSYCHOL 39 157

BEER B
UEBER DAS AUFTRETEN SUBJECTIVER LICHTEMPFINDUNGEN IN
MAGNETISCHEN FELDE
WEIN KLIN WSCHR 15 108

BEETS M
/OLFACCTION/
AM PERFUMER AROMAT 76 54

BEGG M HOGBEN L
CHEMORECEPTIVITY OF DROSOPHILA MELANOGASTER
PROC ROY SOC B 133 1
BEHAN J
DOGS OF WAR
SCRIBNERS, NY 46

BEHRENS M
THE ELECTRICAL RESPONSE OF THE PLANARIAN PHOTORECEPTOR
COMP BIOCHEM PHYSIOL 5 129 62

BEIDLER L
A THEORY OF TASTE STIMULATION
J GEN PHYSIOL 38 133 54

BEIDLER L FISHMAN I HARDIMAN C
SPECIES DIFFERENCES IN TASTE RESPONSES
AM J PHYSIOL 181 235 55A

BEIDLER L TUCKER D
RESPONSE OF ISOLATED NASAL EPITHELIUM OF OPPOSUM TO ODOR
STIMULATION
SCIENCE 122 76 55B

BEIDLER L
FACTS AND THEORY ON THE MECHANISM OF TASTE AND ODOR
PERCEPTION IN CHEMISTRY OF NATURAL FOOD FLAVORS
J MITCHELL, ED
QM FOOD AND CONT INST CHICAGO 57

BEIDLER L
PHYSIOLOGY OF OLFAC TION AND GUSTATION
ANN OTOL RHINOL LARYNGOL 69 398 60

BEIDLER L
MECHANISM OF GUSTATORY AND OLFACTORY RECEPTOR STIMULATION
IN SENSORY COMMUNICATIONS ROSENBLITH W, ED
WILEY, NY 61A

BEIDLER L
THE CHEMICAL SENSES
ANN REV PSYCHOLOG 12 363 61B

BEIDLER L
BIOPHYSICAL APPROACHES TO TASTE
AM SCIENTIST 49 421 61C

BEIER E
THE EFFECT OF INDUCED ANXIETY ON THE FLEXIBILITY OF
INTELLECTUAL FUNCTIONING
PSYCHOL MONOG 65 326 51

BEISCHER D
RESEARCH ON THE EFFECTS OF VERY STRONG AND OF
MAGNETIC FIELD-FREE ENVIRONMENTS ON MAN AND ANIMALS
ZZUS NAVAL SCHOOL OF AVIATION MEDICINE, PENSACOLA, FLORIDA
ZZOFF RES GRANTS AND CONTRACTS, NATIONAL AERO AND SPACE ADM
R-39 JAN 29 62A

BEISCHER D
SURVIVAL OF ANIMALS IN MAGNETIC FIELDS OF 120000 GAUSS
ZZNAVAL AV MED CENT, PENSACOLA, FLA
ZZZ AD284064 95
RES REP NO 6 JULY 25

BELL E
LABORATORY MEASUREMENTS OF REFLECTIVITY AND EMISSIVITY
OHIO STATE U, COLUMBUS
AUG

BELL E
THE SPECTRAL RADIANCE OF THE SKY IN THE COLORADO SPRINGS
AREA - BACKGROUND MEASUREMENTS DURING THE INFRARED
MEASURING PROGRAM 1956 - IRMP56
GRD NOTE NO 46

BELL E
AN ATLAS OF REFLECTIVITIES OF SOME COMMON TYPES OF
MATERIALS
DEPT OF PHYSICS AND ASTRON, OHIO STATE U, COLUMBUS
AD141795
REP 659-6 JULY 18

BELL E
RADIOMETRIC QUANTITIES SYMBOL OF UNITS
PROC IRE 47 1432 SEPT

BELLAMY L
THE INFRARED SPECTRA OF COMPLEX MOLECULES
WILEY, NY ED 2

BELTRAN A
EMISSIVITY, AN ANNOTATED BIBLIOGRAPHY
LOCKHEED MISSILES AND SPACE DIVISION, CALIF
AD263182
SPECIAL BIBLIOGRAPHY SB-61-38 JULY

BENDIX SYS DIV, BENDIX CORP
JUNGLE CANOPY PENETRATION VOLUME 2- VEGETATION AND
METEOROLOGICAL STUDIES
AD296572
BSC 36175 JAN

BENEDICT F
CARNEGIE INST, WASH
A STUDY OF PROLONGED FASTING

BENNET C
SEABER W
CHEMICAL COMPOSITION OF SCENT SUBSTANCES FROM CIVET
PERFUM AND ESSENT OIL RFC 19 14

BENNETT F
RECLAMATION OF WASTE WATER
DOUGLAS AIRCRAFT, TULSA
REP 1058 7-58-108 JULY

BENNETT L
STALDER J
DEVELOPMENT OF A PRECIPITATION PARTICLE SENSOR
RESEARCH DIV COLLEGE ENGN, N Y UNIV
ACAD PRESS

BEVAN W PATTON R
SELECTED BIBLIOGRAPHY - FATIGUE, STRESS, BODILY CHANGE AND BEHAVIOR
HUMAN ENG DEPT, LOCKHEED AIRCRAFT, MARIETTA, GEORGIA
WRIGHT AIR DEV CEN, AIR RES AND DEV COMM, WPAFB, OHIO
WADC TECH REP 57-125 APRIL 57

BHaradwaj T
URINARY AND PLASMA 17-HYDROSTEROIDS IN NORMAL ADULTS
IND J MED RES 47 178 57

Biderman A Heller B Epstein P
A SELECTED BIBLIOGRAPHY ON CAPTIVITY BEHAVIOR
BUREAU OF SOCIAL SCI RES, WASH
BEHAVIORAL SCI DIV, AF OFF OF SCI RES, WASH
ADD AD253964
AFOSR 295 FEB 61A

Biderman A
CULTURAL MODELS OF CAPTIVITY RELATIONSHIPS
BUREAU OF SOCIAL SCI RES, WASH
BEHAV SCI DIV, AF OFF OF SCI RES, WASH
ADD AD257325
AFOSR 452 FEB 61B

Biderman A Zimmer H
THE MANIPULATION OF HUMAN BEHAVIOR
WILEY, NY 61C

Billian C
INVESTIGATION OF LONG WAVELENGTH INFRARED GLASSES
SERVO CORP OF AMERICA, HICKSVILLE, NY
RECONNAISSANCE LAB, AERONAUTICAL SYSTEMS DIV, USAF
ADD AD295669
INTERIM ENGNG REP NO 3 JANUARY 15

Binet A Passy J
CONTRIBUTION A L-ETUDE DE L-OLFACTION CHEN LE CHIEN
COMPT REND 2 659 96

BiophySical Soc, NY
AbSTRACTS BIOPHYSICAL SocIETY
SEVENTH ANNUAL MEETING FEB 18

Birks L
/TEN NANOGRAM SENSITIVITY BY ANODIC STRIPPING ANALYSIS FOR NICKEL/
ANAL CHEM 32 19A 60

Birnbaum M
ELECTRONICS PROGRAM, OPTICAL MASER STUDIES
AAEROSPACE CORP
AAEROSPACE SYSTEMS DIVISIONS, AFSC, INGLEWOOD, CALIF
ADD AD293197
DCAS-TDR-62-203 NOV 15

Bishop D Callaway D
OCTAVE BAND ANALYSIS OF NOISE MEASUREMENTS OF SHIPBOARD 97
LIVING QUARTERS, A STUDY OF THE VENTILATION NOISE PROBLEMS IN NAVAL VESSELS
ZARMOUR RESEARCH FOUNDATION, CHICAGO ILL
U.S. NAVY
AD11432
TECH REP NO 3 MARCH 25

BITTERMAN M
KRAUSKOPF J
SOME DETERMINANTS OF THE THRESHOLD FOR VISUAL FORM
ZUNIVERSITY OF TEXAS, AUSTIN TEXAS
ZAAERO MED LAB, WADC OHIO
AD23337
WADC TECH REP 53-331 SEPT

BLACK, W
UNUSUAL FOODS FOR HUMAN CONSUMPTION
PROC NUTR SOC 12 32

BLACKMAN T
OBSERVATIONS ON SENSE OF SMELL IN CHIMPANZEES
AM J PHYS ANTHROP 5 283

BLACKWELL H
REPORT OF PROJECT MICHIGAN, OPTICS AND VISION
ZU OF MICH ENNG RES INST, VISION RES LABS, ANN ARBOR
ZDEPT OF THE ARMY
AD138887
2144-85-P JUNE

BLACKWELL H
OPTICS AND VISION
ZUNIV OF MICHIGAN ENNG RES INST, VISION RES LABS ANN ARBOR
AD149866
REPORT OF PROJ MICHIGAN 2144-184-P NOV

BLAIR H
DERN R
FENN W
ABDOMINAL GAS
ZNAT RES COUN, COMM ON AVIA MED
CAM REP 193

BLAIR H
DERN R
SMITH V
INTESTINAL GAS IN SIMULATED FLIGHTS TO HIGH ALTITUDES
J AVIA MED 18 352

BLAIR H
DERN R
BATES P
THE MEASUREMENT OF VOLUME OF GAS IN THE DIGESTIVE TRACT
AM J PHYSIOL 149 688

BLAKESLEE A
SALMON T
GENETICS OF SENSORY THRESHOLDS—INDIVIDUAL TASTE REACTIONS FOR DIFFERENT SUBSTANCES
PROC US NAT ACAD SCI 21 84

BLANK C
ELECTROMAGNETIC PULSE BIBLIOGRAPHY
ZDEFENSE ATOMIC SUPPORT AGENCY, WASH DC
AD296777
DASA NO 618 JANUARY

BLATTNER D
GOLDSMITH G
KISS Z
A RESEARCH PROGRAM ON THE UTILIZATION OF COHERENT LIGHT
BLAU H MILES J ASHMAN L
THE THERMAL RADIATION CHARACTERISTICS OF SOLID MATERIALS,
A REVIEW
ZZAF CAMB RESEARCH CENT, ELECTRONICS RESEARCH DIRECTORATE
ZZ AD146833
AFCRC-TR-58-132 MARCH 31 58

BLEICHMAR H DEROBERTIS E
SUBMICROSCOPIC MORPHOLOGY OF THE INFRARED RECEPTOR OF PIT VIPERS
Z ZELFFORSCH 56 748 62

BLISS E MIGEON C BRANCH C
REACTION OF ADRENAL CORTEX TO EMOTIONAL STRESS
PSYCHOMAT MED 18 57 56

BLOCK B
BIOASSAY OF SYNTHESIZED GYPSY MOTH /P DISPAR/ SEX ATTRACTANT
J ECON ENTOMOL 53 172 60

BLOCK M
FUNCTION AND OPERATION OF THE FACIAL PIT OF THE PIT VIPERS
NATURE, LOND 165 284 50

BLOCK R
AMINO ACID HANDBOOK
C THOMAS, SPRINGFIELD 56

BLOCK
PAPER CHROMATOGRAPHY
ACAD PRESS 58

BLOIS M
FREE RADICALS IN BIOLOGICAL SYSTEMS
ACAD PRESS, NY 61

BLOUT E
THE INFRARED SPECTRA OF SOME PURINES AND PYRIMIDINES
J AM CHEM SOC 72 479 50

BLOUT E LENORMANT H
INFRARED SPECTROSCOPY OF BIOLOGIC MATERIALS IN AQUEOUS SOLUTIONS
J OPT SOC AMER 43 1093 53

BOARD F PERSKY H HAMBURG D
PSYCHOLOGICAL STRESS AND ENDOCRINE FUNCTIONS - BLOOD LEVELS OF ADRENOCORTICAL AND THYROID HORMONES IN ACUTELY DISTURBED CASES
PSYCHOMAT MED 18 324 56

BOATMAN J
HYPEROSMOTIC EFFECTS ON THE CAT THYROID PERFUSED IN VITRO
AM J PHYSIOL 202 1035 59
THE EFFECTS OF STRESS ON UROPEPSIN EXCRETION
ZAERO MED LAB, AIR RES AND DEV COMM, WPAFB, OHIO
ZZ AD142256
WADC TECH NOTE 57-427 DECEMBER 57

BONNICHSEN R LINTURI M
GAS CHROMATOGRAPHIC DETERMINATION OF SOME VOLATILE COMPOUNDS IN URINE
ACTA CHEMICA SCAND 16 1289 62

BOUGHTON B WHEATLEY V
STUDIES OF SEBUM. FURTHER STUDIES OF THE COMPOSITION OF THE UNSAPONIFIABLE MATTER OF HUMAN FOREARM SEBUM
BIOCHEM J 73 144 59A

BOUGHTON B WHEATLEY V
THE FATTY ACID COMPOSITION OF THE SKIN SURFACE FAT -SEBUM- OF NORMAL HUMAN SUBJECTS
J INVEST DERM 33 49 59B

BOUGHTON B MACKENNA R
/SEBUM CHOLESTEROL CONTENT/
BIOCHEM J 66 320 57

BOUMAN H D
EXPERIMENTS ON THE ELECTRICAL EXCITABILITY OF THE EYE
ARCH NEERL PHYSIOL 20 430 35

BOUMAN M A TENDOESSCHATE J VAN DER VELDEN H A
ELECTRICAL STIMULATION OF THE HUMAN EYE BY MEANS OF PERIODICAL RECTANGULAR STIMULI
DOCUMENTA OPHTHAL 5-6 151 51

BOURNE G
BIOCHEMISTRY AND PHYSIOLOGY OF NUTRITION VOLS. 1 AND 2
ACAD PRESS, NY 53

BOURNE G
WORLD REVIEW OF NUTRITION AND DIETETICS - VOL 3
HAFNER, NY 59

BOWEN J HUSSMAN T LYBRAND W
A REVIEW OF THE LITERATURE ON INDUCED SYSTEMIC FATIGUE
DEPT OF PSYCHOL, U OF MARYLAND, COLLEGE PARK
ARMY MED RES AND DEV BOARD, DEPT OF THE ARMY
AD31307 TR 7 MARCH 18 52

BOWROSS J CHING G LUGG J
THE SIMILARITY OF A RELATIONSHIP BETWEEN BODY WEIGHT AND URINARY 17-KETOSTEROID EXCRETION IN ADULT MALE AND FEMALE HUMAN SUBJECTS
AUST J EXP MED BIOL 36 457 58

BOZZELLI
/RESEARCH ON THE SMELL SENSE IN DOG FROM A PHYSIOLOGICAL AND PSYCHOLOGICAL POINT OF VIEW/
CLIN VET, MILAN 44 380 21

BRAY B
NITROGEN METABOLISM IN WEST AFRICAN CHILDREN
BROADBENT D E
NOISE, PACED PERFORMANCE AND VIGILANCE TASKS
BRIT J PSYCHOL 44 295

BROADBENT D E
SOME EFFECTS OF NOISE ON VISUAL PERFORMANCE
QUART J EXP PSYCHOL 6 1

BROADBENT D
PERCEPTION AND COMMUNICATION
PERGAMON, NY

BROCK J
RECENT ADVANCES IN HUMAN NUTRITION

BRODA E
RADIOACTIVE ISOTOPES IN BIOCHEMISTRY
ELSEVIER

BRONSHTEIN A
TASTE AND ODOR
PUBL HOUSE ACAD SCI, MOSCOW, USSR

BROOKS S, LALICH J, BAUMANN C
SKIN STEROLS - A DIRECT DEMONSTRATION OF FAST ACTING
STEROLS IN THE SEBACEOUS GLAND
AM J PATH 32 1205

BROOKES-SMITH C, COLLS J
MEASUREMENT OF PRESSURE MOVEMENT, ACCELERATION AND OTHER
MECHANICAL QUANTITIES BY ELECTROSTATIC SYSTEMS
J SCI INSTR 16 361

BROUWER R
DIFFERENCES BETWEEN HUMAN INDIVIDUALS IN THE ATTRACTION OF
MALARIA MOSQUITOS Owing TO A DIFFERENCE IN SMELL
ACTA LEIDENSIA 29 123

BROUWER R
VARIATIONS IN HUMAN BODY ODOR AS A CAUSE OF INDIVIDUAL
DIFFERENCES OF ATTRACTION FOR MALARIA MOSQUITOES
TROP GEOGRAPH MED 12 186

BROWN A
STUDIES OF THE RESPONSES OF THE FEMALE AEDES MOSQUITO
PART FOUR, FIELD EXPERIMENTS ON CANADIAN SPECIES
/SWEAT ATTRACTANTS/
BULL ENT RES 42 575

BROWN A
FACTORS WHICH ATTRACT AEDES MOSQUITOS TO HUMANS
PROC 10TH INT CONG ENT 3 757

BROWN A, CARMICHAEL A
/AMINO ACIDS AS MOSQUITO ATTRACTANTS/
ECON ENTOM 54 317

BROWN A
LYSINE AS A MOSQUITO ATTRACTANT
NATURE 189 508 61B
BROWN F ODORS AND INSECTS AM MUSEUM NOVITATES 299 1 28
BROWN F WEBB H BENNETT M A DIURNAL RHYTHM IN RESPONSE OF THE SNAIL ILYANASSA TO IMPOSED MAGNETIC FIELDS BIOL BULL 117 405 59
BROWN F A BRETT W BENNETT M MAGNETIC RESPONSE OF AN ORGANISM AND ITS SOLAR RELATIONSHIP BIOL BULL 118 367 60A
BROWN F A WEBB BRETT W MAGNETIC RESPONSE OF AN ORGANISM AND ITS LUNAR RELATIONSHIP BIOL BULL 118 382 60B
BROWN F A BENNETT M WEBB A MAGNETIC COMPASS RESPONSE OF AN ORGANISM BIOL BULL 119 65 60C
BROWN F A BARNWELL F H ORGANISM ORIENTATION TO MAGNETIC AXES IN RESPONSE TO WEAK MAGNETIC FIELDS BIOL BULL 121 384 62A
BROWN F RESPONSES OF THE PLANARIAN, DUGESIA, AND THE PROTOZOA, PARAMECIUM, TO VERY WEAK HORIZONTAL MAGNETIC FIELDS BIOL BULL 123 264 62B
BROWN F RESPONSE OF THE PLANARIAN, DUGESIA, TO VERY WEAK HORIZONTAL ELECTROSTATIC FIELDS BIOL BULL 123 282 62C
BROZEL L HODGSON E ELECTROPHYSIOLOGICAL STUDIES OF ARTHROPOD CHEMORECEPTION IV. LATENCY, INTERDEPENDENCE AND SPECIFICITY OF LABELLAR CHEMORECEPTION OF THE BLOWFLY, LUCILLA J CELL COMP PHYSIOL 59 187 62
BROZEK J SIMON E FRANKLIN J C A NOTE ON METHODOLOGICAL EVALUATION OF SELECTED VISUAL TESTS AMER J OPHTHAL 31 979 48
BRUMFIELD E GROUND TEST PROGRAM AND INFRARED ACQUISITION PROGRAM FOR AIRBORNE INFRARED SPECTROMETER SYSTEM ZZLOCKHEED CALIFORNIA CO, BURBANK, CALIF ZZAERIAL RECON LAB, AERONAUT SYST DIV, AF SYST COMMAND ZZZ AD296295 LR 16604 JANUARY 20 63
BRUSLOW S MUNGER B COMPARATIVE PHYSIOLOGY OF SWEAT PROC SOC EXP BIOL MED 110 317 62
BUBAN E
DEVELOPMENT OF A CONTINUOUS PROTEIN DETECTOR
ZZMINE SAFETY APPLIANCE CO, PITTSBURGH, PA
ZZ ARMY CHEM CORPS
ZZ AD295572
SIXTH PROGRESS REP OCT 62

BUCHANAN A HEIM H KRAUSHAAR J
BIOMEDICAL EFFECTS OF EXPOSURE TO ELECTROMAGNETIC
RADIATION PART 2— BIOMEDICAL EFFECTS ON THE EYE FROM
EXPOSURE TO MICROWAVES AND IONIZING RADIATIONS
ZZ PHYS, ENG, CHEM CORP, BOULDER COLO
ZZ LIFE SUPP SYS LAB, AEROSPACE MED LAB, WPAFB, OHIO
ZZ AD265279
ASD TR-61-195 JUNE 61

BUCHANAN D HALEY E
OCURRENCE OF ASPARTYL AND GLUTAMYL OLIGOPEPTIDES IN
HUMAN URINE
BIOCHEM J 1 612 63

BUCHTHAL F
THE EFFECTS OF ACETYLCHOLINE LIKE SUBSTANCES ON SENSORY
RECEPTORS
PHARMACOL REV 6 97 54

BUCKLAND F
DETECTION OF BACTERIAL ANTIGENS BY MEANS OF SENSITIZED
GUINEA PIG ILEUM
J HYGIENE 58 291 60

BUCKLEY J LIBPY W
RESEARCH AND REPORTS ON AERIAL INTERPRETATION OF
TERRESTRIAL BIOENVIRONMENTS AND FAUNAL POPULATIONS
ZZ COOP WILDLIFE RES UNIT, U OF ALASKA, COLLEGE, ALASKA
ZZ ARCTIC AEROMED LAB, LADD AFB, ALASKA
ZZ AD294050
TECH REP 57-32 DECEMBER 57

BUCKLEY W GRUM F
REFLECTION SPECTROPHOTOMETRY
ARCH DERMATOL 83 249 61

BUDGETT H
HUNTING BY SCENT
EYRE AND SPOTTIS WOOD, LOND SECOND ED 37

BUDD A
DETERMINATION OF SILVER ION IN SOLUTION WITH A GLASS
ELECTRODE
J ELECTRO ANAL CHEM 5 35 63

BUETTNER K
/REFLECTANCE OF LIVING AND DEAD SKIN/
STRAHLENTHERAPIE 58 23 37

BUETTNER K
TRANSFER FUNCTION OF HUMAN SKIN—
ZZ WASH DEPT OF METEOROL, SEATTLE
ZZUS ARMY CHEM CORPS
ZZ AD257181 66
ANNUAL REP

BULLOCK T, COWLES R
PHYSIOLOGY OF AN INFRARED RECEPTOR - THE FACIAL PIT OF PIT VIPERS
SCIENCE 115 541

BULLOCK T
COMPARATIVE ASPECTS OF SOME BIOLOGICAL TRANSDUCERS
FED PROC 12 666

BULLOCK T, DIECHE F
PROPERTIES OF AN INFRARED RECEPTOR
J PHYSIOL. LOND 134 47

BULLOCK T, FOX W
THE ANATOMY OF THE INFRARED SENSE ORGANS IN THE FACIAL PIT OF PIT VIPERS
QUART J MICROSCOPY 98 219

BULLOCK T
ELECTRICAL SENSING IN FISH - IN MACROMOLECULAR SPECIFICITY AND BIOLOGICAL MEMORY, SCHMITT, F, ED
MIT PRESS, CAMB

BULMER M
THE CONCENTRATION OF URFA IN THERMAL SWEAT
J PHYSIOL LOND 137 261

BULMER M, FORWELL G
SODIUM AND POTASSIUM IN THERMAL SWEAT
ZZRAF INST OF AVIA MED, FLYING PERSONNEL RES COMM
ZZZ AD59072
FPRC 895 NOV

BURES J, PETRAN M, ZACHAR J
ELECTROPHYSIOLOGICAL METHODS IN BIOLOGICAL RESEARCH
CZECH ACAD SCI ACAD PRESS, NY

BURGER A
ANIMAL ODORS IN NATURE
RIECHSTOFF IND U KOSMETIK 7 125

BURGER A
/ANIMAL ODORS IN NATURE/
RIECHSTOFF IND U KOSMETIK 7 152

BURHAN A
/PULSED RF INDUCING SLEEP/
PROC THIRD AM TRI SERVICE CONF ON BIO EFFECTS OF MICROWAVE RADIATION, P 124 AUG

BURR H, NORTHROP F
EVIDENCE FOR EXISTENCE OF ELECTRO-DYNAMIC FIELDS IN LIVING ORGANISMS
PROC US NAT ACAD SCI. 25 284

BURL MAURO A
/ELECTROSTATIC FIELD ABOUT NEURONS/
YALE J BIOL AND MED 21 455
CAIRNS J H
APPARATUS FOR INVESTIGATING TOTAL HEMISPHERICAL EMISSIVITY
JOURNAL OF SCIENTIFIC INSTRUMENTS 37 84  MARCH 60

CALHOUN J
THE STUDY OF WILD ANIMALS UNDER CONTROLLED CONDITIONS
ANN NY ACAD SCI 51 1113  56

CALLIS C VANWAYER J SHOOLER J
ANALYSIS OF PHOSPHORUS COMPOUNDS BY NUCLEAR MAGNETIC RESONANCE
ANALYT CHEM 28 269  56

CALLOWAY D
NUTRITIONAL ASPECTS OF THE ALL-PURPOSE SURVIVAL RATION - A CRITICAL APPRAISAL
ARMED FORCES FOOD AND CONTAINER INST, NATICK
REP 25-59  JULY  59

CAMERON G
TISSUE CULTURE TECHNIQUE
ACAD PRESS, NY  60

CAMPEN, ED
USAF GEOPHYS RES DIR, CAMBRIDGE RES LAB
HANDBOOK OF GEOPHYSICS FOR AIR FORCE DESIGNERS  57

CANADA NAT RES COUNC, OTTAWA
QUARTERLY BULLETIN OF THE DIVISION OF MECHANICAL ENGINEERING AND THE NATIONAL AERONAUTICAL ESTABLISHMENT
AD297553  DME/NAE 1962/4/ DECEMBER  62

CARLSON L
MAN IN COLD ENVIRONMENT - A STUDY IN PHYSIOLOGY
ARCTIC AEROMED LAB
AD67874  AUG  54

CARPENTER J
AN ECOLOGICAL GLOSSARY
HAFNER, NY  56

CARPENTER R
STUDIES ON THE EFFECTS OF 2450 MEGACYCLES RADIATION ON THE EYE OF THE RABBIT
PROC THIRD ANNUAL TRI-SERVICE CONF ON BIO EFFECTS OF MICROWAVE RADIATING EQUIP  279  59

CARPENTER R
AN EXPERIMENTAL STUDY OF THE BIOLOGICAL EFFECTS OF MICROWAVE RADIATION IN RELATION TO THE EYE
TUFTS U, MEDFORD, MASS
ROME AIR DEV CENT, AIR RES AND DEV COMM, GRIFFISS AFB, NY
AD275840  TECH NOTE RADC-TDR-62-131  FEBRUARY  62

CARR A  69
HANDBOOK OF TURTLES
ITHACA, NY

CARR D, VANLOPIK J
TERRAIN QUANTIFICATION PHASE 1- SURFACE GEOMETRY MEASUREMENTS
TTEXAS INST INC, SCI SERVICES DIV, DALLAS
ZGEOPHYS RES DIRECTORATE, CAMBRIDGE RES LABS, BEDFORD MASS
ZG AD297492
AFGL-63-208 FINAL REP DEC 31

CARREL I, ED
HOUNDS AND HUNTING
DECATUR, ILL

CARROLL K
CHARACTER RECOGNITION DEVICES FOR ELECTRONIC COMPUTERS, AN ANNOTATED BIBLIOGRAPHY
ZGLOCKHEED MISSILES AND SPACE DIV, SUNNYVALE CALIF
ZG AD251661
SPECIAL RES BIBLIO SRF-60-11 NOVEMBER

CARTHY J
ANIMAL NAVIGATION
SCRIBNERS, NY

CASE J, GWITHAM G
AMINO ACID SENSITIVITY OF THE DACTYL CHEMORECEPTORS OF CARCINIDES MAENAS
BIOL BULL 121 449

CASE J
RESPONSE OF NEREIS TO ALCOHOLS
COMP BIOCHEM PHYSIOI 6 47

CASELLA C, RAPUZZI G, TACCARDI B
RELATION BETWEEN THE TACTILE AND CHEMICAL SENSITIVITY OF SINGLE FUNGIFORM PAPILLAE OF THE FROG TONGUE
BOLL SOC ITAL BIOL sper 37 1403

CASIDA J, COPPEL H, WATANABE T
SEX ATTRACTION FROM PINE SAWFLY FEMALE ACTIVE AT NANOGRAM LEVELS
J ECON ENTOMOL 56 18

CATON J
SENSES OF SIGHT AND SMELL OF THE WILD TURKEY AND THE COMMON DEER
AM NATURALIST 3 28

CATTON W T
THE EFFECTS OF SUBLIMINAL STIMULATION ON THE EXCITABILITY OF FROG SKIN TACTILE RECEPTORS
J PHYSIOI 164 90

CAUNA N, MAUVER G
STRUCTURE OF HUMAN DIGITAL PACINIAN CORPUSCLES AND THEIR FUNCTIONAL SIGNIFICANCE
J ANAT, LOND 92 1

CAZZAMALLI F
HETERODYNED RADIATION RETURN FROM HUMAN BRAINS IN RESPONSE TO RF ENERGY
NEUROLOGICA 6 193

CHADWICK L DETHIER V
THE RELATIONSHIP BETWEEN CHEMICAL STRUCTURE AND THE RESPONSE OF BLOWFLIES TO TARSAL STIMULATION
J GEN PHYSIOL 30 255

CHADWICK L DETHIER V
STIMULATION OF TARSAL RECEPTORS OF THE BLOWFLY BY ALIPHATIC ALDEHYDES AND KETONES
J GEN PHYSIOL 32 445

CHALMERS
ATMOSPHERIC ELECTRICITY
BOOK

CHAMBERS J DALRYMPLE P
COLOR REGIONS OF THE WORLD
ZZQM RES AND DEV CENT, NATICK, ENVIR PROT RES DIV
ZZZ AD117336
TECH REP EP-37 NOV 56

CHAMBERS J
AN ENVIRONMENTAL COMPARISON OF SOUTHEAST ASIA AND THE ISLAND OF HAWAII
ZZQM RES AND ENG CENT, NATICK
RES REP RER-38 JAN 61

CHANCE B LEGALLIS V
CONTINUOUS FLOW ELECTRON PARAMAGNETIC MEASUREMENT
REV SCI INST 30 732

CHAPANIS A ROUSE R O SCHACHTER S
THE EFFECT OF INTER-SENSORY STIMULATION ON DARK ADAPTATION AND NIGHT VISION
J EXP PSYCHOL 39 425

CHAPMAN J CRAIG R
AN ELECTROPHYSIOLOGICAL APPROACH TO THE STUDY OF CHEMICAL SENSORY RECEPTION IN CERTAIN INSECTS
CANAD ENTOM 85 182

CHAPMAN R
SURVEY AND EVALUATION OF PHENOMENA AND TECHNIQUES IN ULTRAVIOLET, VISIBLE, AND SUBMILLIMETER REGIONS FOR APPLICATION TO DETECTION AND AIDS TO SURVEILLANCE
ZZGEOPHYS CORP OF AMER, BEDFORD
ZZUS AIR FORCE
ZZZ AD261585
REP GCA-61-35A JULY 1

CHAPMAN S
DOGS IN POLICE WORK, A SUMMARY OF EXPERIENCE IN GREAT BRITAIN AND THE UNITED STATES
PUBLIC ADMIN SERVICE, CHICAGO

CHAPMAN V
THE APPLICATION OF AERIAL PHOTOGRAPHY TO ECOLOGY AS EXEMPLIFIED BY THE NATURAL VEGETATION OF CEYLON
CHARNOCK J  SMITH C  SCHWARTZ C  
SERUM MAGNESIUM – CHOLESTEROL RELATIONSHIPS IN THE CENTRAL AUSTRALIAN ABORIGINES AND IN EUROPEANS WITH AND WITHOUT ISCHAEMIC HEART DISEASE  
AUST J EXP BIOL MED 37 509

CHASEN L  COLABRESE E  HIMMELSTEIN D  
SEALED ATMOSPHERES AND PSYCHOPHYSIOLOGICAL FACTORS – A BIBLIOABSTRACT  
ZZMISSILES AND SPACE VEHICLE DEPT, GEN ELEC CO, PHILA, PA  
ZZZ AD238478  
TIS REP R60DS344

CHITFIELD C  
FOOD AND AGRICULTURE ORGANZN, UNITED NATIONS  
FOOD COMPOSITION TABLES FOR INTERNATIONAL USE  
49

CHEATHAM P  
A COMPARISON OF THE VISUAL AND AUDITORY SENSES AS POSSIBLE CHANNELS FOR COMMUNICATION  
ZZWADC, WPAFB, OHIO  
ZZZ AT17687  
TR 5919  MAY

CHEESMAN L  
OBSERVATIONS ON THE LAND CRAB, CARDISOMA ARMATUM, WITH ESPECIAL REGARD TO THE SENSE ORGANS  
ZOOLOGICAL SOCIETY PROCEED, LONDON  P 361

CHENG-PIN L  PING-CHENG H  HUI W  
STUDIES ON THE ANALYSIS OF PURINE AND PYRIMIDINE BASES OF NUCLEIC ACID, PART TWO, A DIRECT SPECTROPHOTOMETER METHOD FOR THE ANALYSIS OF THE PURINE AND PYRIMIDINE BASES IN RIBONUCLEIC ACID  
SCIENTIA SINICA 12 673 63

CHERONIS N  
FLUORESCENCE MEASUREMENTS TO TEN TO THE MINUS 13 GRAMS PAGE TEN IN SUBMICROGRAM EXPERIMENTATION INTERSCIENCE  
61

CHILES W  
EXPERIMENTAL STUDIES OF PROLONGED WAKEFULNESS  
ZZAERO MED LAB, WADC, WPAFB, OHIO  
ZZZ AD100698  
WADC TR 55-395 DEC

CHILES W  FOX R  
A STUDY OF THE EFFECTS OF THE IONIZED AIR ON BEHAVIOR  
ZZBEHAV SCI LAB, WADD AND PHYS CHEM AND ENG CO, BOULDER  
ZZWRIGHT AIR DEV DIV, WPAFB, OHIO  
ZZZ AD252099  
WADD TR-60-598 NOVEMBER

CHILES W  ADAMS O  
HUMAN PERFORMANCE AND THE WORK-REST SCHEDULE  
ZZLOCKHEED AIRCRAFT, MARIETTA, GA  
ZZAEROSPACE MED LAB, AERONAUTICAL SYS DIV, WPAFB, OHIO
CHOLAK J
THE QUANTITATIVE SPECTROGRAPHIC DETERMINATION OF BIOLOGICAL MATERIAL
INDUST AND ENG CHEM /ANAL E 10 619

CHOLAK J
THE QUARTZ SPECTROGRAPHIC DETERMINATION OF LEAD IN URINE
J AM CHEM SOC 57 104

CHORLEY T
DIPTERA ATTRACTED BY THE SCENT OF CATTLE-DUNG AND URINE
PROC ROY ENT SOC LOND 23 9

CHRISTOPHERS S
THE YELLOW FEVER MOSQUITO, Aedes Aegypti
CAMBRIDGE U PRESS

CLAMANN H
PROBLEMS OF METABOLISM IN SEALED CABINS
PRESENTED AT SECOND SYMPOS, PHYSICS AND MED OF ATMOSPHERE
AND SPACE, SAN ANTONIO TEX NOV

CLAPPER P
HOUND THE ENEMY
MARINE CORPS GAZETTE FEB

CLARK C
VINEGAR R HARDY J D
GONIOMETRIC SPECTROMETER FOR THE MEASUREMENT OF DIFFUSE
REFLECTANCE AND TRANSMITTANCE OF SKIN IN THE INFRARED
SPECTRAL REGION
J OPT SOC AMER 43 993

CLARK C
BIBLIOGRAPHY OF INFRARED SPECTRA OF BIOCHEMICALS
ANN NY ACAD SCI 69 205

CLARK D
AN ARMY COMBAT TEAM FOR SOUTHEAST ASIA
ZZARMY OPNS RES OFFICE
ZZ AD316647
ORO-SP-73 OCT

CLARKE G
ELEMENTS OF ECOLOGY
WILEY, NY

CLARK G
HEMOGLOBIN ANALYSIS TO 30 MICROMICROGRAMS BY INFRARED
SPECTROSCOPY
IN ENCYCL OF MICROSCOPY, REINHOLD, NY

CLARK G
HANDBOOK OF SPECTROSCOPY
REINHOLD

CLARK H
SANITARY WASTE DISPOSAL FOR NAVY CAMPS IN POLAR REGIONS
ZZCLARK AND GROFF ENGINEERS, SALEM OREGON
CLARK L
INQUIRES INTO THE ANATOMICAL BASIS OF
OLFACTORY DISCRIMINATION
PROC ROY SOC 146 299
57

CLAUSEN J VANDERBILT C
VISUAL BEATS CAUSED BY SIMULTANEOUS ELECTRICAL AND PHOTIC
STIMULATION
AMER J PSYCHOL 70 577
57

CLEARY M HARVARD J
NATURAL ENVIRONMENTAL DATA AND SUPPORT REQUIREMENTS
ZZOFC OF STAFF METEOROL, HQAFSC, WASH
ZZ AD296108
TECH DOC REP NO AFSC-TDR-63-2 JANUARY
63

CLEMENTS F SHELFORDBIO-ECOLOGY
WILEY, NY
39

COATES J SHARPE L
CHEMICALS FOR CONTROL OF VEGETATION
ZZ INST FOR DEFENSE ANALY, RES AND ENGNGL ENGNG SUPPORT DIV, WASH
ZZ AD297146
TN NO 62-68 JAN
63

COERMANN R
THE PASSIVE DYNAMIC MECHANICAL PROPERTIES OF THE HUMAN
THORAX-ABDOMEN SYSTEM AND THE WHOLE BODY SYSTEM
AEROSPACE MED 31 443
60

COHEN M HAGIWARA S ZOTTERMAN
THE RESPONSE SPECTRUM OF TASTE FIBRES IN A CAT A
SINGLE FIBRE ANALYSIS
ACTA PHYSIOL SCAND 33 316
55

COLEGERIDGE G
ANIMAL ATTRACTIONS AND REPULSIONS
CONTEMP REV 117 539
20

COLLINS K
ENDOCRINE CONTROL OF SALT AND WATER IN HOT CONDITIONS
FED PROC 22 717
63

COMMONER B
ELECTRON SPIN RESONANCE FOR FREE RADICALS IN
LIVING MATERIAL/
PROC US NAT ACAD SCI 44 1110
58

CONDIT D REASON B MUGHISUDDIN M
A COUNTERINSURGENCY BIBLIOGRAPHY
ZZ SPCL OPNS RES OFF, AMERICAN U, WASH
ZZ DEPT OF THE ARMY
ZZ AD294857
JAN
63

CONDIT D
A SYSTEM FOR HANDLING DATA ON UNCONVENTIONAL WARFARE
INCLUDING A BIBLIOGRAPHY OF OPEN SOURCES
ZZARMY OPNS RES OFFICE
ZZZ AD105860
ORO-T-339 MAY 56

CONDON E ODISHAW H
HANDBOOK OF PHYSICS
MCGRAW-HILL, NY 58

CONKLIN J
THREE FACTORS AFFECTING THE GENERAL LEVEL OF ELECTRICAL
SKIN RESISTANCE
AMER J PHYSIOl 64 78 51

CONN DAVI/SPECTROFLUORIMETRY, ARGinine/
NATURE 183 1053 59

CONN A REPORT BIBLIOGRAPHY ON PHOTOGRAPHY AND PHOTO EQUIPMENT
ZZASTIA REF CENTER, LIBRARY OF CONGRESS
ZZZ AD117631
ARC-1649U JAN 55

CONNERTY H BRIGGS A EATON E
DETERMINATION OF PREFORMED URINARY AMMONIA BY MEANS OF
DIRECT NesslerIZATION
AM J CLIN PATHOL 58 634 57

COOK M KEYES R POUND E
ELECTRIC FIELDS AND ELECTROMAGNETIC RADIATION FROM CHEMICAL
EXPLOSIONS
ZZARMY OFFICE SPCL WPN DEVEL FT BLISS
AFOSR TN-K9-551

CONSOLAZIO C MATOUSH L NELSON R
CALCIUM IN SWEAT AND ITS POSSIBLE RELATION TO CALCIUM
REQUIREMENTS
J NUTRIT 78 78 62

CONSOLAZIO C NELSON R MATOUSH L
NITROGEN EXCRETION IN SWEAT AND ITS RELATION TO NITROGEN
BALANCE REQUIREMENTS
J NUTRIT 79 400 63A

CONSOLAZIO C MATOUSH L NELSON R
EXCRETION OF SODIUM, POTASSIUM, MAGNESIUM AND IRON IN
HUMAN SWEAT AND THE RELATION OF EACH TO BALANCE AND
REQUIREMENTS
J NUTRIT 79 408 63B

CONSOLAZIO C
ZZARMY MED RES AND NUTRIT LAB, DENVER
THE NITROGEN EXCRETION IN SWEAT AND ITS RELATION TO
NITROGEN BALANCE AND REQUIREMENTS
REP 270 63C

COOK E
THE INFLUENCE OF INSTRUMENTATION, TISSUE PREPARATION, AND
PERIOD OF DRUG ACTION ON THE RESPONSE OF ISOLATED RABBIT
ILEAL SEGMENTS TO ACETYLCOLINE
COPELAND J
MILLIMETER WAVELENGTH RADIOMETRY
ARMY ORD MISSILE CMD, REDSTONE ARS, ALA
AD294542
P 23 IN RES LAB QTLY RES REV, RR-TR-62-4 DEC 31 61

COPELAND M
OLFACTORY REACTIONS OF THE SPOTTED NEWT, DIEMYCTYLUS VIRIDISCENS
J ANIM BEHAV 3 260 13

COPPEL H
SEX ATTRACTANT EXTRACT FROM PINE SAWFLY FEMALE ACTIVE AT NANOGRAM LEVELS/
ANN ENTOMOL SOC AMER 53 510 60

CORSO J
THE EFFECTS OF NOISE ON HUMAN BEHAVIOR
PENN STATE COLLEGE
ZZAERO MED LAB, WADC, WPAFB, OHIO
AD18259
WADC TR 53-81 DEC 52

COSGRIFF R
ELECTROMAGNETIC DEFLECTION PROPERTIES OF NATURAL SURFACES WITH APPLICATIONS TO DESIGN OF RADARS AND OTHER SENSORS ANTENNA LAB, OHIO STATE U
AIR FORCE TR 33/616/-3649 WADC XX

COTT H
ADAPTIVE COLORATION IN ANIMALS METHUEN, LOND 57

COTTREAU J
L-ODORAT CHEZ LES INSECTS NATURE, LOND 34-2 39 05

COUJARD R
ETUDE DES GLANDES ODORANTES DE LAPIN ET DE LEUR INFLUENCE MENT PAR LES HORMONES SEXUELLES REV CANAD BIOL 6 3 47

COWLING T
THE ABSORPTION OF WATER VAPOR IN THE FAR INFRARED REP PROG PHYS 9 29 43

CRAgg J
REACTIONS OF LUCILIA SERICATA TO VARIOUS SUBSTANCES PLACED ON SHEEP PARASITOL 40 179 50A

CRAgg J
THURSTON R
REACTIONS OF BLOWFLIES TO ORGANIC SULFUR COMPOUNDS AND OTHER MATERIALS USED IN TRAPS PARASITOL 40 187 50B

CRAgg J
RAMOGE G
CHEMOTROPIC STUDIES ON BLOWFLIES
PARASITOLOGY 36 168

CRAIGHEAD F
RADIO TRACKING OF GRIZZLY BEARS
ZUMONTANA STATE U
ABSTRACT FOR NATL GEOGRAPHIC SOCIETY

CRAIG R BARTEL A KIRK P
PHOTOMETER AND ABSORPTION CELL ATTACHMENT FOR
ULTRAMICRO-SPECTROPHOTOMETRY
REV SCI INSTR 24 49

CRAIG W
THE DOG AS DETECTIVE
SCIENTIFIC MONTHLY 18 38

CRAZER M
ODORS, OLFACION AND TRAINED ODOR DETECTORS
PROTAB 7 127

CRISLER R FENTON A
THE INFRARED SPECTRA OF FATTY ACIDS, SOAPS AND TRIGLYCERIDES
FROM 15-30 MICRONS
PROCTOR AND GAMBLE, CINCINNATI

CRISP D MEADOWS P
CHEMICAL BASIS OF GREGARIOUSNESS IN CIRRIPEDES
PROC ROY SOC 156 500

CRISTMAN R DOHERTY W
HUMAN FACTORS, ANNOTATED BIBLIOGRAPHY ON SPEECH
COMMUNICATIONS JAMMING
ZZROME AIR DEV CENT, GRIFFISS AFB, N Y
ZZZ AD114273
RADC-TR-57-25 FEBRUARY

CROCKER E
COMPREHENSIVE METHOD FOR THE CLASSIFICATION OF ODORS
PROC SCI SECT, TOILET GOODS ASSOC 6 24

CROCKER E
THE NATURE OF ODOR
TECH PAP PULP PAP IND NY 35 169

CROMBIE A
ON OVIPOSITION OLFACTORY CONDITIONING AND HOST SELECTION
IN RHIZOPERTHA DOMINICA FAB INSECTA COLEOPTERA
J EXP BIOL 18 62

CROMBIE A DARRAH J
THE CHEMORECETORS OF THE WIREWORM AGRIOTES SPP AND THE
RELATION OF ACTIVITY TO CHEMICAL CONSTITUTION
J EXP BIOL 24 95

CROOK D
A BIBLIOGRAPHY ON DARK ADAPTATION
ZZTUFTS COLL, MEDFORD
ZZNRC VISION COMM
ZZZ AD19508
CUTTIS H
BIOELECTRIC MEASUREMENTS
IN BIOPHYSICAL RESEARCH METHODS VOL 8
INTERSCIENCE NY 59

CUTTHERTSON D GUTHRIE W
EFFECT OF VARIATION OF PROTEIN AND SALT INTAKE ON THE
NITROGEN AND CHLORIDE CONTENTS OF SWEAT
BIOCHEM J 28 1444 34
DAMON A
SOME HOST FACTORS IN DISEASE, SEX RACE ETHNIC GROUP
J NAT MED ASS  54 424 62

DANIEL G  KASPAREK F
COMPREHENSIVE BIBLIOGRAPHY OF RESEARCH REPORTS ISSUED OVER
A NINETEEN-YEAR PERIOD BY THE NAVAL SCHOOL OF AVIATION
MEDICINE
NAVAL SCHOOL OF AVIATION MED, PENSACOLA FLA 61
AD258940
RESEARCH REPORT MAY 1

DANSEREAU
A UNIVERSAL SYSTEM FOR RECORDING VEGETATION
CONTRIB DE LINSTITUTE UNIV-MONTREAL 72 58

DANZER A
SMELL ORIENTATION OF GECRUPES SILVATICUS IN NATURAL
SURROUNDINGS
Z VERGLEICH PHYSIOL  39 76 56

DARKE S
THE CUTANEOUS LOSS OF NITROGEN COMPOUNDS IN AFRICAN ADULTS
BRIT J NUTRIT  14 115 60

DARLINGTON P
ZOOGEOGRAPHY - THE GEOGRAPHICAL DISTRIBUTION OF ANIMALS
WILEY, NY  57

DARROW C
QUANTITATIVE RECORDS OF CUTANEOUS SECRETORY REACTIONS
J GEN PSYCHOL  11 445 34

DAS GUPTA S  MONMOHAN S
STUDIES ON THE SERUM SODIUM AND POTASSIUM LEVELS AND ON THE
24 HOURS URINARY EXCRETION OF 17-KETOSTERIODS IN HEALTHY
ADULTS
IND J MED RES  44 31 56

DAVIDSON F  WYCKOFF R
X-RAY FLUORESCENT YIELDS FROM SEVERAL LIGHT ELEMENTS
DEPT OF PHYSICS, UNIV OF ARIZONA, TUCSON
J APPL PHYSICS VOL 33 NO 12 3528 DECEMBER 62

DAVIDSON S
HUMAN NUTRITION AND DIETETICS
BOOK  59

DAVIES G
REPORTS DEALING WITH NUTRITION IN RELATION TO SURVIVAL
FEEDING
DEFENCE RESEARCH BOARD, BIBLIO SERIES, CANADA
AD89656 DRB 55/5827 JUNE 55

DAVIES J  TAYLOR F
OLFACTORY THRESHOLD - A TEST OF A NEW THEORY
PERFUM AND ESSEN OIL REC  46 15 55

DAVIES M  /20
THE INFRARED ABSORPTION OF ASPARAGINE AND GLUTAMINE
J CHEM SOC XXX 480

DAVIS H
BIOLOGIC TRANSDUCERS
FED PROC 12 661

DAVIS H
DOG ENCYCLOPEDIA
STACKPOLE, HARRISBURG

DAVIS J
SOME PRINCIPLES OF SENSORY RECEPTOR ACTION
PHYSIOL REV 41 391

DAVIS J
MANUAL OF SURFACE ELECTROMYOGRAPHY
MCGILL U REPRINT FROM 1952 AS WADC TR-59-184

DAVIS J
RAPID COLORIMETRIC DETERMINATION OF ADENINE COMPOUNDS
ANAL BIOCHEM 5 64

DAVIS L
HOW FATIGUE EFFECTS PRODUCTIVITY - A STUDY OF MANUAL WORK PATTERNS
PERSONNEL 30 54

DAVIS L
TRAINING AND USE OF DOGS FOR CW DETECTION
Z K-9 TRAINING AGENCY HYDE MD

PAPPA JOHN K
BIBLIC OF THE BIOLOGICAL EFFECTS OF MAGNETIC FIELDS
FED PROC 21 PT 2, PG 1

DAY W
A SURVEY OF THE RESEARCH LITERATURE COMPARING THE VISUAL AND AUDITORY PRESENTATION OF INFORMATION

DEAN R
NITROGENOUS CONSTITUENTS OF URINE IN KWASHIORKOR
FED PROC 20 202

DEANE G E
HUMAN HEART RATE DURING ANXIETY
PERCEPT MOTOR SKILL 8 103

DECHARMS R
STUDIES IN THE PSYCHOLOGY OF AGGRESSION
WASH UNIV, ST LOUIS MO

DEESE J
STUDIES OF DETECTABILITY DURING CONTINUOUS VISUAL SEARCH
ELECTROPHYSIOLOGICAL EVIDENCE THAT WATER STIMULATES A FOURTH SENSORY CELL IN BLOWFLY TASTE RECEPTOR
DEFOREST M EVANS D
AM ZOOL 1 377

POLAROGRAPHY OF GASES
DEHN H GUTMANN V
MONATSCHR 93 1348

THE VOLATILE SUBSTANCES OF URINE
DEHN W HARTMAN F
J AM CHEM SOC 36 2118

THE CAUSE OF THE CHARACTERISTIC ODOR OF URINE
DEHN W HARTMAN F
J AM CHEM SOC 36 2136

ATTENUATION OF LIGHT IN THE EARTHS ATMOSPHERE AND RELATED PROBLEMS
DEIRMENDJIAN D
DEPT OF METEOROLOGY, U OF CAL AT LOS ANGELES
GEOPHYS RES DIV, AF CAMB RES CENT
SCI REP NO 1 JULY 52

INTERNATIONAL ENCYCLOPEDIA OF COSMETIC MATERIAL TRADE NAMES
DENAVARRE M
MOORE 57

THE COMPLETE DOBERMAN PINSCHER
DENLINGER, RICHMOND 53

THE COMPLETE BEAGLE
DENLINGER, RICHMOND 56

NORMAL VALUES FOR URINARY EXCRETION OF LEAD AND COPROPORPHIRIN TOGETHER WITH BASOPHILIC RED BLOOD CELL COUNT IN CHINESE CHINESE MED J 80 538

THE INFANTRY GOES TO THE DOGS
DERINGER C
INFANTRY OCT-DEC 58

/REFLECTANCE OF LIVING AND DEAD SKIN/
DERKSON W MONAHAN T
J OPT SOC AMER 42 263 52

RESEARCH REPORT ON REFLECTANCE AND ABSORPTION OF HUMAN SKIN
DERKSON W Delprey G MONOAHAN T
REPT AFSPW 840 55
DESHJARDINS J ZEFF J BAMBENEK R
WASTE COLLECTION FOR A SPACE VEHICLE MR 1092
ZZAMER MACH AND FOUNDRY CO, ALEXANDRIA, VIRGINIA
ZZAEROSPACE MED DIV, WRIGHT AIR DEV DIV, WPAFB, OHIO
ZZ AD243608
WADD TECH REP 60-290 MAY 60

DETHIER V
CHEMICAL INSECT ATTRACTANTS AND REPELLENTS
BLAKISTON

DETHIER V
REJECTION THRESHOLDS OF THE BLOWFLY FOR A SERIES OF
ALIPHATIC ALCOHOLS
J GEN PHYSIOL 30 247

DETHIER V
THE ROLE OF ANTENNAE IN THE ORIENTATION OF CARRION
BEETLES TO ODOR
J NY ENTOMOL SOC 55 285

DETHIER V
CHEMORECEPTION IN INSECTS
PHYSIOL REV 28 220

DETHIER V
THE LIMITING MECHANISM IN TARSAL CHEMORECEPTION
J GEN PHYSIOL 35 55

DETHIER V
THE RELATION BETWEEN OLFACTORY RESPONSE AND RECEPTOR
POPULATION IN THE BLOWFLY
BIOL BULL, WOODS HOLE 102 11

DETHIER V
OLFACTORY RESPONSES OF BLOWFLIES TO ALIPHATIC ALDEHYDES
J GEN PHYSIOL 37 743

DETHIER V
THE PHYSIOLOGY AND HISTOLOGY OF THE CONTACT CHEMORECEPTORS
OF THE BLOWFLY
QUART REV BIOL 30 348

DETHIER V
CHEMORECEPTOR MECHANISMS
MOLECULAR STRUCTURE AND FUNCTIONAL ACTIVITY OF NERVE
CELLS /GRENNELL R MULLINS L, EDS/
ZZAM INST BIOL SCI, WASH

DETHIER V WOLBARTSHT M
THE ELECTRON MICROSCOPY OF CHEMOSENSORY HAIRS
EXPERIENTIA 12 335

DETHIER V
CHEMORECEPTION AND THE BEHAVIOR OF INSECTS
IN SURVEY OF BIOL PROG VOL 3 B GLASS ED ACAD PRESS NY 57A

DETHIER V
THE SENSORY PHYSIOLOGY OF BLOOD SUCKING ARTHROPODS /MITES,
TICKS, LICE, FLEAS, FLIES/
DETHIER V
EFFECT OF TEMPERATURE ON THE CONTACT CHEMORECEPTORS
OF THE BLOWFLY
J INSECT PHYSIOL 2 153

DELVER H
LIPIDS, CHEMISTRY AND BIOCHEMISTRY
INTERSCIENCE

DIAMOND J
THE DEPRESSION OF THE RECEPTOR POTENTIAL IN PACINIAN
CORPUSCLES
J PHYSIOL, LOND 141 117

DICKE R
THE MEASUREMENT OF THERMAL RADIATION AT MICROWAVE FREQUENCIES
REV SCI INST 17 268

DICKSON D
RADIATION ABSORBED BY WATER VAPOR IN THE ATMOSPHERE
UTAH UNIV MET DEPT
AIR FORCE
AN APPROXIMATE METHOD FOR DETERMINING THE AMOUNT OF SOLAR
REP NO 5

DIEDERICH H
POLICE AND WORK DOGS IN EUROPE
US DEPT COMMERCE AND LABOR, BUREAU OF MANUF, WASH

DIEM K
GEIGY SCIENTIFIC TABLES, SIXTH ED
GEIGY PHARMACEUTICALS, ARDSLEY NY
CONTAINS TABLES G AND H

DILL D B
COMPOSITION OF SWEAT DURING ACCLIMATIZATION TO HEAT
AM J PHYSIOL 123 412

DIITTMER D
GREBE R
HANDBOOK OF RESPIRATION
NNRC WASH AND USAF DAYTON
WADC TR-58-352 AUGUST

DIXEY F
SCENTS OF BUTTERFLIES
NATURE 87 164

DOBSON R
ABELE D
HALE D
THE EFFECT OF HIGH AND LOW SALT INTAKE AND REPEATED
EPISODES OF SWEATING ON THE HUMAN ECCRINE SWEAT GLAND
J INVEST DERM 36 327

DOBSON R
FURTHER STUDIES ON THE HUMAN ECCRINE SWEAT GLAND
Oregon Med School, Portland
ZZARMY SURG GENL
ANN REP FEB 15

DOELLING N
KRYTER K
CHARACTERISTICS OF NOISF PRODUCED BY SEVERAL CONTEMPORARY ARMY WEAPONS
ZZBOLT BERANEK AND NEWMAN, CAMBRIDGE, MASS
RES AND DEV DIV, DEPT OF THE ARMY
ZZ AD212420
REP NO 630 MARCH 6 59

DOLL R BERKSHIRE J
BIBLIOGRAPHY, PSYCHOLOGICAL RESEARCH IN THE U. S. NAVAL SCHOOL OF AVIATION MEDICINE
ZZNAVAL SCHOOL OF AVIATION MED, PENSACOLA FLORIDA
ZZ AD258939
RESEARCH REPORT FEBRUARY 6 61

DORN F
HUND UND UMWELT, EIN BUCH ÜBER ALLE FRAGEN DER ZUCHTUNG, HALTUNG UND ERZIEHUNG DES RASSEHUNDES UNTER BESONDERER BERÜCKSICHTIGUNG DES GEBRACHSHUNDEWESENS AUFGEZEIGT AM DOBERMANN
DEUTSCHER BAUERNVERLAG, BERLIN 57

DORSEY N
PROPERTIES OF ORDINARY WATER-SUBSTANCE IN ALL ITS PHASES WATER VAPOR, WATER AND ALL THE ICES
REINHOLD PUBLISHING CORP, NEW YORK 40

DOWNEY F
DOGS FOR DEFENSE, AMERICAN DOGS IN WORLD WAR TWO
MCDONALD NY 55

DRAVNIEKS A
POSSIBLE MECHANISMS OF OLFACITION
NATURE 194 4025 245 62

DRUMMOND A
A NEW APPROACH TO THE MEASUREMENT OF TERRESTRIAL RADIATION
ZZEPPELLEY LAB INC., NEWPORT RI
ZZGEOPHYSICS RES DIRECTORATE, AFCRL, BEDFORD, MASS
ZZ AD265139
FINAL REPORT JULY 61

DRUMMOND R
LACKEY E
VISIBILITY OF SOME FOREST STANDS OF THE U.S.
QMR AND EC TECH REP EP-36 MAY 56

DRYDEN C HANS L
HITCHCOCK F
ARTIFICIAL CABIN ATMOSPHERES FOR HIGH ALTITUDE AIRCRAFT
ZZFOR USAF AERO MED LAB, WADC
WADC TECH REP 55-353 56

DUBOIS GAUTIER
THE AFRICAN CIVET AND OTHER VIVIRREDAE
LA FRANCE ET SES PARFUMES 2 3 59

DUGGAN
/SPECTROFLUORIMETRY, URIC ACID/
ARCH BIOCHEM BIOPHYS 68 1 57
DUNKLE R
SPECTRAL REFLECTANCE MEASUREMENTS, SYMPOSIUM, SURFACE EFFECTS ON SPACECRAFT MATERIALS
PAGE 117 IN REP OF FIRST SYMP, WILEY NY

DUNELMAN L
HORIZONTAL ATTENUATION OF ULTRAVIOLET AND VISIBLE LIGHT BY THE LOWER ATMOSPHERE
NAVAL RES LAB, WASH
NRL 4031 SEPT

DUNN F
DESTRUCTIVE EFFECT OF SOUND
J ACOUS SOC AMER 29 395

DUNTLEY S
THE REDUCTION OF APPARENT CONTRAST BY THE ATMOSPHERE
J OPT SOC AMER 38 179

DURVELLE J
THE PREPARATION OF PERFUMES AND COSMETICS
SCOTT, GREENWOOD, LOND

DUTKY S
SCHERCHTER M
US DEPT AGRICULTURE ENTOMOL RES DIV
MONITORING ELECTROPHYSIOLOGICAL AND LOCOMOTION ACTIVITY

DURIGINS R
FACTORS AFFECTING SIGNALING BY VISUAL METHODS
CHEM RES DEPT, US NAVAL ORDNANCE LAB, WHITE OAK, MD
NAVORD REP 6034 DEC 19

DOWORKIN S
MINE DETECT, ARMY ENG RES AND DEV, FT BELVOIR, VA
ZZZ AD292994
ZZZ 2381
VARIATION IN REFLECTANCE OF VEGETATION AND SOILS CAUSED BY AN UNDERGROUND NUCLEAR EXPLOSION
FINAL TECHNICAL REP NOVEMBER 1

DYSON G
SURVEY OF THE CHEMISTRY OF NATURAL AND SYNTHETIC MUSK SUBSTANCES
CHEM AGE, LOND 24 489
EAGLESON C
INSECT OLFATORY RESPONSES, CONSTRUCTION AND USE OF AN
OLFACTOMETER FOR FLIES
SOAP SANIT CHEM 15 123

EARLEY W
SUPPRESSION OF SCENT IN RABBITS
NATURE 8 78

EARP
/SANITARY SIGNIFICANCE OF ODORS/
AMER J PUBL HLTH 13 283

EDOZIEN J PHILLIPS E
PARTITION OF URINE NITROGEN IN KWASHIORKOR
NATURE LOND 191 47

EDSALL
RAMAN SPECTRA OF AMINO ACIDS AND RELATED COMPOUNDS
J AM CHEM SOC 72 474

EDSTROM J
QUANTITATIVE DETERMINATION OF RIBONUCLEIC ACID IN THE
MICROMICROGRAM RANGE
J NEUROCHEM 3 100

EDWARDS A S
EFFECTS OF THE LOSS OF 100 HOURS SLEEP
AMER J PSYCHOL 54 80

EDWARDS D
SOME OBSERVATIONS ON THE EFFECTS ON HUMAN SUBJECTS OF AIR
AND STRUCTURE BORNE VIBRATIONS OF VARIOUS FREQUENCIES
ZZFLYING PERSON RES CENT, GT BRITAIN
ZZZ AD115863
SEPT

EDWARDS D
EFFECTS OF ARTIFICIALLY PRODUCED ATMOSPHERIC ELECTRICAL
FIELDS ON ACTIVITY OF SOME ADULT DIPTERA
CANAD J ZOOL 38 899

EDWARDS E A DUNTELY S Q
PIGMENTS AND COLOR OF LIVING SKIN, REFLECTANCE CHANGE WITH
AGE, SEX, RACE
AMER J ANAT 65 1

EDWARDS E A DUNTELY S Q
/SPECTROPHOTOMETRIC REFLECTANCE MEASUREMENTS TO DETERMINE
PIGMENT CHANGES AFTER EXPOSURE TO SUNLIGHT/
SCIENCE 90 235

EDWARDS E
/SPECTROPHOTOMETRY OF LIVING HUMAN SKIN IN UV RANGE/
J INVEST DERM 16 311

ELDER T STRONG J
THE INFRARED TRANSMISSION OF ATMOSPHERIC WINDOWS
J FRANKLIN INST 255 189 MARCH

ELIZAROV Y U
/27
<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Title</th>
<th>Journal/Book</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>H Elkins</td>
<td>The Chemistry of Industrial Toxicology</td>
<td>Wiley, NY 2nd Ed</td>
<td>59</td>
</tr>
<tr>
<td>J Eller</td>
<td>Body Odor</td>
<td>Medical Record</td>
<td>41</td>
</tr>
<tr>
<td>A Ellicott</td>
<td>Advances in Mass Spectrometry</td>
<td>Macmillan</td>
<td>63</td>
</tr>
<tr>
<td>D Ellson</td>
<td>A Report on Detection of Deception</td>
<td>Indiana U</td>
<td>52</td>
</tr>
<tr>
<td>W Elasser</td>
<td>Far Infrared Absorption of Atmospheric Water Vapor</td>
<td>Astrophysics J</td>
<td>38</td>
</tr>
<tr>
<td>S Emanuel</td>
<td>Quantitative Determination of the Sebaceous Glands and Function with particular mention of two methods employed</td>
<td>Acta Dermat Venereol</td>
<td>36</td>
</tr>
<tr>
<td>Emanuel</td>
<td>Mechanism of Sebum secretion</td>
<td>Acta Dermatol Venereol</td>
<td>38</td>
</tr>
<tr>
<td>R Emerling</td>
<td>Velocity Measuring System Employing Modulated Light Doppler Techniques</td>
<td>Electro-Optical Systems, Pasadena, Cal</td>
<td>61</td>
</tr>
<tr>
<td>T Engen</td>
<td>Pfaffmann C Absolute Judgments of Odor Intensity</td>
<td>J Exp Psychol</td>
<td>59</td>
</tr>
<tr>
<td>N England</td>
<td>Sharples N Some Measurements at 3.18 cm Wavelengths of Human Tissue</td>
<td>Nature</td>
<td>49</td>
</tr>
</tbody>
</table>
EOLIAN S. ERAMIAN S.
ON CHANGES IN THE EXCITABILITY OF THE OLFATORY ANALYZER
DURING THE ACTION OF VARIOUS INDUSTRIAL SUBSTANCES
VESTZ OTORINOLARING 22 40

ERIKSEN C.
PARTITIONING AND SATURATION OF THE PERCEPTION FIELD AND
EFFICIENCY OF VISUAL SEARCH
ZZZ AD40730
WADC TR 54-161 APRIL

ESAKOV A.
EFFERENT CONTROL OF RECEPTORS /CHEMORECEPTORS OF THE
TONGUE/
BULL EXP BIOL MED, USSR 51 237

EVANS C L.
SWEATING IN RELATION TO SYMPATHETIC INNERVATION
BRIT MED BULL 13 197

EVANS D.
MELLON D.
ELECTROPHYSIOLOGICAL STUDIES OF A WATER RECEPTOR
ASSOCIATED WITH THE TASTE SENSILLA OF THE BLOWFLY
J GEN PHYSIOL 45 487

EVANS G.
RADAR CONFUSION REFLECTORS- AN ANNOTATED BIBLIOGRAPHY
ZZLOCKHEED MISSILES AND SPACE CO, SUNNYVALE CALIFORNIA
ZZZ AD296383
SPECIAL BIBLIO 5B-62-38 OCT

EVANS L.
BACTERIAL FLORA OF NORMAL HUMAN SKIN
J INVEST DERMATOL 15 305

EVANS R.
KRANER H.
SCHROEDER G.
ON SITE RADON STUDIES IN SURFACE SOILS PROJECT VELA
ZGEDERTON, GERMESHAUSEN AND GRIER, BOSTON
ZZU.S. AIR FORCE
ZZZ AD294019
REP NO B-2516 DEC

EVERED D.
/FREE AMINO ACIDS IN URINE/
LONDON U, PHD THESIS

EVERED D F.
The Excretion of Amino Acids in the Human
BIOCHEM J 62 416

EWALD H.
HINTENBERGER H.
METHODS AND USES OF MASS SPECTROSCOPY
ZZMAX-PLANCK INST FOR CHEMISTRY, MAINZ
ZZZ AEC, DIV OF TECHNICAL INFORMATION
TRANSLATION AEC-TR-5080

EWING G.
INSTRUMENTAL METHODS OF ANALYSIS
MCGRAW HILL
Eysenck H
The Dynamics of Anxiety and Hysteria
Routledge, Lond
FAIR WELLS / DETERMINATION OF ODOR IN WATER/ WATER WORKS ENG 87 1051
FAIR G Geyer J WATER SUPPLY AND WASTE-WATER DISPOSAL WILEY NY 54
FALES H PISANO J GAS CHROMATOGRAPHY OF BIOLOGICALLY IMPORTANT AMINES ANALYTICAL BIOCHEM 3 337 62
FENNING W REFERENCE SOURCES IN THE PHYSIOLOGY OF EXTREME ENVIRONMENTAL TEMPERATURES ZZENG RES INST, U MICH ZZ ARMY ORDNANCE PROJ 2167 54
FESSERT A LES ORGANS ELECTRIQUES TRAIT DE ZOOL 13 1143 MASSON, PARIS XX
FESTER G BERTUZZI F GLAND SECRETION OF THE ALLIGATOR /YACAROL/ BERICHTE 67 365 34
FESTER G /ODOROUS SUBSTANCES OF THE ANIMAL KINGDOM/ CIENCIA INVEST /BUENOS AIRES/ 1 111 45
FINAN J FINAN S HARTSON L A REVIEW OF REPRESENTATIVE TESTS USED FOR THE QUANTITATIVE MEASUREMENTS OF BEHAVIOR-DECREMENT UNDER CONDITIONS RELATED TO AIRCRAFT FLIGHT USAF TECH REP NO 5830 JULY 49
FISCHER R TASTE BLINDNESS AND VARIATIONS IN TASTE THRESHOLD IN RELATION TO THYROID METABOLISM RECENT ADVANCES B I O L PSYCHIAT 3 198 61
FITCHES H MASS SPECTRA OF SOME STEROIDS ADVAN IN MASS SPECTROM 2 428 63
FLEISCHMANN L GESUNDHEITSSCHADLICHKEIT DER MAGNET WECHSELFELDER NATURWISSEN 10 434 22
FLEROV K FAUNA OF USSR MAMMALS - MUSK DEER AND DEER ACAD SCI USSR, MOSCOW 52
FLEMING I TERRESTRIAL MAGNETISM AND ELECTRICITY MCGRAW HILL, NY 39
FLETCHER K LEITHEAD A ALDOSTERONE EXCRETION IN ACCLIMATIZATION TO HEAT ANN TROP MED AND PARASITOL 55 498 61
FLOCK A, WERSALL J
A STUDY OF THE ORIENTATION OF THE SENSORY HAIRS OF THE RECEPTOR CELLS IN THE LATERAL LINE ORGAN OF FISH, WITH SPECIAL REFERENCE TO THE FUNCTION OF THE RECEPTORS
J CELL BIOL 15 19

FLUGGE C
GERUCHLICHE RAUMORIENTIERUNG VON DROSOPHILA MELANOGASTER Z VERGLEICH PHYSIOL 20 463

FORD A
FOUNDATION OF BIOELECTRONICS FOR HUMAN ENGINEERING ZNAV ELECTRONICS LAB SAN DIEGO

FOREMAN H, BROOKS M
STUDIES ON DETECTION OF BIOLOGICAL EFFECTS OF MAGNETIC FIELDS LOS ALAMOS SCI Lab REPORTS 2627 94

FORRESTER A T, GUDMUNSEN R A, JOHNSON P O
PHOTOELECTRIC MIXING OF INCOHERENT LIGHT PHYS REV 99 1691

FORRESTER A T
PHOTOELECTRIC MIXING AS A SPECTROSCOPIC TOOL J OPT SOC AMER 51 253

FORSTER G
/Sексual attractants of crustacea/
J MAR BIOL ASSOC U.K. 30 333

FOSTER D
FUTURE PATHWAYS OF OLFACTORY RESEARCH PROC SCI SECT TOILET GOODS ASS 14 14

FOSTER H
/Magnetic resonance spectrometry/
ANAL CHEM 34 255R

FOSTER K G
RELATION BETWEEN THE COLLIGATIVE PROPERTIES AND CHEMICAL COMPOSITION OF SWEAT
J PHYSIOL /LONDON/ 155 490

FOULKE E
COMMUNICATION BY ELECTRICAL STIMULATION OF THE SKIN ZZU OF LOUISVILLE, LOUISVILLE, KY ZZUS ARMY MED RES AND DEV CMD, WASH ZNZ AD294648 ANNUAL PROG REP NOV

FOX D
ANIMAL BIOCHROMES AND STRUCTURAL COLOUPS UNIV PRESS, CAMBRIDGE

FOX W
VISUAL DISCRIMINATION AS A FUNCTION OF STIMULUS SIZE, SHAPE, AND EDGE GRADIENT ZZBOSTON U, PHYSICAL RES LABS, BOSTON MASS
FREE J  BUTLER G
BUMBLEBEES
LONDON  59

FREE L
INFRARED BACKGROUND NOISE MEASURING PROGRAM
ZZNAVAL UNDERWATER SOUND LAB, NEW LONDON
AUG 10  61

FREEMAN G  Darrow C
INSENSIBLE PERSPIRATION AND THE GALVANIC SKIN REFLEX
AM J PHYSIOL  111 55  35

FREEMAN N
INFRARED SPECTRA OF SOME LIPOPROTEINS AND RELATED LIPIDS
/STEROIDS/
J BIOL CHEM  203 293  53

FREY A
AUDITORY SYSTEM RESPONSE TO MODULATED RADIO FREQUENCY
ENERGY
ZZGEN ELEC ADVAN ELECTRON CENTER, CORNELL U, ITHACA, NY
JULY 20  61A

FREY A
AUDITORY SYSTEM RESPONSE TO RADIO FREQUENCY ENERGY
J AEROSPACE MED ASSOC  AUG  61B

FREY A H
HUMAN AUDITORY SYSTEM RESPONSE TO MODULATED
ELECTROMAGNETIC ENERGY
J APPL PHYSIOL  17 689  62

FRIEDLAND S  ZIEMBA F  ZIMMERMAN
A PROTON RECOIL NEUTRON SPECTROMETER UTILIZING A
SEMICONDUCTOR RADIATION DETECTOR
ZZSOLID STATE RADIATIONS INC, LOS ANGELES CALIF
ZZDIAMOND ORD FUZE LABS, ORDNANCE CORPS, WASH DC
ZZZ AD294324
FINAL REPORT NP-12226 NOVEMBER 16  62

FRIEDMAN H
17-KETOSTEROID EXCRETION IN INDIANS
LANCET  2 262  51

FRIEDMAN M
ARTIFICIAL INTELLIGENCE-SOVIET BLOC, BIBLIOGRAPHY
ZZLINCOLN LAB OF MIT, LFXINGTON MASS
ZZU,S, AIR FORCE
ZZZ AD271667
EIGHTH REFERENCE BIBLIO DECEMBER 27  61

FRIEDMAN S  JAMIESON J  NAKASHIMA M
SODIUM AND POTASSIUM SENSITIVE GLASS ELECTRODES FOR
BIOLOGICAL USE
SCIENCE  130 1252  59

FRIEDMAN S  NAKASHIMA M
SINGLE SAMPLE ANALYSIS WITH THE SODIUM ELECTRODE
ANALYT BIOCHEM  2 568  61
<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Title</th>
<th>Journal</th>
<th>Volume</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fries J A</td>
<td>COLONIC GASES AND DIET</td>
<td>AM J Physiol</td>
<td>16</td>
<td>468</td>
</tr>
<tr>
<td>Frings H</td>
<td>LOCI OF Olfactory end-organs in the Honeybee</td>
<td>J Exp Zool</td>
<td>97</td>
<td>123</td>
</tr>
<tr>
<td>Frings H</td>
<td>Gustatory thresholds for sucrose and electrolytes for the cockroach Periplaneta Americana</td>
<td>J Exp Zool</td>
<td>102</td>
<td>23</td>
</tr>
<tr>
<td>Frings H and Oneal B</td>
<td>The loci and thresholds of contact chemoreceptors in females of the horsefly Tadanus Sulcifrons Macq</td>
<td>J Exp Zool</td>
<td>103</td>
<td>61</td>
</tr>
<tr>
<td>Frings H</td>
<td>A contribution to the comparative physiology of contact chemoreception</td>
<td>J Comp Physiol Psychol</td>
<td>41</td>
<td>25</td>
</tr>
<tr>
<td>Frings H and Frings M</td>
<td>The loci of contact chemoreceptors in insects</td>
<td>AM Midland Nat</td>
<td>41</td>
<td>602</td>
</tr>
<tr>
<td>Frings H and Hamrum C</td>
<td>The contact chemoreceptors of adult yellow fever mosquitoes</td>
<td>J NY Ent Soc</td>
<td>58</td>
<td>133</td>
</tr>
<tr>
<td>Frings H and Boyd W</td>
<td>Evidence for olfactory discrimination by the Bobwhite quail</td>
<td>AM Midland Nat</td>
<td>48</td>
<td>181</td>
</tr>
<tr>
<td>Frings H and Cox B</td>
<td>The effects of temperature and the sucrose thresholds of the tarsal chemoreceptors of the flesh fly Sarcophaga bullata</td>
<td>Biol Bull</td>
<td>107</td>
<td>360</td>
</tr>
<tr>
<td>Fry W</td>
<td>Mechanism of acoustic absorption in tissue</td>
<td>J Acoust Soc</td>
<td>24</td>
<td>412</td>
</tr>
<tr>
<td>Fry W</td>
<td>Zzavail from Comm on hearing and bio-acoustics, NRC Wash, DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fryberger D</td>
<td>Study of atmospheric electricity</td>
<td>Zzarmour Res Fdn, Chicago</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Zzusaf Camb Res Labs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Zzad 267264</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sept</td>
<td></td>
<td></td>
<td>61</td>
</tr>
<tr>
<td>Fujii N</td>
<td>The biochemical examination of urine</td>
<td>Zogo Igaku</td>
<td>13</td>
<td>478</td>
</tr>
</tbody>
</table>
FUJIOKA H
URINARY CHANGE FOLLOWING EXERCISE 1 CHANGES IN URINARY
VOLUME WITH REFERENCE TO SOME OTHER COMPONENTS, 2 CHANGES
IN NA AND K IN REFERENCE TO SOME OTHER COMPONENTS
MIE-IGAKU 4 567

FURCHGOTT
/EFFECTIONS ON ISOLATED AORTA STRIP LENGTH OF TRACES OF
BIOCHEMICAL SUBSTANCES
J PHARM EXP THER 108 129
GAITO J
ENVIRONMENTAL REQUIREMENTS OF SEALED CABINS FOR SPACE AND
ORBITAL FLIGHTS, 3 PERFORMANCE AND HABITABILITY ASPECTS
OF EXTENDED CONFINEMENT
ZZNAV AIR MATER CENT, PHILA
ZZZ AD205381
REPT NAMC-ACEL-385

GALLAGHER J DEES J STRAUCH R
EXCITATION AND DETECTION TECHNIQUES FOR MILLIMETER WAVE
TRANSITIONS
ZZMARTIN COMPANY, ORLANDO FLORIDA
ZZARMY SIGNAL SUPPLY AGENCY, FT MONMOUTH N J
ZZZ AD295715
FIRST QUARTERLY PROGRESS REPORT OCTOBER 24 62

GALLIOS G
SUMMARY REPORT ON ELECTROMAGNETIC HAZARDS STUDIES ON
ORDNANCE
ZZMAXSON ELECTRONICS CORP, NY, NY
ZZTECH SERVICES LAB, AMMUNITION GROUP PICATINNY ARSENAL NJ
ZZZ AD287979
REP NO 4112-1 AUGUST 62

GANDY H W GINTHER R J
STIMULATED EMISSION OF ULTRA-VIOLET RADIATION FROM
GADOLINIUM ACTIVATED GLASS
APPL PHYS LETTERS 1 25 62

GARBEH M
SOVIET RESEARCH ON GRAVITATION, AN ANALYSIS OF PUBLISHED
LITERATURE
ZZGARBELL RESEARCH FOUNDATION, SAN FRANCISCO
ZZSCI AND TECHNOLOGY SECTION AIR INFORMATION DIVISION
ZZZ AD246700
AID REPORT 60-61 OCTOBER 60

GARLOCK E HURLEY M
MEASUREMENT OF 17-HYDROXYCORTICOSTEROIDS IN URINE -
DEVELOPMENT OF A METHOD FOR THE MEASUREMENT OF
PREGNANEDIOL IN URINE
ZZHAZLETON LABS, WASH, DC
ZZUS ARMY RES AND DEV COMM, WASH, DC
ZZZ AD294974
ANNUAL PROGRESS REP JAN 63

GARTRELL F CARPENTER S
AERIAL SAMPLING BY HELICOPTER - A METHOD FOR STUDY OF
DIFFUSION PATTERNS
J METEOROL 12 215 55

GARTRELL F CARPENTER S
AERIAL SAMPLING BY HELICOPTER - A METHOD FOR STUDY OF
DIFFUSION PATTERNS
IND HYG DIGEST 20 27 56A

GARTRELL F CARPENTER S
AERIAL SAMPLING BY HELICOPTER - A METHOD FOR STUDY OF DIFFUSION PATTERNS
PUBL HEALTH ENGR ABSTR 36 6 56B

GARY N
HONEYBEE SEX ATTRACTANT IN QUEEN MANDIBULAR GLANDS IDENTIFIED AS DECANOIC ACID DERIVATIVE/
SCIENCE 135 773 62

GAZAN M
FLAVOURS AND ESSENCES /A HANDBOOK OF FORMULAE/
CHAPMAN LTD, LOND 36

GAZENKO O BAYEVSKY R
SOVIET LITERATURE ON LIFE SUPPORT SYSTEMS AND BIOSCIENCES
ZZAEROSPACE INFO DIV, LIBRARY OF CONGRESS
ZZZ AD283005
AID REP 62-91 62

GEBHARD J W MOWBRAY G H
ON DISCRIMINATING THE RATE OF VISUAL FLICKER AND AUDITORY FLUTTER
AMER J PHYSIOL 72 521 59

GEE A
CONTROL OF ODORS IN EVACUATION AIRCRAFT
ZZF D SNELL, NY
ZZZ AT1159415
AFTR 6565 PT 1 AND 2 51

GEIGER
THE CLIMATE NEAR THE GROUND
HARVARD U PRESS, CAMBRIDGE 57

GELARD F
THE HUMAN SENSES
WILEY, NY 53

GELINAS R GENOUD R
A BROAD LOOK AT THE PERFORMANCE OF INFRARED DETECTORS
ZZE Zacorp, Eng Div, Santa Monica, CAL
ZZZ AD295044
P-1697 MAY 11 59

GERICKE O
SPECTRUM AND CONTOUR ANALYSIS OF ULTRASONIC PULSES FOR IMPROVED NONDESTRUCTIVE TESTING
ZZZ Watertown Arsenal Labs, Mass
ZZZ AD249903
WAL TR 830.5/1 DEC 60

GERICKE O
GEOMETRY OF HIDDEN DEFECTS DETERMINED BY ULTRASONIC PULSE ANALYSIS AND SPECTROSCOPY
ZZZ Watertown Arsenal Labs, Watertown Mass
ZZZ AD296033
Tech Rep WAL TR 830.5/5 DECEMBER 62

GERISCHER H
ELECTRODE PROCESSES
ANN REV PHYS AND CHEM 12 XX 61
GERSON N
THE ATMOSPHERE
GEOPHYS RES DIR, AFCRC AIR RES AND DEV COMMAND, CAMBRIDGE
AF SURVEYS IN GEOPHYSICS NO 73 AFCRC TN-55-216 SEPTEMBER 55

GESTELAND R
ACTION POTENTIALS RECORDED FROM OLFATORY RECEPTOR NEURONS
MIT PHD THESIS 61A

GESTELAND R PITTS W
ALLIGATOR OLFACtION
MIT RLE QUART PROG REP 60 226 JAN 15 61B

GEX R
EFFECTS OF NUCLEAR RADIATION ON THE OPTICAL, ELECTRICAL
AND THERMOPHYSICAL PROPERTIES OF SOLIDS, AN ANNOTATED
BIBLIOGRAPHY
ADDENDUM TO THE SPACE MATERIALS HANDBOOK
LOCKEED MISSILES AND SPACE DIVISION, CALIFORNIA
SPECIAL BIBLIOGRAPHY SB-61-42 AUGUST 61

GEX R
SPACE TRAVEL AND HUMAN THERMAL LIMITS - A SELECTED
BIBLIOGRAPHY
LOCKEED MISSILES AND SPACE DIV, SUNNYVALE, CAL
SPECIAL BIBLIO SB-61-33 FEB 62

GIBBONS D LOVERIDGE B MILLETT R
RADIOACTIVITY ANALYSIS - A BIBLIOGRAPHY
UK, ATOMIC ENERGY AUTHORITY RES, HARWELL
EERE I/R 2208 AUGUST 57

GIBBS G
SALT IN SWEAT
AEROSPACE MED RES LABS, WP-AFB OHIO
MRL TDR/62-50 MAY 62A

GIBBS K HALL E
BIBLIOGRAPHY OF BIBLIOGRAPHIES
ARLINGTON VA
AD281900 AUGUST 62B

GIBSON H GROSSMAN W COOKE W D
/FLAME SPECTROMETRY/
ANAL CHEM 35 266

GIDDINGS J
THEORY OF MINIMUM TIME SEPARATION IN GAS CHROMATOGRAPHY
ANAL CHEM 34 314

GIER J T DUNKLE R V BEVANS J T
MEASUREMENT OF ABSOLUTE SPECTRAL REFLECTIVITY FROM 1 TO 15 MICRONS
J OPT SOC AMER 44 558 JULY 54

GILL E
CONDORS SENSE OF SMELL
TRANSACT NAT HIST SOC NORTHUMBERL 1 40 04

GILL J WEISSBLUTH M
THERMOLUMINESCENCE AND ELECTRON PARAMAGNETIC RESONANCE OF AMINO ACIDS, POLYPEPTIDES AND PROTEINS IRRADIATED WITH ULTRAVIOLET LIGHT
ZZBIOPHYSICS LAB, STANFORD UNIV, STANFORD CALIF
ZZOFFICE OF NAVAL RESFARCH
ZZAD294395 TECH REP NO 2 B.L. REP NO 77 OCTOBER 62

GILLESPIE T
TASTE OR SCENT IN THE OSTRICH
SCOT NATURALIST XX 168 22

GILMAN J
PERSPECTIVES IN HUMAN MALNUTRITION
GRUNE AND STRATTON NY 51

GILMOUR D
THE BIOCHEMISTRY OF INSECTS
ACAD PRESS, NY 60

GINI B
SPACE FEEDING, CLOSED ECOLOGICAL SYSTEM FOR EXTENDED TRAVEL
A REVIEW OF PERTINENT LITERATURE
QM FOOD AND CONTAIN INST LIBRARY BULL 2 JUNE 60

GIONIS N
AUTOCORRELATION OF PULSE POSITION MODULATED SIGNALS
ZZSCHOOL OF ENGNG AF INST OF TECHNOLOGY WP AFB, OHIO
ZZAD294922 GE/EE/62-7 DECEMBER 62

GIVAUDAN, DELAWANNA INC
THE GIVAUDAN INDEX, SPECIFICATIONS OF SYNTHETICS AND ISOLATES FOR PERFUMERY
GIVAUDAN-DELAWANNA INC 49

GIVENS M
A STUDY OF THE OPTICAL PROPERTIES OF SOLIDS IN THE EXTREME VACUUM ULTRAVIOLET AND THE SOFT X-RAY REGION 100-1500 A
ZZUNIV OF ROCHESTER INSTITUTE OF OPTICS, ROCHESTER NY
ZZARMY ORDNANCE
ZZAD296616 FINAL REPORT JANUARY 63

GLASCOCK H ED
JOINT US-CANADIAN CONFERENCE ON ENVIRONMENTAL PHYSIOLOGY
ZZARMY MED RES LAB, FT KNOX, KY
ZZAD264971 REPORT NO 474 NOVEMBER 60

GLASER E M LEE T S
ACTIVITY OF HUMAN SWEAT GLANDS DURING EXPOSURE TO COLD
J PHYSIOL 122 59

GOING C
DOGS AT WAR
MACMILLAN NY 44

GOKHALE S
NITROGEN PARTITION IN URINE, A STUDY BASED ON THE
EXAMINATION OF URINES OF 251 HEALTHY INDIA MALES
IND J MED RES 51 92 63

GOLDBERG B LUFKIN D PENNDORF R
SLANT VISIBILITY
ZGEOGRAPHY RES DIRECTORATE, AF CAMB RES CENT
ZZZ AD3276
AF SURVEYS IN GEOPHYSICS NO 21 DEC 52

GOLDBLITH S WICK E
ANALYSIS OF HUMAN FECAL COMPONENTS AND STUDY OF METHODS FOR
THEIR RECOVERY IN SPACE SYSTEMS
ZZMIT DEPT OF NUTRIT
ZZAEROSPACE MED LAB, WP-AFB
ZZZ AD266882
REPORT ASD-TR-61-419 61

GOLDBY F HICKS C OCONNOR W
A COMPARISON OF THE SKIN TEMPERATURE AND SKIN CIRCULATION
OF NAKED WHITES AND ABORIGINES EXPOSED TO SIMILAR
ENVIRONMENTAL CHANGES
AUSTRAL J EXP BIOL AND MED SCI 6 29 38

GOLDFINGER P HUYBRECHTS G VERBEKE G
MASS SPECTROMETRIC STUDY OF FAST REACTIONS AT ATMOSPHERIC
PRESSURE
ADV IN MASS SPECTROM 2 360 63

GOLDMAN D
MECHANICAL VIBRATION AND ITS EFFECTS ON MAN
ZZNAVAL MED RES INST, BETHESDA, MD
ZZZ AD6179
LECTURE AND REVIEW SERIES NO 52-1 FEB 6 52

GOLDMAN D
THE BIOLOGICAL EFFECTS OF VIBRATION
ZZARMED FORCES-NRC COMMITTEE ON HEARING AND BIO-ACOUSTICS
ZZZ AD256926
MARCH 61

GOLDSMITH T
THE VISUAL SYSTEM OF THE HONEYBEE
PROC NAT ACAD SCI 44 123 58A

GOLDSMITH T RUCK P
THE SPECTRAL SENSITIVITIES OF THE DORSAL OCHEL OF
COCKROACHES AND HONEYBEES
J GEN PHYSIOL 41 1171 58B

GOLDSMITH
THE NATURE OF THE RETINAL ACTION POTENTIAL, AND THE
SPECTRAL SENSITIVITY OF UV AND GREEN RECEPTOR SYSTEMS
OF THE COMPOUND EYE OF THE WORKER HONEYBEE
GRASSI BATTISTA CASTRONONOVA A
/CONTRIBUTION ON THE OLFATORY ORGANS OF DOGS/
ARCH MIKROSKOP ANAT 34 385

GRAVITT D
X-RAY METHODS OF MINE DETECTION
ZZMINE DET BR ARMY ENG R AND D LAB, FT BELVOIR
ZZZ AD294144
TECH REPT 1723-TR SEPTEMBER 28

GRAY D, ED
AMERICAN INSTITUTE OF PHYSICS HANDBOOK
MCGRAW HILL

GRAY E PUMPHREY R
ULTRASTRUCTURE OF THE INSECT EAR
NATURE LOND 181 618

GRAY J
ENERGETICS OF SENSORY EFFECTS
NATURE LOND 170 823

GRAYBIEL A GUEDRY F JOHNSON W
ADAPTATION TO BIZARRE STIMULATION OF THE SEMI-CIRCULAR
CANALS AS INDICATED BY THE OCULOGLYRAL ILLUSION
AEROSPACE MED 32 321

GREEN A, ED
THE MIDDLE ULTRAVIOLET AND ITS APPLICATIONS
ZZGENL DYNAMICS CORP ASTRO DIV
REP ERR-AN-185

GREEN D
AUDITORY DETECTION OF A NOISE SIGNAL
ZZAVAIL FROM COMM ON HEARING AND BIO-ACOUSTICS, NRC WASH, DC

GREEN N
/SPECIAL ATTRACTIVENESS OF AMINES, SULFIDES, FATTY ACIDS AND AMMONIA TO INSECTS INDUCING BEHAVIOR RESPONSES/
ADVANCES IN PEST CONTROL 3 129

GREENBERG L
HANDBOOK OF COSMETIC MATERIAL
INTERSCIENCE, NY

GREER R PEARSON W HAVRON M
EVASION AND SURVIVAL PROBLEMS AND THE PREDICTION OF CREW PERFORMANCE, CREWSCAT PROBLEM FORM AND MANUAL
ZZAP PERSONNEL AND TRAINING RES CENT, LACKLAND AFB, TEX
ZZZ AD146428
SUPPLEMENT 2 TECH REP AFPRC-TR-57-14 DEC

GRiffin D
ECHOES OF BATS AND MEN
DOUBLEDAY-ANCHOR

GRiffin J
FIELD STUDY OF VARIATION IN CHARACTERISTICS OF SEISMIC
NOISE AND SIGNALS WITH GEOLOGIC AND GEOGRAPHIC
ENVIRONMENT
ZZUNITED EARTH SCIENCES, DIV OF UNITED ELECTRODYNAMICS
ZZAF TECHNICAL APPLICATIONS CENTER, WASH DC
ZZZ AD296938
REP NO VT/078-28 JAN 15 VOLS 1 AND 2 63

GRINKER R
MEN UNDER STRESS
BLAKISTON, PHILA 45

GRITTER R
PRODUCTION AND DETECTION OF FREE RADICALS BY CHEMICAL
AND SPECTROSCOPIC METHODS
ZZUNIV OF CONN
ZZZ AD299008
OCTOBER 62

GRITTER R
THE PRODUCTION AND DETECTION OF FREE RADICALS BY CHEMICAL
AND SPECTROGRAPHIC METHODS
UNIV OF CONN CHEM DEPT FOR QMR AND EC OCT 62

GROSS H
DIE ISERLOHNER DRESSURANSTALT FUR POLIZEIHUNDE
ARCHIV FUR KRIMINAL ANTHROPOL UND KRIMINALSTIK, LEIPZIG 12

GUBIN V
SENSITIVITY OF SMELL IN BEES
PCHELOVOODSTVO USSR 34 17 57

GUGGENHEIM K												WEISS Y	FOSTICK M
COMPOSITION AND NUTRITIVE VALUE OF DIETS CONSUMED BY
STRICT VEGETARIANS
BRIT J NUTR 16 475 62

GUIBERT A	TAYLOR C
THE RADIATION AREA OF THE HUMAN BODY
ZZWADC, WPAFB, OHIO
AF TR-6706 DEC 51

GWYER J	WALDRON V
PHOTO INTERPRETATION TECHNIQUES, A BIBLIOGRAPHY
ZZTECHNICAL INFO DIV, LIBRARY OF CONGRESS
ZZZ AD91699 56
HAAHTI E
MAJOR LIPID CONSTITUENTS OF HUMAN SKIN SURFACE
SCAND J CLIN AND LAB INVEST 13 1 61A

HAAHTI E
FALES H
CONTINUOUS INFRARED FUNCTIONAL GROUP DETECTION OF GAS
CHROMATOGRAPHY ELUATES
CHEM AND INDUST XX 507 61B

HAAHTI E
HORNUNG E
CASTREN O
MICROANALYSIS OF SEBUM AND SEBUM-LIKE MATERIALS BY
TEMPERATURE PROGRAMMED GAS CHROMATOGRAPHY
SCAND J CLIN LAB INVEST 14 368 62

HABGOOD J
SENSITIZATION OF SENSORY RECEPTORS IN THE FROGS
SKIN
J PHYSIOL, LOND 111 195 50

HACK M H
SIGNAL DETECTION IN THE RAT
SCIENCE 139 750 63

HACKFORTH H
INFRARED RADIATION
MCGRaw-HILL NY 60

HAEFNER K
MILLER R
COOPER J
RADIOISOTOPES FOR LOW ALTITUDE MEASUREMENT
GENERAL ELECTRIC CO, SCHENECTADY NY
FLIGHT CONTROL LAB, AERONAUT SYST DIV WP-AFB, OHIO
TECH DOC REP NO ASD-TDR-62-648 NOVEMBER 62

HAGGARD A
GREENBERG C
/GASES AND VAPORS MEASURED IN EXPIRED AIR TOXICOLOGY/
J PHARM EXP THER 66 479 39

HAGGARD H W
BREATH ODORS FROM ALLIACEOUS SUBSTANCES
J AMER MED ASSOC 104 2160 35

HAGGARD H
WHY OTHER PEOPLE SMELL
HYGEIA 19 12 41

HAGINS W
ZONANA H
ADAMS R
LOCAL MEMBRANE CURRENT IN THE OUTER SEGMENTS OF SQUID
PHOTORECEPTORS
NATURE 194/4831/ 844 62

HAGIWARA S
KUSANO K
NEGISHI K
PHYSIOLOGICAL PROPERTIES OF ELECTRORECEPTORS OF SOME
GYMNOTIDS
J NEUROPHYSIOL 25 430 62A

HAGIWARA S
KUSANO K
NEGISHI K
PHYSIOLOGICAL PROPERTIES OF ELECTRORECEPTORS IN SOME
GYMNOTIDS
J GEN PHYSIOL 45 600A 62B
HAINER R, EMSLIE A, JACOBSON A
AN INFORMATION THEORY OF OLFACTION
ANN NY ACAD SCI 58 158 54

HAKKI B
GENERATION OF COHERENT ELECTROMAGNETIC SIGNAL IN THE LOW
AND SUBMILLIMETER RANGE
ZEELECTRICAL ENGNG RES LAB, U OF ILL, URBANA, ILL
ZEELECTRONIC TECH LAB, WPAFB, OHIO
ZZZ AD273415
ASD-TDR-62-39 DEC 61

HALASZ I, SCHNEIDER W
QUANTITATIVE GAS CHROMATOGRAPHIC ANALYSIS OF HYDROCARBONS
WITH CAPILLARY COLUMN AND FLAME IONIZATION DETECTOR
ANAL CHEM 33 978 61

HALDANE J, SPURWAY H
A STATISTICAL ANALYSIS OF COMMUNICATION IN APIS MELLIFERA
AND A COMPARISON WITH COMMUNICATION IN OTHER ANIMALS
INSECTS SOC 1 247 54

HALE E
BEHAVIORAL AND STRESS EFFECTS OF SOUND ON ANIMALS
ZPENN STATE COLLEGE
ZZAERO MED LAB, WADC, WPAFB, OHIO
ZZZ AD25577
WADC TR 53-282 JUNE 53

HALE H
SEASONAL VARIATION IN HUMAN AMINO ACID EXCRETION
ZZDEPT PHYSiol, AF SCHOOL OF AVIAT MED
REP 7758-82 JUNE 59

HALPERIN M
LIMITED WAR, AN ANNOTATED BIBLIOGRAPHY
HARVARD U, CAMBRIDGE 61

HALPERN A, FREDMAN H
ZTHE RAND CORP, SANTA MONICA, CALIF
ZZU.S. AIR FORCE
ZZZ AD7-107,107
ZZZ 2944
COMMUNIST STRATEGY IN LAOS
RM-2561 XX

HALVORSON, SCHULTZE
/ORGANIC COLORIMETRY/
J BIOL CHEM 186 471 50

HAMAMURA Y, NAITO K
FOOD SELECTION BY SILKWORM LARVAE BOMBYX MORI CITRAL
LENAHYL CETATE LENATOL AND TERPIN ACETATE AS ATTRACTANTS
OF LARVAE
NATURE 190 279 61

HAMILTON G
EXPERIMENTAL STUDY OF AN UNUSUAL TYPE OF REACTION IN A DOG
J COMP NEUROL 17 329 07
AMINO ACID SEPARATION
ANAL CHEM 31 1504

HAMILTON W
AMERICAN MAMMALS, THEIR LIVES, HABITS AND ECONOMIC RELATIONS
MCGRAW HILL NY 39

HANNA T
ENVIRONMENTAL REQUIREMENTS OF SEALED CABINS, SOME
RHYSIOLOGICAL MEASURES ON CONFINED SUBJECTS BREATHING RECYCLED GASES
NAV AIR MATER CENT, AIR CREW EQUIP LAB, PHILA
NAMC-ACEL-417 60

HANNON J VIERECK E
PROCEEDINGS - SYMPOSSIA ON ARCTIC BIOLOGY AND MEDICINE 1.
NEURAL ASPECTS OF TEMPERATURE REGULATION
GEOPHYS INST, U OF ALASKA
ARCTIC AEROMED LAB, FORT WAINWRIGHT, ALASKA
61

HANRAHAN G SALTZMAN A
ASIAN GUERRILLA MOVEMENTS, AN ANNOTATED BIBLIOGRAPHY
OPERATIONS RES OFFICE, JOHNS HOPKINS U, MD
SALTZMAN A, ARMY
AD22149
TECH MEM ORO-T-244 JULY 22 53

HANS J KRAL J ZENISEK A
CHROMATOGRAPHY OF AMINO ACID CONTENT OF HUMAN PERSPIRATION WITH WORK/
CHEKHOŠL FIZIOLOGIIA 1 238 52

HANSEN K
SOME OBSERVATIONS WITH A VIEW TO THE POSSIBLE INFLUENCE OF MAGNETISM UPON THE HUMAN ORGANISM
ACTA MED SCAND 97 339 48A

HANSEN K
ON TRANSMISSION THROUGH THE SKIN OF VISIBLE AND ULTRAVIOLET RADIATION
ACTA RADIOL SUPPL 71 48B

HANSEN K
STUDIES MADE TO FIND OBJECTIVE EXPRESSION OF INFLUENCE OF MAGNETISM ON MAN AND TO ASCERTAIN WHETHER THIS INFLUENCE IS CARRIED BY WAY OF AUTONOMIC NERVOUS SYSTEM
ACTA MED SCANDINAV 135 448 49

HANSEN R CORNOG D
ANNOTED BIBLIOGRAPHY OF APPLIED PHYSICAL ANTHROPOLOGY IN HUMAN ENGINEERING
YOH CO, PHILA
AERO MED LAB, WP-AFB
AD155622 WADC TR 56-30 MAY 58

HANSON H
PHYSIOLOGICAL RESPONSE CHANGES OF MEN ATTRIBUTABLE TO BODY
ARMOR, SUN, AND WORK IN A NATURAL DESERT ENVIRONMENT
/INCLUDING NEGRO-WHITE DIFFERENCES/
ZQUARTERMASTER RES AND ENG COMMAND, NATIC MASS
ZZZ AD262076
TECH REP EP-148 JUNE 61

HARDING F
A SURVEY OF INCENTIVES FOR HAZARDOUS OR UNPLEASANT WORKING CONDITIONS
ZPPERSONNEL LAB, PERSON AND TRAIN RES CENT, LACKLAND AFB
ZZZ AD134240
DEV REP AFPRTRC-TN-57-115 AUGUST 57

HARDY E
ANIMALS IN PERFUMERY, ONE, THE CIVET
PERFUM ESSEN OIL REC 38 276 47A

HARDY E
SCENTS FROM INSECTS
PERFUM ESSEN OIL REC 38 403 47B

HARDY E
THE BEAVER AND CASTOREUM
PERFUM ESSENT OIL REC 39 315 48

HARDY E
LESSER KNOWN SOURCES OF MUSK
PERFUM ESSEN OIL REC 40 93 49A

HARDY E
THE DAMAN AND HYRACFUM
PERFUM ESSEN OIL REC 40 367 49B

HARDY E
LOW MOLECULAR WEIGHT FATTY ALCOHOLS FROM WORMS
PERFUM ESSENT OIL REC 47 29 56

HARDY J
RADIATION OF HEAT FROM THE HUMAN BODY
PART THREE, HUMAN SKIN AS A BLACK BODY RADIATOR
J CLIN INVEST 13 615 34A

HARDY J
MUSCHENHEIM C
THE RADIATION OF HEAT FROM THE HUMAN BODY, IV EMISSION,
REFLECTION AND TRANSMITTANCE OF INFRARED RADIATION ON THE HUMAN SKIN /1-15 MICRONS/
J CLIN INVEST 13 817 34B

HARDY J
MUSCHENHEIM C
RADIATION OF HEAT FROM THE HUMAN BODY, V TRANSMISSION OF INFRARED RADIATION OF 0.8-2 MICRONS THROUGH SKIN
J CLIN INVEST 13 825 34C

HARDY J D
RICHARDS C H
A NEW INSTRUMENT FOR MEASURING THE THERMAL RADIATION OF THE ENVIRONMENT
SCIENCE 107 461 48

HARDY J
SUMMARY REVIEW OF THE INFLUENCE OF THERMAL RADIATION ON HUMAN SKIN
HARDY J. HAMMEL H. MURGATROYD D.
SPECTRAL TRANSMITTANCE AND REFLECTANCE OF EXCISED HUMAN SKIN
J APPL PHYSIOL 9 257 56

HARDY J.
THE PHYSIOLOGY OF TEMPERATURE REGULATION
ZZNAV AVIA MED ACCEL LAB, JOHNSVILLE
ZZZ AD242363
REP NO 22 JUNE 9 60B

HARRIS H.
AN INTRODUCTION TO HUMAN BIOCHEMICAL GENETICS
CAMBRIDGE U PRESS 53

HARRIS R.
FOOD COMPOSITION AND NUTRITION PROGRAMS
NUTRIT REV 6 33 48

HARRIS R S.
INFLUENCE OF CULTURE ON MANS DIET
ARCH ENV HEALTH 5 58 62

HARRIS S. MCMURTRY B. SIEGMAN A.
MODULATION AND DIRECT DEMODULATION OF COHERENT AND INCOHERENT LIGHT AT A MICROWAVE FREQUENCY
ZZSTANFORD ELECTRONICS LABS, STANFORD UNIV, CALIF
ZZZELECTROMAG WAR AND COMMUN LAB, AERO SYST DIV, WPAFB
ZZZ AD296920
SEL-62-119 TECH REP NO 176-3 SEPTEMBER 62

HARRIS W. MACKIE R. WILSON C.
PERFORMANCE UNDER STRESS, A REVIEW AND CRITIQUE OF RECENT STUDIES
ZZHUMAN FACTORS RES, LOS ANGELES
TR 6 JULY 56

HARRISON F. DITMAN L.
HABITS OF DROSOPHILA WITH REFERENCE TO ANIMAL EXCREMENT
J ECON ENT 47 935 54

HARRISON G. RAYMOND W.
The estimation of trace amounts of barium or strontium in biological materials by activation analysis
J NUCLEAR ENERGY 1 290 55

HARRISON G A.
The applications of spectrophotometry to the study of skin color inheritance
ACTA GENETICA STAT MED 6 481 56

HARRISON W.
STANDARDIZATION OF THERMAL EMITTANCE MEASUREMENTS
WADC TR-59-510 PTS 1 AND 2

HARVEY A
A BIBLIOGRAPHY ON MICROWAVES
Zadar Res Estab Ministry of Supply, Malvern, Worcs
ZZZ AD104507
RRE Tech Note No 592 April

HASLER A
DISCRIMINATION OF STREAM ODORS BY FISH AND ITS RELATION TO
PARENT STREAM BEHAVIOR
Amer Natur 85 223

HASLER A
THE SENSE ORGANS OLFACTORY AND GUSTATORY SENSES OF
FISHES
IN THE PHYSIOLOGY OF FISHES (BROWN M, ED) ACAD PRESS

HASLER A
INSTRUMENTATION FOR FISH HOMING
Univ Wisconsin

HASSETT C
A COMPARISON OF NUTRITIVE VALUES AND TASTE THRESHOLDS OF
CARBOHYDRATES FOR THE BLOWFLY
Biol Bull 99 446

HATT R
A NEW DORSAL GLAND IN THE GROUND SQUIRREL
Callotoppermophilus with a note on its Anal gland
J Morph Physiol 42 441

HAUSER S
INVESTIGATION OF NEAR ULTRAVIOLET TRANSMITTING LIQUIDS FOR
USE AS KERR CELL FLUIDS IN TRANSIENT SPECTROGRAPHIC
SHUTTERS
ZZZ AD254695
Jan 1

HAUST H
BEVERIDGE J
EFFECT OF VARYING TYPE AND QUANTITY OF DIETARY FAT ON THE
FECAL EXCRETION OF BILE ACIDS IN HUMANS SUBSISTING ON
FORMULA DIETS
Arch Biochem 78 367

HAWK P
OSER B
SUMMERSON W
PRACTICAL PHYSIOLOGICAL CHEMISTRY
13TH ED, LEA AND FEBIGER, PHILA

HAWKES G
COMMUNICATION BY ELECTRICAL STIMULATION OF THE SKIN 1.
ABSOVLUTE IDENTIFICATION OF STIMULUS INTENSITY LEVEL
ZZArmy Med Res Lab, Ft Knox
Rep No 400

HAWKES G
COMMUNICATION BY ELECTRICAL STIMULATION OF THE SKIN 2. THE
STIMULUS INTENSITY RANGE
ZZUS Army Med Res Lab, Ft Knox
ZZZ AD226915
REP NO 401

HAWKINS W R
THE FEASIBILITY OF RECYCLING HUMAN URINE FOR UTILIZATION IN A CLOSED ECOLOGICAL SYSTEM
J AVIAT MED 29 525

58

HAYDEN S
PYROLYSIS -- GAS CHROMATOGRAPHY
ANAL CHEM 35 113

HEATH G
THE STUDY OF COMPLEX IONS IN A MODIFIED MASS SPECTROMETER
ZI ROCKET PROPULSION EST, WESTCOTT
ZZ TECH MEMO 260 OCT

63

HEAVENS O
OPTICAL METHODS IN NON-DESTRUCTIVE TESTING
PROG IN NON-DESTRUC TEST, VOL 3, STANFORD AND FEARSON ED
MACMILLAN NY

61

HECKER E
ISOLATION AND CHARACTERIZATION OF THE SEX ATTRACTANTS OF THE SILKWORM MOTH
PROC TENTH INT CONGR ENTOM 2 293

58

HEDIN P
THE EFFECT OF DIET AND TIME OF FEEDING ON GASTROINTESTINAL GAS PRODUCTION IN RATS
J NUTR 77 229

62

HEFFERNAN J
BARNES D
TECHNICAL PHOTOGRAPHY OF SURFACE MOTION
ZI EDDERTON, GERMESHAUSEN AND GRIER, BOSTON
ZZ TECH MEMO 260 OCT

62

HEGGENESS F
GALACTOSE INGESTION AND URINARY EXCRETION OF CALCIUM AND MAGNESIUM
NUTRIT REV 18 147

60

HEGSTED D M
THE COMPOSITION OF HUMAN ADIPOSE TISSUE FROM SEVERAL PARTS OF THE WORLD
AM J CLIN NUTRIT 10 11

62

HELMER O
ESTIMATION OF URINARY CATECHOLAMINES BY MEANS OF STRIP OF RABBIT AORTA
J LAB CLIN MED 50 737

57

HENDLER E
CROSBIE R
HARDY J
MEASUREMENT OF SKIN HEATING DURING EXPOSURE TO INFRARED RADIATION
ZI AIR CREW EQUIP LAB, NAV AIR MAT CENT, PHILA
ZZ AD1265843
REP NAMC-ACEL-332 MARCH 19

57

HENNEMAN R
LONG E
A COMPARISON OF THE VISUAL AND AUDITORY SENSES AS CHANNELS FOR DATA PRESENTATION
ZZUS AIR FORCE, DAYTON
ZZZ AD61558
WADC TECH REP 54-363 AUGUST

HENNING H
SMELL EXPERIMENTS WITH THE DOG
Z BIOL 70 1

HENRY W
DEVELOPMENT OF ANALYTICAL TECHNIQUES FOR THE DETERMINATION OF MINUTE QUANTITIES OF SELECTED ELEMENTS IN BERYLLIUM
ZZBATTTELLE MEM INST, COLUMBUS O
ZZBUREAU OF NAVAL WEAPONS
ZZZ AD294406
INTERIM REP NO 3 JAN 11

HENRY CHIAMORI
NESSLERIZATION OF AMMONIA FORMED BY UREASE TREATMENT
AM J CLIN PATHOL 59 277

HENSEL H IGGO A WITT I
A QUANTITATIVE STUDY OF SENSITIVE CUTANEOUS THERMORECEPTORS WITH C AFFERENT FIBERS
J PHYSIOL 153 113

HENSEL H
RECENT ADVANCES IN THERMORECEPTOR PHYSIOLOGY IN NEURAL ASPECTS OF TEMPERATURE REGULATION, HANNON AND ZZARCTIC AEROMED LAB
ZZZ AD293130
VIHEREK EDS

HERCULES W
SHOCK AND VIBRATION ENVIRONMENT BIBLIOGRAPHY
ZZHZ ARMED SERVICES TECH INFO AGENCY, ARLINGTON, VA
ZZZ AD277392
AUGUST

HERMAN H T STARK L
SINGLE UNIT RESPONSES IN A PRIMITIVE PHOTORECEPTOR ORGAN
J NEUROPHYSIOL 26 215

HERON W DOANE B K SCOTT T H
VISUAL DISTURBANCES AFTER PROLONGED PERCEPTUAL ISOLATION
CANAD J PSYCHOL 10 13

HERRICK C
NEUROLOGICAL FOUNDATIONS OF ANIMAL BEHAVIOR
HAFNER NY

HERRICK J F KRUSEN F H
PHYSIOLOGICAL AND PATHOLOGICAL EFFECTS OF MICROWAVES
ELECT ENG 72 238

HERSHEY F
HORMONE AND ENZYME MECHANISMS IN SEBACEOUS GLAND EXCRETION
J INVEST DERMATOL 32 1

HERZBERG H EMANUEL I ALEXANDER M
PHOTOGRAMMETRIC ENGNG 23 894 DEC 57

HINES H M, RANDALL J E
MICROWAVE INDUSTRIAL HAZARDS
ELECT ENGNG 71 879 52

HINGTON R
THE MEANING OF ANIMAL COLOR AND ADORNMENT
ARNOLD, LOND 33

HIROMICHI MORITA, SATORU
GENERATOR POTENTIAL OF INSECT CHEMORECEPTOR
SCIENCE 130 922 59

HOBSON R
SHEEP BLOW-FLY INVESTIGATIONS, PART THREE, OBSERVATIONS ON
THE CHEMOTROPISM OF LUCILIA SERICATA
ANN APPL BIOL 23 845 36

HOCHSCHILD R
DIELECTRIC CONSTANT AND CONDUCTIVITY -- BY MICROWAVES
NON-DEST TESTING 21 115 63

HOCKING B
SMELL IN INSECTS
ZZDOPT OF ENTOMOL, U OF ALBERTA
ZZDEFENSE RESEARCH BOARD, OTTAWA CANADA, DIR BIOSCI RES
ZZZ AD241984
REP EP-TR-8 JUNE 60

HODGSON E
A STUDY OF CHEMORECEPTION IN AQUEOUS AND GAS PHASES
BIOL BULL 105 115 53

HODGSON E
PROBLEMS IN INVERTEBRATE CHEMORECEPTION
QUART REV BIOL 30 331 55A

HODGSON E, LETTVIN J, ROEDER K
PHYSIOLOGY OF A PRIMARY CHEMORECEPTOR UNIT
SCIENCE 122 419 55B

HODGSON E, ROEDER K
ELECTROPHYSIOLOGICAL STUDIES OF ARTHROPOD CHEMORECEPTION
GENERAL PROPERTIES OF THE LABELLAR CHEMORECEPTORS OF
DIPTERA
J CELL COMP PHYSIOL 48 5 56

HODGSON E
ELECTROPHYSIOLOGICAL STUDIES OF ARTHROPOD CHEMORECEPTION
RESPONSES OF LABELLAR CHEMORECEPTORS OF THE BLOWFLY
TO STIMULATION BY CARBOHYDRATES
J INSECT PHYSIOL 1 240 57

HODGSON E
CHEMORECEPTION IN ARTHROPODS
ANN REV ENTOMOL 3 19 58A

HODGSON E
ELECTROPHYSIOLOGICAL STUDIES OF ARTHROPOD CHEMORECEPTION
ILL CHEMORECEPTORS OF TERRESTIAL AND FRESH WATER
ARTHROPODS
BIOL BULL 115 114

HODGSON E
TASTE RECEPTORS
SCI AMER 204 135

HOFMANN T
DIE MODERNE PARFUMERIE
J SPRINGER, BERLIN 32 TRANSL EDWARDS, ANN ARBOR

HOLBROOK R
OUTLINE OF A STUDY OF EXTRATERRESTRIAL BASE DESIGN
RAND CORP, SANTA MONICA RM-2161 APR 22

HOLEMANS K
FAECAL EXCRETION OF CALCIUM AND PHOSPHORUS IN AFRICANS
S AFRIC J LAB CLIN MED 8 145

HOLLADAY J
REFERENCES TO RESEARCH ON HIGH-EMISSION SURFACES
ZBBATTELLE MEM INST, COLUMBUS OHIO
ZZZ AD239991
DMIC MEM 57 JUNE 27

HOLLAND A
REFERENCES TO RESEARCH ON HIGH-EMISSION SURFACES
ZBBATTELLE MEM INST, COLUMBUS OHIO
ZZZ AD239991
DMIC MEM 57 JUNE 27

HOLLAND A
SCHULTZ E
MARMON F
SPECTRAL REFLECTIVITY OF THE EARTHS ATMOSPHERE II, A
CONGERIES OF ABSORPTION CROSS SECTIONS FOR WAVELENGTHS
LESS THAN 3000 ANGSTROMS
ZGEOPHYS CORP OF AMER, BEDFORD MASS
ZZAERONAUT SYST DIV, USAF AND NASA, WASH
ZZZ AD297884
GCA TECH REP NO 62-27-A DEC

HOLLOWAY O
JUNGLE WARFARE, AN ANNOTATED BIBLIOGRAPHY
ZZARMY ARTILLERY AND MISSILE SCHOOL LIBRARY, FT SILL OKLA
ZZZ AD263549
USAAMS LIB SPECIAL BIBLIO NO 28 SEPT

HOLLOWAY O
GUERRILLA WARFARE, AN ANNOTATED BIBLIOGRAPHY
ZZARMY ARTILLERY AND MISSILE SCHOOL LIBRARY, FT SILL OKLA
ZZZ AD273166
USAAMS LIB SPECIAL BIBLIO NO 27

HOLMES T
THE NOSE
THOMAS, ILL

HOOVER R
PROCEEDINGS OF BIO-ASSAY AND ANALYTICAL CHEMISTRY MEETING
ZNNATIONAL LEAD COMPANY, CINCINNATI, OHIO
ZZATOMIC ENERGY COMMISSION
AEC REP NLCO-595 HEALTH AND BIOLOGY OCTOBER 6

HOPKINS A
OLFACTORY RECEPTORS IN VERTEBRATES
J COMP NEUROL 41 253

HOPKINS G
A SURVEY OF PAST AND PRESENT INVESTIGATIONS OF THE NATURAL EARTH CURRENTS

HORACEK, K.
EXAMINATION OF LIPIDS IN HUMAN SEBUM BY DISK CHROMATOGRAPHY

HORIGAN, F.
CONTROL OF INSECTS AFFECTING MAN AND HIS HABITATIONS

HORIUCHI, I.
THE ABSORPTION OF SOUND IN HUMID AIR AT LOW AUDIO FREQUENCIES

HOSHIHIMA, K.
sense_of_smell_in_american_vultures, sense_of_smell_in_black_vultures

HOSMER, S.
IDENTIFICATION OF BLOOD COMPONENTS WHICH INDUCE GORGING OF THE MOSQUITO

HOWARD, J.
ABSORPTION OF NEAR INFRARED BLACKBODY RADIATION BY ATMOSPHERIC CARBON DIOXIDE AND WATER VAPOR

HOWARD, J.
NEAR-INFRARED TRANSMISSION THROUGH SYNTHETIC ATMOSPHERES

HOWARD, R.
SUN-SAND AND SURVIVAL, AN ANALYSIS OF SURVIVAL EXPERIENCES IN DESERT AREAS

HOSOI, T.
TASTE SENSITIVITY IN VARIOUS STRAINS OF MICE

HOSHISHIMA, K.
sense_of_smell_in_american_vultures, sense_of_smell_in_black_vultures
<table>
<thead>
<tr>
<th>Author</th>
<th>Title</th>
<th>Journal / Publisher</th>
<th>Year</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOYT F</td>
<td>Method of Measuring Relative Intensities in the X-Ray Spectrum</td>
<td>/For X-Ray Spectroscopy/</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Case Inst., Physics Thesis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSU E</td>
<td>A Factorial Analysis of Human Olfaction</td>
<td>Psychometrika</td>
<td>11</td>
<td>31</td>
</tr>
<tr>
<td>HUBBS C</td>
<td>ZooGeography</td>
<td>1959 AAAS Stanford Paper, AAAS, Wash</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HUBER G</td>
<td>Cholera and the Sodium Pump/Measured Electrically in Isolated Frog Skin</td>
<td>ZNAV Med Res Unit 2, Taiwan</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Report of Nov</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HUEBNER D</td>
<td>Rapid Viewing and Immediate Verbal Report in Recognition of Objects in Natural Environments</td>
<td>ZARMY Electronics Res and Dev Lab, Ft Monmouth NJ</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>USAELRLDL Tech Rep, Aug 2309</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HUMAN RELATIONS AREA FILES, INC</td>
<td>/Annual Technical Report on Southeast Asia/</td>
<td>New Haven, Conn</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HUMAN RESOURCES RESEARCH OFFICE</td>
<td>Bibliography of Reports as of June 30 1961</td>
<td>Army Electronics Res and Dev Lab, Ft Monmouth NJ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HUMPHREYS A</td>
<td>Experimental Design for User Review of Camouflage for the Individual Combat Soldier</td>
<td>ZARMY Infantry Cent, Army Infantry School, Ft Benning GA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HUMPHRY A E</td>
<td>Air Sterilization by Fibrous Media</td>
<td>Indust Eng Chem</td>
<td>47</td>
<td>924</td>
</tr>
<tr>
<td>HUNT C</td>
<td>On the Nature of Vibration Receptors in the Hind Limb of the Cat</td>
<td>J Physiol Lond</td>
<td>155</td>
<td>175</td>
</tr>
<tr>
<td>HURSH J</td>
<td>The Natural Radioactivity of Man</td>
<td>National Lead Co</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Atomic Energy Comm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
IN PROC OF MEETING BIO ASSAY AND ANAL CHEM, AEC NLCO 5-95,55

HUSSAIN A
THE NUTRITION PROBLEM OF THE VILLAGER, INDIA, STUDIES IN VILLAGE PROBLEMS. BOMBAY, CALCUTTA, MADRAS
LONGMANS 51

HUSSAIN R PATWARDHAN V
IRON CONTENT OF THERMAL SWEAT AND IRON DEFICIENCY ANEMIA
LANCET 276 1073 59

HUSSAIN R
DERMAL IRON LOSS IN HEALTHY INDIAN MEN
IND J MED RES 48 235 60
IAMPIETRO P
VOLUNTARY DEHYDRATION DURING PROLONGED DESERT OPERATIONS
ZQM RES AND ENG CENT, NATICK
ZARMY PANEL MEETING ON ENVIRONMENTAL PHYSIOLOGY
OCT 6

IDLIE D FAGERLUND U MAYOH H
OLFACTORY PERCEPTION IN MIGRATING SALMON I L SERINE
A SALMON REPELLENT IN MAMMALIAN SKIN
J GEN PHYSIOL 39 889

ILLER J BOUTHILET L ELD RIDGE C
A BIBLIOGRAPHY FOR THE DEVELOPMENT OF STRESS-SENSITIVE TESTS
ZPSYCHOLOGICAL RES ASSOC
ZPERSONNEL RES BRANCH, DEPT OF THE ARMY
ZZ AD41773
PRB TN 22 OCT

ILSE D
OLFACTORY MARKING OF TERRITORY IN TWO YOUNG MALE APES  
/LORIS TARDIGRADUS/, KEPT IN CAPTIVITY IN POONA
BRIT J ANIMAL BEHAV 3 118

INDIAN COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH
A BIBLIOGRAPHY OF INDIAN SCIENTIFIC TECHNICAL PUBLICATIONS
NEW DELHI, INDIA
XX

INGLE L
APPARATUS FOR TESTING CHEMOTROPIC RESPONSES OF FLYING INSECTS
J ECON ENTOMOL 36 108

INGRAM W
AN INVESTIGATION OF THE TREATMENT OF CABIN CRUISER WASTES 
SEWAGE AND INDUSTRIAL WASTES 28 93 JAN

INGRAM W
SKIN EXCRETIONS /ENGINEERING BIOTECHNOLOGY OF HANDLING WASTES RESULTING FROM A CLOSED ECOLOGICAL SYSTEM/
ZNYU COLL ENNG
ZAAEROMED DIV, AF OFFICE OF SCI RESEARCH
ZZ AD154171
AFOSR REP 58-270 OCTOBER
CONTAINS TABLE T

INGRAM W
ORIENTATION OF RESEARCH NEEDS ASSOCIATED WITH ENVIRONMENT OF CLOSED SPACES
ZNEW YORK U, COLLEGE OF ENG
ZAAIR RES DEV COMM
ZZ AD152015
AFOSR TN 58-106 JAN

INGRAM W
THE ENGINEERING BIOTECHNOLOGY OF HANDLING WASTES RESULTING FROM A CLOSED ECOLOGICAL SYSTEM
ZRES DIV, NYU COLLEGE OF ENNG, NY
ZAAEROMED DIV, AIR RES AND DEV COMM, WASH, DC
ZZ AD162277
AFOSR REP NO TR-58-148 DEC
INGRAM W NEWMAN B PALEVSKY G

EXPLORATORY RESEARCH ON THE THEORETICAL CONSIDERATION OF
WASTE WATER CYCLES IN A CLOSED ECOLOGICAL SYSTEM
PRESENTED AT AAAS SYMPOSIUM ON CLOSED ECOL SYSTEM
NYU COLL ENG, NYC
U.S. AIR FORCE
AD210087
AFOSR REP TN-59-87 DEC 58C

INGRAM W WORK H
FUNDAMENTAL STUDIES ON RECOVERY OF WATER FROM URINE
NEW YORK U, COLL OF ENG, NY
JAN 61

INGRAM W
MICROBIOLOGICAL WASTE TREATMENT PROCESSES IN A CLOSED
ECOLOGY
NEW YORK U
BIOLOC MED LAB, AEROSPACE MED DIV, WPAFB, OHIO
AD294480
AMRL-TDR-62-126 NOV 62

INHOFFEN H
RESEARCH ON ISOLATION OF SEXUAL ATTRACTANT FROM BUTTERFLIES
ARCH PHARM BERL 284 337 51

INSTITUTE OF SCI AND TECHNOLOGY, U OF MICH, ANN ARBOR
REMOTE SENSING OF ENVIRONMENT
AD274155
PROCEEDINGS OF THE FIRST SYMPOSIUM MARCH 62

INTEGRATION CORP, NY
USAF, ROME AIR DEV CENT
ELECTROSTIMULATION TECHNIQUES OF HEARING
AF 30/602/3051 63

ISHIKAWA S
RESPONSES OF MAXILLARY CHEMORECEPTORS IN THE LARVA OF THE
SILKWORM, BOMBYX MORI, TO STIMULATION BY
CARBOHYDRATES
J CELL COMP PHYSIOL 61 99 63

ISHIZAWA M
POLAROGRAPHIC STUDY ON THE EXCRETION OF URINARY CALCIUM
IN PATIENTS
KYUSHU J MED SCI 12 27 62

ISRAEL H
RADIOACTIVITY OF THE ATMOSPHERE
P 155 IN COMPRENDIUM OF METEOROLOGY, AMER METEOROL SOC 51

IVY A
PHYSIOLOGICAL DIFFERENCES PRODUCED BY RACE AND DIET OTHER
THAN VITAMIN AND MINERAL DEFICIENCIES
PROC HAWAII MED ASSOC APRIL 56

IWATA H
GENETICAL STUDY OF AMINO ACIDS EXCRETED IN URINE
J NAGOYA MED ASSOC 79 37 59
JACKSON E
BATTLEFIELD CASUALTY LOCATOR STUDY
ZZSPACELABS, INC, VAN NUYS, CAL
ZZARMY MED RES AND DEV COMM
ZZ AD299509
REP SR62-1049 DEC 62

JACOBIUS A
LITERATURE STUDY ON BIOMAGNETICS
ZZLIBRARY OF CONGRESS XX

JACOBS M
THE CHEMISTRY AND TECHNOLOGY OF FOOD AND FOOD PRODUCTS
INTERSCIENCE NY VOLS 1,2,3 51

JACORS M
DETERMINATION AND MEASUREMENT OF PARTICLES IN CITY
ATMOSPHERES
AM J PUBL HEALTH 47 1430 57

JACOBSON J
EFFECTS OF THERMAL ENERGY ON RETINAL FUNCTION
ZZWPAFB AEROSPACE MED DIV
AMRL-TDR-62-96 62

JACOBSON M
SEXUAL ATTRACTION OF FEMALE GYPSY MOTH
SCIENCE 132 1011 60

JACOBSON M  BEROZA M  YAMAMOTO R
FEMALE COCKROACH SEX ATTRACTANT, CHEMICALLY IDENTIFIED AND
ACTIVE AT THE THIRTY MOLECULE LEVEL
SCIENCE 139 48 63A

JACOBSON M  BEROZA M
CHEMICAL INSECT ATTRACTANTS
SCIENCE 140 1367 63B

JACQUEZ J
THE SPECTRAL REFLECTIONS OF HUMAN SKIN IN THE REGION
ZZARMY MED RES LAB FT KNOX
255-1000 MILLIMICRONS
REP 159 54

JACQUEZ J  A  KUPPENHEIM H F  DIMITROFF J M
SPECTRAL REFLECTANCE OF HUMAN SKIN IN THE REGION 235-700
MILLIMICRONS
J APPL PHYSIOL 8 212 55A

JACQUEZ J  A  KUPPENHEIM H F
SPECTRAL REFLECTANCE OF HUMAN SKIN IN THE REGION 235-1000
MILLIMICRONS
J APPL PHYSIOL 7 523 55B

JACQUEZ J  A
/SPECTRAL REFLECTANCE FROM RATS AND RABBITS/
J APPL PHYSIOL 8 292 55C

JACQUEZ J  A  HUSS J  MCKEEHAN
SPECTRAL REFLECTANCE OF HUMAN SKIN IN THE REGION .7-2.6 U
JAHN T
CHEMORECEPTION
P 447 IN COMPARATIVE ANIMAL PHYSIOLOGY, PROSSER C, ED
SAUNDERS, PHILA 50

JAMES A
OCURRENCE OF UNUSUAL FATTY ACIDS IN FECAL LIPIDS FROM
HUMAN BEINGS WITH NORMAL AND ABNORMAL ABSORPTION
BIOCHEM J 78 333 61
CONTAINS TABLE AF

JAMIESON H
ASTHMA DUE TO ODOR OF UPINE FECES AND SWEAT
ANN ALLerg 5 234 47

JANAK J
IDENTIFICATION OF ORGANIC SUBSTANCES BY THE GAS
CHROMATOGRAPHIC ANALYSES OF THEIR PYROLYSIS PRODUCTS
P 387 IN GAS CHROMATO SYMPOS,EDINBURGH 60

JANIS I
FESHBACH S
EFFECTS OF FEAR AROUSING COMMUNICATIONS
J ABNORM SOC PSYCHOL 48 78 53

JANSEN M
A REFLECTANCE SPECTROMETRIC STUDY OF ULTRAVIOLET ERYTHEMA
J CLIN INVESt 32 1053 53

JAPAN NAT INST OF NUTRITION
EFFECT OF DIET ON EXCRETION OF 17-KETOSTEROIDS IN URINE
ANN REP 60

JARDETSKY O
(MAGNETIC RESONANCE SPECTROSCOPY,BIOLOGICAL APPLICATIONS)
METH OF BIOCHEM ANAL 9 62

JASKI T
SUSKIND C
ELECTROMAGNETIC RADIATION AS A TOOL IN THE LIFE SCIENCES
SCIENCE 133 443 61

JAVES A
WHEATLY V
STUDIES OF SEBUM,THE DETERMINATION OF THE COMPONENT FATTY
ACIDS OF HUMAN FOREARM SEBUM BY GAS LIQUID CHROMATOGRAPHY
BIOCHEM J 63 269 56

JELLINEK P
THE PRACTICE OF MODERN PERFUMERY
INTERSCIENCE NY 54

JOHANNIN-GILLES A
VODAR B
THE ABSORPTION SPECTRUM OF WATER VAPOR IN THE SCHUMANN
REGION
PHYS AND RADiUM J 15 223 54

JOHNS T
PURIFICATION AND IDENTIFICATION OF THE COMPONENTS OF
COMPLEX ORGANIC MATERIALS
P 242 IN GAS CHROMATO SYMPOS,EDINBURGH 60
JOHNSON G SERRANA J LEVY E
APPLICATION OF SKIN RESISTANCE TO PSYCHOPHYSIOLOGICAL STUDIES
ZZAEROMED LAB WADC
REP TR-59-688 59

JOHNSON H M
A NOTE ON THE SUPPOSED OLFACTORY HUNTING RESPONSE OF THE DOG
J ANIMAL BEHAV 4 76 14

JOHNSON J
CONSUMPTION OF OXYGEN BY COMBUSTIBLES IN SUBMARINE ATMOSPHERES
ZZNAV RES LAB
REP MR 882 56

JOHNSON J
NUCLEAR SUBMARINE ATMOSPHERE ANALYSIS AND REMOVAL OF ORGANIC CONTAMINANTS
ZZFUELS BRANCH, CHEM DIV, US NAVAL RES LAB, WASH, DC
ZZZ AD285269
NRL REPORT 5800 62

JOHNSSON K KLEIN A
PUBLICATIONS, REPORTS, AND PAPERS FOR 1962 FROM OAK RIDGE NATIONAL LABORATORY
ZZOAK RIDGE NAT LAB, UNION CARBIDE CORP
ZZAEC ORNL-3300 VOL 2 SPECIAL 62

JOHNSTON F MCMILLAN T EVANS E
PERSPIRATION AS A FACTOR INFLUENCING THE REQUIREMENTS FOR CALCIUM AND IRON
J NUTRIT 42 285 50

JOHNSTON J
CONCEPTS OF CONTACT CHEMORECEPTION IN MAMMALS AND MAN
VIRGINIA J SCI 6 27 55

JOHNSTON J SANDOVAL A
ORGANOLEPTIC QUALITY AND THE STEREOCHEMICAL THEORY OF OLFACTION
AM PERF 75 8 60

JOHNSTONE J
AN ANNOTATED BIBLIOGRAPHY OF THE UNITED STATES MARINES IN GUERRILLA-TYPE ACTION
MARINE CORPS HIST BIBLIO NO 5, WASH 61

JOLLIFFE N TUNG T
NUTRITIONAL STATUS SURVEY OF THE CIVILIAN POPULATION OF FORMOSA
METABOLISM 5 309 56

JOLLIFFE N
CLINICAL NUTRITION
HARPER 2ND ED NY 62

JONES SANDORFF
CHEMICAL APPLICATIONS OF SPECTROSCOPY
JONES B
THE CULTIVATION OF INSECT CELLS AND TISSUES
BIOL REV 37 512

JONES F JONES M
ZZONR
MODERN THEORIES OF OLFACITION A CRITICAL REVIEW
REP 27515

JONES F JONES M
MODERN THEORIES OF OLFACITION
J PSYCHOL 36 207

JOSEPHSON R K
REPETITIVE POTENTIALS FOLLOWING BRIEF ELECTRIC STIMULI IN
A HYDROID
J EXPER BIOL 38 579
KAHMANN H
SINNESPYPHYSIOLOGISCHE STUDIEN AN REPTILIEN
ZOOLOG JAHRF 51 173

KALMUS H
THE ORIGIN OF ODORS BY WHICH HONEYBEES DISTINGUISH THEIR
COMPANIONS
PROC ROY SOC LOND B140 50

KALMUS H
THE DISCRIMINATION BY THE NOSE OF THE DOG OF INDIVIDUAL
HUMAN ODORS AND IN PARTICULAR OF THE ODORS OF TWINS
BRIT J ANIMAL BEHAV 3 23

KALMUS H HUBBARD S
THE CHEMICAL SENSES IN HEALTH AND DISEASE
THOMAS, SPRINGFIELD

KAMM G N BOHM H V
INSTRUMENTATION FOR ULTRASONIC ATTENUATION STUDIES
REV SCI INSTR 33 957

KARLSON P
PEROMONES, A NEW TERM FOR A CLASS OF BIOLOGICALLY ACTIVE
SUBSTANCES
NATURE, LOND 183 55

KARLSON P BUTENANDT A'
PEROMONES /ECTOHORMONES/ IN INSECTS
ANN REV ENTOMOL 4 39

KARR A O'CONNOR J
HUMAN FACTORS STUDY OF DESIGN CONFIGURATIONS FOR THE LASER
RANGE FINDER
Z2PITMAN-DUNN LABS
Z2FRANKFORD ARSENAL, PHILA
REP R-1664 FEB

KASEMIR H
AN APPARATUS FOR SIMULTANEOUS REGISTRATIONS OF POTENTIAL
GRADIENTS AND AIR-EARTH CURRENT
J ATMOSPHERE TERREST PHYS 2 32

KATCHMAR L
INDICATORS OF BEHAVIOR DECREMENT
Z2DEPT OF PSYCHOLOG, UNIV OF MD, COLLEGE PARK
Z2ARMY MED RES AND DEV BOARD, WASH
Z2AD31305
TECH REP 5 MARCH 16

KATSUKI Y
REVIEW OF ELECTROPHYSIOLOGICAL STUDIES ON SENSORY
RECEPTOR MECHANISMS
J PHYSIOL SOC JAPAN 23 647

KATZ B
INITIATION OF IMPULSES OF STRETCH RECEPTORS IN MUSCLES OF
FROG
J PHYSIOL, LOND 111 248

KAUFMAN W SWAN A DAVIS H
THERMAL EFFECTS OF SIMULATED NUCLEAR FLASH ON AIRCREW MEMBERS
ZZAEROSPACE MED RES LAB, WPAFB, OHIO
ZZZ AD297960
AMRL MEMO M-25 JAN 63

KAWAHATA A SAKAMOTO H
SOME OBSERVATIONS ON SWEATING OF THE AINO
JAPAN J PHYSIOL 2 166 51

KAWAHATA A TANAKA M
STUDIES ON THE FUNCTION OF HUMAN SWEAT ORGANS
MIE MED J 3 219 53

KAWAHATA A ADAMS T
RACIAL VARIATIONS IN SWEAT GLAND DISTRIBUTION
PROC SOC EXP BIOL MED 106 862 61

KEEFE C
THE COMMON CHEMICAL SENSE AND ITS RECEPTORS
ARCH INT PHARMACODYN 139 547 62

KEEGAN H SCHLETER J HALL W
SPECTROPHOTOMETRIC AND COLORIMETRIC RECORD OF SOME LEAVES
OF TREES VEGETATION AND SOIL
ZZOPTICS AND METEOROL DIV, NAT BUR OF STDS
ZZZAERIAL RECON LAB, WADC, WPAFB
ZZZ AD105798
NBS REPORT 4528 APRIL 56

KEENEY A MELLINHOFF S
COMPONENT MEASUREMENT IN EXPIRED AIR
ANN INT MED 34 331 51

KEHOE R A CHOLAK J STORY R
SPECTRO CHEMICAL STUDY OF THE NORMAL RANGES OF CONCENTRATION
OF CERTAIN TRACE METALS IN BIOLOGICAL MATERIALS /FECES/
J NUTRIT 19 586 40

KEITHER W
THE FORMULATION OF COSMFTICS AND COSMETIC SPECIALTIES
DRUG COSMETIC INDUSTRY PUB 56

KELLOGG R
OLFACTORY SENSE
/IN HISTORY OF WHALES, THEIR APPLICATION TO LIFE IN THE WATER/
QUART REV BIOL 3 198 28

KELLY E, ED
ULTRASOUND IN BIOLOGY AND MEDICINE
ZZAMER INST OF BIOL SCI, WASH
SYMPOS OF USAF BIOACOUSTICS LAB AT U OF ILL, 55 57

KELLY M
MEASUREMENT OF NEURON ACTIVITY BY PARAMAGNETIC RESONANCE
ZZPOLYTECH INST OF BROOKLYN
ZZAIR FORCE OFF OF SCI RES
AFOSR 62-295 NOV 9 AD291441 62

KENDEIGH C
KENNARD D W
THE NERVOUS REGULATION OF THE SWEATING APPARATUS OF THE
HUMAN SKIN AND EMOTIVE SWEATING IN THERMAL SWEATING AREAS
J PHYSIOL 165 457

KENNEDY C
SOME NON-NERVOUS FACTORS THAT CONDITION THE SENSITIVITY OF
INSECTS TO MOISTURE, TEMPERATURE, LIGHT AND ODORS
ANN ENTOMOL SOC AMER 20 87

KENNEDY D
NEURAL PHOTORECEPTION IN A LAMELLIBRANCH MOLLUSC
J GEN PHYSIOL 44 277

KENNEDY D  BRUNO M
THE SPECTRAL SENSITIVITY OF CRAYFISH AND LOBSTER VISION
J GEN PHYSIOL 44 1091

KENNEDY D
THE INITIATION OF IMPULSES IN RECEPTORS
AMER ZOOL 2 27

KENNEDY W
INFRARED SENSOR DEVELOPMENT
ZZTRIONICS CORP, MADISON WISCONSIN
ZZWEAPONS GUIDANCE LAB, AIR RES AND DEV COMMAND, WPAFB OHIO
ZZZ AD234126
FINAL REPORT MARCH

KERKA W  HUMPHREYS C
TEMPERATURE AND HUMIDITY EFFECTS ON ODOR PERCEPTION
ASHAE TRANS 62 531

KERSLAKE D
FACTORS CONCERNED IN THE REGULATION OF SWEAT PRODUCTION IN
MAN
ZZR.A.F. INST OF AVIA MED
F.P.R.C. 879 MAY

KETTLEWELL H
/INSECT FEMALE ASSEMBLING SCENTS/
ENTOMOLOGIST 79 8

KEULEMANS A
GAS CHROMATOGRAPHY
REINHOLD, NY

KEYS A  BROZEK J
THE BIOLOGY OF HUMAN STARVATION
U OF MINN PRESS, VOLS 1 AND 2

KOLODOV J
ACTION OF AN ELECTROMAGNETIC FIELD ON THE CENTRAL NERVOUS
SYSTEM
PRIRODA, USSR 51 104
PRIRODA 51 104

KILGMAN A  SHELLEY W
AN INVESTIGATION OF THE BIOLOGY OF THE HUMAN SEBACEOUS GLAND
J INVEST DERM 30 99

KIMURA K BEIDLER L
MICROELECTRODE STUDY OF TASTE RECEPTORS OF RAT AND HAMSTER
J CELL COMP PHYSIOL 58 131

KIMURA K
OLFACTORY NERVE RESPONSE OF THE FROG
KUMAMOTO MED J 14 37

KIMURA K
ADAPTATION OF CHEMORECEPTORS AS ANALYZED BY ACTIVITY IN SINGLE GUSTATORY FIBERS
KUMAMOTO MED J 14 149

KING S H FUNKENSTEIN D H
RELIGIOUS PRACTICE AND CARDIOVASCULAR REACTIONS UNDER STRESS
J ABNORM SOC PSYCHOL 55 135

KIRK E
THE QUANTITY AND COMPOSITION OF HUMAN COLONIC FLATUS
GASTROENTEROLOGY 12 782

KIRK P
ULTRAMICROANALYSIS
WILEY, NY

KIRK P L
IDENTIFICATION IN THE SUB-MICROGRAM RANGE
MICROCHEM J SYMP SER 1 19

KISHIMOTO Y RADIN N
MICRODETERMINATION, ISOLATION AND GAS-LIQUID CHROMATOGRAPHY OF TWO-HYDROXY FATTY ACIDS
J LIPID RES 4 130

KISTIAKOWSKY G
ENZYME THEORIES OF OLFACTION
SCIENCE 112 154

KLEMENTYEVS A
INTERFERENCE LIGHT FILTERS FOR THE ULTRAVIOLET REGION OF THE SPECTRUM
VESTNIK MOSKOV UNIV SER 3, FIZIKA ASTRONOMIYA, P 23
Zzz AD269635

KLIER S LINSKEY J
SELECTED ABSTRACTS FROM THE LITERATURE ON STRESS
ZzNYU COLL OF ENGG, NY
ZzNAVAL TRAINING DEVCF CENT
Zzz AD253068
NAVTRADEVCEN 565/1 NOVEMBER

KLOEK J
THE SMELL OF SOME STEROID SEX HORMONES AND THEIR METABOLITES
PSYCHIATRIA NEUROLOGIA NEUROCHIRURG 65 309

KLOTZ I DOLE M
AN AUTOMATIC-RECORDING ULTRAVIOLET PHOTOMETER FOR LABORATORY AND FIELD USE
IND ENG CHEM, ANAL 18 741

KLUIVER M
BIOPHYSICS OF THE SENSE OF SMELL
STUDENT THESIS GRONINGEN

KNEESER H
INTERPRETATION OF THE ANOMALOUS SOUND ABSORPTION IN AIR AND OXYGEN IN TERMS OF MOLECULAR COLLISIONS
J ACOUST SOC AM 5 122

KNESTRICK G COSDEN T CURCIO J
ATMOSPHERIC ATTENUATION COEFFICIENTS IN THE VISIBLE AND INFRARED REGIONS
ZZOPTICS DIV, NAVAL RES LAB, WASH
ZZZ AD263441
NRL REP 5648 AUGUST 8

KNOCHE H
DER HUND IM DIENST DER POLIZEI
VERLAG FUR POLIZEI FACHSCHRIFTEN LUBECK

KNOX G W
INVESTIGATIONS OF FLICKER AND FUSION III THE EFFECT OF AUDITORY STIMULATION ON THE VISUAL CFF
J GEN PHYSIOL 33 139

KNOX G W
INVESTIGATIONS OF FLICKER AND FUSION IV THE EFFECT OF AUDITORY FLICKER ON THE PRONOUNCEDNESS OF VISUAL FLICKER
J GEN PHYSIOL 33 145

KNUDSEN V
THE ABSORPTION OF SOUND IN AIR, IN OXYGEN AND IN NITROGEN - EFFECTS OF HUMIDITY AND TEMPERATURE
J ACOUST SOC AM 25 835A

KODAMA K MIURA Y
RELATION BETWEEN DIET AND INTESTINAL GAS FORMATION
JAPAN SOC FOOD NUTR 2 149

KOJIMA N
A STUDY OF THE AMOUNT OF URINARY SULFATES FOR HEALTHY JAPANESE ADULTS
J OSAKA MED CENT 9 5081

KOLSKY H
ELECTROMAGNETIC WAVES EMITTED ON DETONATION OF EXPLOSIVES
NATURE JAN 9 P 77

KONECCI E WOOD N
DESIGN OF AN OPERATIONAL ECOLOGICAL SYSTEM
ZZDOUGLAS AIRCRAFT CO, STA MON, CAL
MISSILES AND SPACE SYS ENG REP 861

KONIKOFF J REYNOLDS L
STUDY OF THE PURIFICATION OF WATER FROM BIOLOGICAL WASTES
ZZGEN ELEC CO, SPACE SCI LAB, PHILA
ZZNASA, WASH
ANN REP ON NASA CONTRACT NASW 127 OCT

KONIKOFF J
SPACE FLIGHT ECOLOGIES
ZZ GEN ELECT CO, SPACE SCI LAB, PHILA
ZZZ AD268509
REP NO R615D200 DEC

KONISHI J
TASTE FUNCTIONS IN THE CARP
ACTA PHYSIOL SCAND 52 150

KOPPANYI T
CATECHOLAMINES AS POSSIBLE STIMULANTS OF CHEMORECEPTOR MECHANISMS
ARCH INT PHARMACODYN 139 564

KORNFIELD A
BIBLIO OF BIOSENSORS/PART OF A REVIEW OF BIOLOGICAL MECHANISMS FOR APPLICATION TO INSTRUMENT DESIGN/
REP ARA-985 JULY
Z ALLIED RES ASSOC BOSTON
Z NAT AERONAUT + SPACE ADMIN WASH CONTR NASR-16
REP ARA-985 61

KORNFIELD A
BIOSENSING CONCEPTS
Z BIOSEARCH CO BOSTON
Z ARMY BIOL LABS PHYS DEF DIV FT DETRICK
ZZZ AD275381
QTLY PROG REPT MAR 62A

KORNFIELD A
BIOSENSING FOR BW DETECTION VOL 1 DATA AND ANALYSES
Z BIOSEARCH CO BOSTON
Z ARMY BIOL LABS PHYS DEF DIV FT DETRICK
ZZZ AD294874
FINAL REP OCT 62B

KORNFIELD A
BIOSENSING FOR BW DETECTION VOL 2 BIBLIO + SELECTED GRANTS
Z BIOSEARCH CO BOSTON
Z ARMY BIOL LABS PHYS DEF DIV FT DETRICK
ZZZ AD294871
FINAL REP OCT 62C

KORNFIELD A
BIOSENSING FOR BW DETECTION VOL 3 INTERPRETATIONS
Z BIOSEARCH CO BOSTON
Z ARMY BIOL LABS PHYS DEF DIV FT DETRICK
FINAL REPT FEB 63

KOSHTOJANTS T
THE ENZYMATIC BASIS OF TASTING
BIOPHYS USSR TRANSL 3 652

KOSHTOYANTS K
COMPARATIVE PHYSIOLOGY OF THE NERVOUS SYSTEM
ST PUBL HOUSE, MOSCOW

KRAVCOV S V

ACTION DES EXCITATIONS AUDITIVES SUR LA FREQUENCE CRITIQUE DES PAPILLOTEMENTS LUMINEUX
ACTA OPHTHAL KBH 13 260 35A

KRAVKOV S V
THE ACTION OF AURAL STIMULI ON FLICKER FUSION
FIZIOL ZH, USSR 19 826 35B

KRAVKOV S V
CRITICAL FREQUENCY OF FLICKER AND INDIRECT STIMULI
CR ACADEM SCI, USSR 22 65 39A

KRAVKOV S V
THE INFLUENCE OF ODORS ON COLOR VISIONS
ACTA OPHTHAL KBH 17 426 39

KRINOV E
SPECTRAL REFLECTANCE PROPERTIES OF NATURAL FORMATIONS
IZVEST AKADEM NAUK USSR
TRANS TT-439 BY NAT RES COUNCIL, CANADA 47

KROLAK L DAVIS T
THE MEASUREMENT OF DIFFUSE REFLECTANCE OF CLOTH AND SKIN SAMPLES
ZUO OF ROCHESTER
ZUOMIC ENERGY COMMISSION
REP UR-380 55

KRUM J
TRUEST EVALUATIONS IN SENSORY PANEL TESTING
FOOD ENG 74 JULY 55

KRUSE P
ORGANIC COLORIMETRY
ANAL CHEM 25 1188 53

KRUSE P McGLAUCHLIN L McQUISTAN R
ELEMENTS OF INFRARED TECHNOLOGY
WILEY, NY 62

KRUSE P BLUE M
INTRINSIC INFRARED DETECTOR RESEARCH
ZUHONEYWELL RESEARCH CENT, HOPKINS, MINNESOTA
ZUONAUT SYSTEMS DIV, RECONNAISSANCE LAB, WP-AFB, OHIO
ZUZ 140 ADZ4884
INTERIM ENGNG REP NO 7 JANUARY 15 63

KRYLOV A TARAKANOVA G
MAGNETROPISM OF PLANTS AND ITS NATURE
PLANT PHYSIOLOG 7 191 60

KUBOTA K
COMPARATIVE ANATOMICAL AND NEUROHISTOLOGICAL OBSERVATIONS ON THE TONGUE OF THE GREAT ANTEATER /MYRMECOPHAGA JUBATA LINNE/
ANAT REC 143 15 62

KULP C ROWLAND G
DAYLIGHT VISUAL TARGET DETECTION
ZUROWLAND, HADDONFIELD, NJ
ZUZNAVY AIR CREW EQUIP LAB, NAV AIR MAT CENT, PHILA
KUNO Y
HUMAN PERSPIRATION
THOMAS , SPRINGFIELD
CONTAINS TABLE AG

KUPPENHEIM H BEER R
SPECTRAL REFLECTANCE OF WHITE AND NEGRO SKIN BETWEEN
FOUR HUNDRED AND ONE THOUSAND MILLIMICRONS
J APPL PHYSIOL 4 800

KUSANO K
ANALYSIS OF THE SINGLE UNIT ACTIVITY OF GUSTATORY
RECEPTORS IN THE FROG TONGUE
JAP J PHYSIOL 10 620
<table>
<thead>
<tr>
<th>Author</th>
<th>Title and Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAARMAN J</td>
<td>THE HOST SEEKING BEHAVIOR OF THE MOSQUITO ANOPHELES MACULOPENNIS</td>
</tr>
<tr>
<td>LACHER</td>
<td>INFRA RED ABSORPTION SPECTRA FOR URACIL, THYMINE</td>
</tr>
<tr>
<td>SCIENCE</td>
<td>110 300</td>
</tr>
<tr>
<td>LADELL W</td>
<td>THE MEASUREMENT OF CHLORIDE LOSSES IN THE SWEAT</td>
</tr>
<tr>
<td>J PHYSIOL</td>
<td>107 465</td>
</tr>
<tr>
<td>LAIRD D</td>
<td>MNS INDIVIDUALITY IN ODOR</td>
</tr>
<tr>
<td>J ABNORMAL AND SOCIAL PSYCHOL</td>
<td>29 459</td>
</tr>
<tr>
<td>LALOY L</td>
<td>THE ODOR OF EUROPEANS</td>
</tr>
<tr>
<td>J MED BRUXELLES</td>
<td>9 388</td>
</tr>
<tr>
<td>LALOY L</td>
<td>THE ODOR OF EUROPEANS</td>
</tr>
<tr>
<td>J ANTHROPOLOG MOSCOW</td>
<td>15 119</td>
</tr>
<tr>
<td>LANDIS C</td>
<td>AN ANNOTATED BIBLIOGRAPHY OF FLICKER FUSION PHENOMENA COVERING THE PERIOD 1740 - 1952</td>
</tr>
<tr>
<td>ZZPSYCHIATRIC INST, COLUMBIA U, NYC</td>
<td>ZARMED FORCES NRC VISION COMM, ANN ARBOR</td>
</tr>
<tr>
<td>ZZ AD121183</td>
<td>JUNE</td>
</tr>
<tr>
<td>LANDGREN S</td>
<td>EXCITATION OF CAROTID PRESSURE RECEPTORS</td>
</tr>
<tr>
<td>ACTA PHYSIOL SCAND</td>
<td>26 1</td>
</tr>
<tr>
<td>LANG L</td>
<td>ABSORPTION SPECTRA (PYRIDINES) IN THE ULTRAVIOLET AND VISIBLE REGION</td>
</tr>
<tr>
<td>VOL 3 ACAD PRESS</td>
<td>62</td>
</tr>
<tr>
<td>LANYON W</td>
<td>TAVOLGA W</td>
</tr>
<tr>
<td>ANIMAL SOUNDS AND COMMUNICATION</td>
<td></td>
</tr>
<tr>
<td>AMER INST OF BIOL SCI WASH</td>
<td>60</td>
</tr>
<tr>
<td>LARMORE L</td>
<td>TRANSMISSION OF INFRARED RADIATION THROUGH THE ATMOSPHERE</td>
</tr>
<tr>
<td>LOCKHEED AIRCRAFT CORP</td>
<td>RESCH MEMO RM 63-20</td>
</tr>
<tr>
<td>LAROCCA A</td>
<td>ZISSIS G</td>
</tr>
<tr>
<td>FIELD SOURCES OF BLACKBODY RADIATION</td>
<td></td>
</tr>
<tr>
<td>ZENGNG RES INST, U OF MICH, ANN ARBOR</td>
<td>ZENGNG AND EXPER STATION, COLL ENGNGB, U OF FLA</td>
</tr>
<tr>
<td>ZZ AD202608</td>
<td>2144-264-T JUNE</td>
</tr>
<tr>
<td>LARSEN M</td>
<td>GANO R</td>
</tr>
<tr>
<td>STUDY OF ELECTRO-MAGNETIC PROPAGATION OF A TRANSIENT SIGNAL THROUGH SEA WATER</td>
<td></td>
</tr>
<tr>
<td>ZENGNG AND DEPT OF THE NAVY, OFFICE OF NAVAL RESEARCH</td>
<td></td>
</tr>
</tbody>
</table>
LASKER G B
PHOTOELECTRIC MEASUREMENTS OF SKIN COLOR IN A MEXICAN MEZTIZO POPULATION
AM J PHYS ANTHROP 12 115

LAVERACK M
RESPONSE OF CUTICULAR SENSE ORGANS OF THE /LOBOTA/ HOMARUS VULGARIS TO HAIR PEG ORGANS AS WATER CURRENT RECEPTORS
COMP BIOCHEM PHYSIOL 5 319

LAVERACK M
ASPECTS OF CHEMORECEPTION IN CRUSTACEA
COMPAR BIOCHEM PHYSIOL 8 141

LAW L
RESPONSE OF CUTICULAR SENSE ORGANS OF THE /LOBOTA/ HOMARUS VULGARIS TO HAIR PEG ORGANS AS WATER CURRENT RECEPTORS
COMP BIOCHEM PHYSIOL 5 319

LAWRENCE A FERGUSON L
EXPLORATORY PHYSICO-CHEMICAL STUDIES ON THE SENSE OF TASTE
NATURE, LOND 183 1469

LAYMON R
RELATIONSHIP BETWEEN FLAVOR AND PHYSICO-CHEMICAL PROPERTIES OF COMPOUNDS
ZYBATTELLE MEMORIAL INST, COLUMBUS OHIO
ZQQUARTERMASTER FOOD AND CONTAINER INST, CHICAGO ILL, SPONS
PROGRESS REP NO 1 APRIL 59

LAZARUS R DEESE J OSLER S
THE EFFECTS OF PSYCHOLOGICAL STRESS UPON PERFORMANCE
PSYCHOLOGICAL BULL 49 293 52

LEAF A
PERMEABILITY OF THE ISOLATED TOAD BLADDER TO SOLUTES AND ITS MODIFICATION BY VASOPRESSIN
J GEN PHYSIOL 45 921 62

LEBLANC P
ZMUSEUM OF SCI AND INDUSTRY, LAB FOR APPLIED SCI, CHICAGO
ZBBUREAU OF NAVAL WEAPONS, WASH
ZZZ AD299549
SYMPOSIUM ON MILITARY APPLICATIONS OF ULTRAVIOLET RADIATIONS
REP LAS-TR-199-37 62

LEDERER
CHEMICAL COMPOSITION OF SCENT SUBSTANCE CASTOREUM
BULL SOC CHIM BIOL TRAV 43

LEDERER
ON ANIMAL PERFUMERY
INDUSTRIE DE LA PARFUMERIE JULY AUG 46

LEHMANN J F
THE BIOPHYSICAL MODE OF ACTION OF BIOLOGIC AND THERAPEUTIC
ULTRASONIC REACTIONS
J ACoust Soc AMER 25 17

LEIDEN
LAARMAN J
THE HOST SEEKING BEHAVIOR OF THE MALARIA MOSQUITO
ARCH NEERL ZOOL 11 529

LEIDERMAN P STERN R
SELECTED BIBLIOGRAPHY ON SENSORY DEPRIVATION AND RELATED
SUBJECTS
ZZHARVARD MED SCHOOL, BOSTON
ZZBIOMED LAB, WP-AFB OHIO
ZZZ AD268601
ASD TECH REP 61-259 JULY

LEIGH A
DEFECTS OF SMELL AFTER HEAD INJURY
LANCET 244 38

LEIGHTON A
THE TURKEY VULTURES EYES (AND SCENT)
AUK 45 352

LEITHEAD C
WATER AND ELECTROLYTE METABOLISM IN THE HEAT
FED PROC 22 901

LEMAGNEN J
UN CAS DE SENSIBILITE OLFACTIVE SE PRESENTANT COMME UN
CARACTERE SEXUEL SECONDAIRE FEMININ
COMPT REND 226 694

LEMAGNEN J
VARIATIONS SPECIFIQUES DES SENSIS OLFACTIFS CHEZ L HOMME
SOUSS ACTIONS ANDROGENE ET OESTROGENE
COMPT REND

LEMAGNEN J
THE ROLE OF OLFAC TORY STIMULI IN THE REGULATION OF
THE ALIMENTARY BEHAVIOR OF THE MAMMAL
J PSYCHOL NORM PATH 56 137

LEMAGNEN J
LA VARIATION DES SENSIBILITES OLFACTIVES EN FENCTION
DES ETATS PHYSIOLOGIQUES GENERAUX
THESE DE DOCTORAT ES SCIENCES PARIS

LEMAIRE R
/PHYSIOLOGY OF SUDATION/
ARCH BIOL THERMO CLIMAT /PARIS/ 1 7

LEMIMON G
BIBLIOGRAPHY OF AFFTC TECHNICAL PUBLICATIONS AND
PRESENTATIONS 1952-1962
ZZAIR FORCE FLIGHT TEST CENT, EDWARDS AFB, CAL
ZZZ AD297997
AFFTC BIBLIO FTC-TDR-63-5 FEB

LENHOFF H BOVAIRD J
REQUIREMENT OF BOUND CALCIUM FOR THE ACTION OF SURFACE CHEMORECEPTORS
SCIENCE 130 1475

LENHOFF H
THE PH-PROFILE OF A CHEMORECEPTOR /HYDRA/
AMER ZOOL 2/3/ 424

LETTAVET A GORDON D
THE EFFECTS OF RADAR ON THE HUMAN BODY
ZINST OF LABOR HYGIENE AND OCCUPATIONAL DISEASES, USSR
ZZZ AD278172
ASTIA TRANSLATION

LENZI M
BIOLGICAL EFFECTS OF MAGNETIC FIELDS
STRAHLENTERAPIE 67 219

LEONG P
NUTRITIONAL BIBLIO OF MALAYA
U HAWAII PRESS

LETTAU H
RESEARCH PROBLEMS IN MICROMETEOROLOGY
ZZZ INST OF LABOR HYGIENE AND OCCUPATIONAL DISEASES, USSR
ZZZ AD278172
ASTIA TRANSLATION

LEVINE R
EFFECT OF SELECTED PHYSICAL PARAMETERS ON THE TRANSFER THROUGH BIOLOGICAL MEMBRANES OF COMPOUNDS OF VARYING CHEMICAL TYPES
ZZZ INST OF LABOR HYGIENE AND OCCUPATIONAL DISEASES, USSR
ZZZ AD278172
ASTIA TRANSLATION

LEVINSTEIN H
INTERIM REPORT ON INFRAFRED DETECTORS
ZZZ SYRACUSE UNIV RES INST, SYRACUSE NY
ZZZ AERIAL RECON LAB, WRIGHT AIR DEVELOPMENT DIV, USAF
ZZZ AD288259
PHYSICS REPORT 104-12 NOVEMBER 1

LEWIS B
DETERMINATION OF FECAL BILE ACIDS
S AFRIC J CLIN SCI 3 316

LEWIS C
CONTACT CHEMORECEPTORS OF BLOWFLY TARSI
NATURE, LOND 173 130

LEWIS J
SIGHT AND SCENT IN THE TURKEY VULTURE
AUK 45 467

LIBERMAN E
ON THE PROBLEM OF THE EFFECT OF THE CONSTANT MAGNETIC FIELD ON THE EXCITATION THRESHOLD ON AN ISOLATED FROG NERVE
BIOPHYZIKA USSR 4 505

LICKLIDER J
ON JAMMING SPEECH COMMUNICATION WITH COHERENTLY AMPLITUDE-MODULATED INTERFERENCE
ZZAVAIL FROM COMM ON HEARING AND BIO-AcouSTICS, NRC WASH, DC

LILJESTRAND G
THE PROBLEM OF TRANSMISSION AT CHEMORECEPTORS
PHARMACOL REV 6 73

LINDMAN M
NOISE LEVEL LIMITS FOR AVOIDANCE OF DEAFNESS IN SHIPBOARD MACHINERY SPACES
ZZBUREAU OF SHIPS, WASH DC
ZZ AD109636
REP NO 371-N-27 NOVEMBER 8

LINEHAN D
RESEARCH ON COLLECTION, REDUCTION AND EVALUATION OF GEOMAGNETIC FIELD DATA AND ELECTRIC FIELD PHENOMENA ATMOSPHERIC AND TERRESTRIAL
ZZBOSTON COLLEGE
ZZAF CAMBRIDGE RES LABS, MASS
AFCRL 62-1143 SEPT

LINSDALE J
THE CALIFORNIA GROUND SQUIRREL
U CAL PRESS BERKELEY

LINSDALE J
THE DUSKY FOOTED WOOD RAT
U CAL PRESS BERKELEY

LINSDALE J
TOMICH P
A HERD OF MULE DEER
U CAL PRESS BERKELEY

LISSMAN H W
CONTINUOUS SIGNALS FROM THE TAIL OF A FISH GYMnARCHUS NILOTICUS
NATURE /LONDON/ 167 201

LISSMAN H W
ON THE FUNCTION AND EVOLUTION OF ELECTRIC ORGANS IN FISH
J EXP BIOL 35 156

LISSMAN H
MACHIN K
THE METHOD OF OBJECT LOCATION IN GYMnARCHUS NILOTICUS AND SIMILAR FISHES
J EXP BIOL 35 451

LISSMAN H
ECOLOGICAL STUDIES ON GYMnOTIDS P 215 IN BIOELECTROGENESIS ELSEVIER NY

LISSMAN H
ELECTRIC LOCATION BY FISHES
SCIENTIF AMER 208 50

LIST C
PEET M
SWEAT SECRETION IN MAN
ARCH NEUROL AND PSYCHIATRY 39 1231
LLOYD D P
TEMPERATURE AND THE ACTION OF THE SWEAT GLANDS
PROC NATL ACADEMY SCI 47 358 61

LOBITZ W C  DOBSON R L
DERMATOLOGY THE ECCRINF SWEAT GLANDS
ANN REV MED 12 289 61

LOCINTI J  ROTH L
COMPOSITION OF THE ODOROUS SECRETION OF TRIBOLIUM CASTANEUM
ANN ENT SOC AMER 46 281 53

LOEB M
A FURTHER INVESTIGATION OF THE INFLUENCE OF WHOLE-BODY
VIBRATION AND NOISE ON THE TREMOR AND VISUAL ACUITY
AZZMARY MED RES LAB, FORT KNOX, KY
ZZZ AD55065
REP NO 165 OCTOBER 22 54

LOEB M
CULTURE OF INSECT TISSUES
CORNELL UNIV 57

LOEWENSTEIN W  RATHKAMP R
THE SITES FOR MECHANOELECTRIC CONVERSION IN A PACINIAN
CORPUSCLE
J GEN PHYSIOL 41 1245 58

LOEWENSTEIN W
THE GENERATION OF ELECTRIC ACTIVITY IN A NERVE ENDING
ANN NY ACADEMY SCI 81 367 59

LOEWENSTEIN W
BIOLOGICAL TRANSDUCERS
SCI AMER 203 98 60

LOHNER L
INDIVIDUAL AND REGIONAL ODOR OF HUMAN BEINGS
ARCH GES PHYSIOL 202 25 24

LOHNER L
/RESEARCH ON OLFACTORY PHYSIOLOGY, OLFACTORY
EFFICIENCY OF POLICE DOGS/
ARCH GES PHYSIOL 212 84 26

LONDON S  WEST A
GASEOUS EXCHANGE IN A CLOSED ECOLOGICAL SYSTEM
ZZBIOMED LAB, AEROSPACE MED DIV, AF SC, WPAFB
AMRL-TDR-62-139 DECEMBER 62

LONG C
BIOCHEMISTS HANDBOOK
VAN NOSTRAND NY
CONTAINS TABLE 2 61

LOOFBOUROW J
ULTRAVIOLET ANALYSIS FOR VITAMINS AND HORMONES
VITAMINS AND HORMONES 1 109 43

LORD R  COCHRAN W
ZZILL NATURAL HISTORY SURVEY
TECHNIQUES OF RADIO TRACKING WILD ANIMALS

LOWRY O
BIOCHEMICAL EVIDENCE OF NUTRITIONAL STATUS
PHYSIOL REV 32 431

LUCAS C
THE ECOLOGICAL EFFECTS OF EXTERNAL METABOLITES
BIOL REV 22 270

LUCAS N
THE PERMEABILITY OF THE HUMAN EPIDERMIS TO ULTRAVIOLET RADIATION
BIOCHEM J 25 57

LUDWIG G
THE VELOCITY OF SOUND THROUGH TISSUES AND THE ACOUSTIC IMPEDANCE OF TISSUES
J ACOUST SOC AMER 22 862

LUGG J
RENAL EXCRETION OF 17 KETOSTEROIDS BY MEMBERS OF SOME ETHNIC GROUPS IN MALAYA
NATURE LOND 174 1147

LUGG W
A STUDY OF THE RELATIONSHIP BETWEEN THE TWENTY FOUR HourLY UrINARy OUTPUTS OF 17-KETOSTEROIDS AND CREATININE AND THE WeIGHTS OF TWENTY ADULT MALE SUBJECTS FROM SIX ETHNIC GROUPS
AUSTRAL J EXP BIOL 35 395

LUGT A
OPTICAL SPATIAL FILTERING TECHNIQUES
ZZRADAR LAB, INST SCI AND TECH U OF MICHIGAN, ANN ARBOR
ZZU.S. AIR FORCE
ZZ AD294553
INTERIM ENGNG REPORT FOURTH AND FIFTH QUARTERS JAN 63

LIU D
NORMAL LEVEL OF BLOOD AND UrINARy ALPHA KETO ACIDS IN CHINESE
J FORMOSA MED ASSOC 61 714

LUKASIK S
HANDBOOK OF ACOUSTIC NOISE CONTROL, VOL 1 PHYSICAL ACOUSTICS
ZZBOLT BERNANEK AND NEWMAN
ZZAERO MED LAB, WADC, WP-AFB OHIO
ZZ AD66250
SUPPLEMENT 1 WADC TR-52-204 APRIL 55

LYBURN E
A COMPARISON OF THE COMPOSITION OF SWEAT INDUCED IN DRY HEAT AND BY WET HEAT
J PHYSIOL 134 207

LYON M
THE DOG IN ACTION
ORANGE JUDD PUBL CO NY 50
EVALUATION OF INFRARED SPECTROPHOTOMETRY FOR COMPOSITIONAL
ANALYSIS OF LUNAR AND PLANETARY SOILS
STANFORD RES INST, MELANO PARK, CAL
NASA WASH, SPONSOR
NASA TN D-1871 APRIL 63
MCGRATH J
HUMAN FACTORS PROBLEMS IN ANTI-SUBMARINE WARFARE, A BIBLIO
OF RESEARCH ON HUMAN VIGILANCE
HUMAN FACTORS RES INC, L.A. CAL
PSYCHOL SCI DIV, DEPT OF THE NAVY
AD256488
SUPPLEMENTARY NOTE TO TECH REP 1 APRIL 61A

MCGRATH W D
ANALYSIS OF GASES AND VAPORS BY SPECTROSCOPIC TECHNIQUES
I EMISSION SPECTROSCOPY
TALANTA 8 892 61B

MCINDO N
AN INSECT OlfACTOMETER
J ECON ENTOMOL 19 545 26

MCKAY J CIANCI S HALL C
SOME FACTORS WHICH HAVE CONTRIBUTED TO BOTH SUCCESSFUL AND
UNSUCCESSFUL AMERICAN INFANTRY SMALL UNIT ACTIONS
HUM RES UNIT FT BENNING AND GEORGE WASH U, HUMRRO
DEPT OF THE ARMY
AD260994 RESEARCH MEM APRIL 59

MCKEE H RHOADES J WHEELER R
GAS CHROMATOGRAPHIC MEASUREMENT OF TRACE CONTAMINANTS IN A
SIMULATED SPACE CABIN
SOUTHWEST RES INST, SAN ANTONIO
NASA, WASH DC
NASA TN D-1825 MARCH 63

MCLAFFERTY F
MASS SPECTROMETRY OF ORGANIC IONS
ACAD PRESS 63

MCMAHON H O
THERMAL RADIATION FROM PARTIALLY TRANSPARENT REFLECTING
BODIES
J OPT SOC AMER 40 376 50

MCMASTER R
NON DESTRUCTIVE TESTING HANDBOOK
RONALD PRESS NY 59

MCNEIL W
ZAEROMED LAB WADC
URINE EVAPORATOR
WDAC TR-54-94 54

MA L
A SURVEY OF BLOOD CONSTITUENTS OF HEALTHY CHINESE IN HONG
KONG
TRANS ROY SOC TROP MED HYG 56 222 62

MACHIN K E LISSMAN H W
THE MODE OF OPERATION OF THE ELECTRIC RECEPTORS IN
GYMNARCHUS NILOTICUS
J EXP BIOL 37 801 60
MACHMAN M
THE INFLUENCE OF SIZE AND SHAPE ON THE VISUAL THRESHOLD OF
THE DETECTABILITY OF TARGETS
BOSTON U, OPTICAL RES LAB, BOSTON MASS
PHOTO RECON LAB, WRIGHT AIR DEV CENT
TECH NOTE 109 DECEMBER 53

MACKENNA R
/SEBUM SQUALENE CONTENT/
J INVEST DERMATOL 15 33

MACKENNA R, WHEATLEY V, WORMAL A
STUDIES OF SEBUM, SOME CONSTITUENTS OF THE UNSAPONIFIABLE
MATTER OF HUMAN SEBUM
BIOCHEM J 52 161

MACKWORTH N H
THE BREAKDOWN OF VIGILANCE DURING PROLONGED VISUAL SEARCH
QUART J EXP PSYCHOL 1 6

MAGOUN H
HANDBOOK OF PHYSIOLOGY NEUROPHYSIOLOGY SEC 1
AM PHYSIOL SOC, WASHINGTON

MAHADERA K
THE ENERGY EXPENDITURE AT REST OF SOUTHERN ASIATICS IN
BRITAIN
IND J MED RES 42 181

MAIER B, BEVAN W, BEHAR I
THE EFFECT OF AUDITORY STIMULATION UPON THE CRITICAL FLICKER
FREQUENCY FOR DIFFERENT REGIONS OF THE VISIBLE SPECTRUM
AMER J PSYCHOL 74 67

MAKAROV P
BIOPHYSICAL PROBLEMS OF THE SENSE ORGANS
RUSSIAN REV BIOL 50 314

MAKI A G, STAIR R, JOHNSTON R G
APPARATUS FOR THE MEASUREMENT OF THE NORMAL SPECTRAL
EMISSIVITY IN THE INFRAE
J RES NATL BUR STANRD 64C 99

MALLETTTE F
PROBLEMS AND CONTROL OF AIR POLLUTION
REINHOLD NY

MALMO R
CERTAIN PHYSIOLOGICAL CORRELATES OF PSYCHOMOTOR FUNCTIONING
MCGILL UNIV CANADA
AD247373 JAN

MANCINELLI D
A SPACE VEHICLE SIMULATOR AND ATMOSPHERIC CONTROL SYSTEM
AEROSPACE MED 34 261

MANGAN G
CHEMICAL COMPONENTS OF THE ODOR OF FISH
PRESENTED FOR THE QM REC AT AMER CHEM SOC BOSTON APRIL 59
MANGINI A
NEW RAMAN SPECTROSCOPIC INSTRUMENTS
ADVAN IN MOLEC SPECTROSCOPY 3 1320 AND 1386

MANN A COUTU A ROSSI E
A COMPARISON STUDY OF PANCHROMATIC AND INFRARED AERIAL
PHOTOGRAPHS TAKEN IN LATE FALL AND IN WINTER
ZWESLEYAN U
ZZU S. AIR FORCE
ZZ AD13143
TECH NOTE NO 30 MAY 29

MANN A COUTU A BRACKETT D
MANUAL FOR PHOTOINTERPRETERS A COMPARATIVE STUDY OF AERIAL
PHOTOGRAPHY ON INFRARED PANCHROMATIC AND COLOR FILM
ZWESLEYAN U
ZZU S. AIR FORCE
ZZ AD46594
TECH NOTE NO 50 JULY 30

MARCHGRABER R DRUMMOND A
A PRECISION RADIOMETER FOR THE MEASUREMENT OF TOTAL
RADIATION IN SELECTED SPECTRAL BANDS
PRESENTED AT INT RAD SYMPOS, OXFORD

MARCUS H
OLFACTORY ORGANS OF ANTS
ACTA ZOOL LILLUOANA 2 441 46

MARKOWITZ M
PRACTICAL SURVEY OF THE CHEMISTRY AND METABOLISM OF THE SKIN
BLAKISTON

MARQUIS D
REVISED AMR INFRARED MEASUREMENTS PROGRAM
ZPAN AM AIRWAYS AND RCA SERVICE CO, MISSILE TEST PROJ
ZAF MISSILE TEST CENT, PATRICK AFB, FLA
ZZ AD254182
AFMTC-TR-61-4 FEB 28

MARSH H
A SURVEY REPORT UNDERWATER SOUND REVERBERATION
ZAVCO MARINE ELECTRONICS, NEW LONDON CONN
ZOFFICE OF NAVAL RESEARCH
ZZ AD294540
SEPTEMBER

MARSHALL J
ON THE SENSITIVITY OF THE CHEMORECEPTORS ON THE ANTENNA AND
FORE TARSUS OF THE HONEY BEE APIS MELLIFICAL
J EXP BIOL 12 17

MARTIGNONI M
PROBLEMS OF INSECT TISSUE CULTURE
EXPERIENTIA 16 125

MARTZ D SUMNICHET H AUGASON G
QUANTITATIVE SPECTRAL MEASUREMENTS OF SUNLIT BACKGROUND:
ZNAV ORD TEST STAT, CHINA LAKE, CAL
ZZ AD95708
TECH NOTE IDP-95 APRIL 11
MASICA B
OMEGATRON GAS ANALYZER
PRACE PRZEMYBLOWEGO INST ELECTRON 1 49

MASKALENO E
THE USE OF ULTRA HIGH FREQUENCIES IN BIOLOGICAL RESEARCH
BIOPHYSICS USSR TRANSL 3 589

MASON M
BIBLIOGRAPHY OF THE DOG
IOWA STATE U PRESS 59

MASON N
George Wash U, MASTERS THESIS
THE IMPACT OF ENVIRONMENT ON MILITARY OPERATIONS - A STUDY
IN MILITARY GEOGRAPHY
8412031 75

MATESON J
THE OLFACTORY AREA AND THE OLFACTORY RECEPTOR PROCESS
ANN NY ACADEM SCI 58 83 54

MATHIES J, LUND P, EIDE W
X-RAY SPECTROSCOPY IN BIOLOGY AND MEDICINE, PART FOUR, A
SIMPLE INDIRECT SENSITIVE PROCEDURE FOR THE DETERMINATION OF
NITROGEN /AMMONIA/ AT THE MICROGRAM AND SUBMICROGRAM LEVEL
ANALYT BIOCHEM 3 408 62

MATRIX CORP, ARLINGTON
A FEASIBILITY STUDY CONCERNING PERSONNEL SURVIVAL
FLOTATION AND LOCATOR SYSTEM
NAVAL PARACHUTE FACILITY, EL CENTRO, CAL
REP NO 61-11 JUNE 14 61

MATTHES E
SMELL AND TASTE IN THE ANIMAL KINGDOM
ARQUIV MUS BOCAGE 9 17 38

MATTICE M
RESUME OF NORMAL DATA
P 403 IN CHEMICAL PROCEDURES FOR CLINICAL LABORATORIES
LEA AND FEBIGER PHILA

MATTONI R, SULLIVAN G
SANITATION AND PERSONAL HYGIENE DURING AEROSPACE MISSIONS
SPACELABS, VAN NUYS CAL
ZAAEROSPACE MED LAB WP-AFB
REP MRL TDR-62-68 JUNE 62 62

MAW M
SUPPRESSION OF OVIPOSITION RATE OF HYMENOPTERA IN
FLUCTUATING ELECTRIC FIELDS
CANAD J ENTOMOL 93 602 61

MAXWELL J
U OF MISSOURI
ARMY CORPS OF ENG, WATERWAYS EXP STATION
TEST OF QUANTITATIVE TERRAIN DESCRIPTION SYSTEMS AT FORT
LEONARD WOOD, MO
MAY J
ECOLOGY OF HUMAN DISEASE
MD PUBLICATIONS NY 58

MAY J
STUDIES IN DISEASE ECOLOGY
HAFNER NY 61A

MAY J
THE ECOLOGY OF MALNUTRITION IN THE FAR AND NEAR EAST
HAFNER NY 61B

MECKS M / LILLEY A
THE MICROWAVE SPECTRUM OF OXYGEN IN THE EARTHS ATMOSPHERE
LINCOLN LAB, MIT, DIVISION THREE, LEXINGTON MASS JA NO 2009 CITED IN LINCOLN LAB QPR DIV 3 JAN 63

MEERLOO J
PSYCHIATRIC ECOLOGY
J NERV MENT DIS 127 59

MEGUIN P
LES CHIENS DE FRANCE AU FRONT PENDANT LA GUERRE
REV HISTOIRE NATURELLE APPLIQUEE PARIS 20

MEIGS P
ENVIRONMENT OF SOUTHEAST ASIA
ENVIRON PROT DIV, NATICK QM RES AND DEV LAB, MASS ZZZ AD20310 REP 219 AUG 53

MEITES L ED
HANDBOOK OF ANALYTICAL CHEMISTRY
MCGRaw HILL NY 63

MELGARD R
A STUDY OF TECHNIQUES FOR REACTOR EFFLUENT ANALYSIS
TRACERLAB, RICHMOND VA ZZA AF SPECIAL WEAPONS CENT, KIRTLAND AFB, NM ZZZ AD295426 FINAL REP AFSWC-TDR-62-146 DECEMBER 62

ZZMELPAR, FALLS CHURCH, VA
BW AGENT DETECTION BY CONCENTRATION PROFILE TECHNIQUE ZZA ARMY BIOL LABS, FT DETRICK ZZZ AD284208 QUARTERLY PROG REP 1 SEPT 61

MENZEL E / MENZEL R
SIGNIFICANCE OF THE LAWS OF SPEED-VALUE AND STIMULATION-SUMMATION IN THE TRAILING OF THE DOG
J PSYCHOL U NEUROL 38 258 29

MENZEL E / MENZEL R
DIE VERWENDUNG DER REICHFAHIGKEIT DES HUNDES IM DIENSTE DER MENSCHHEIT
BERLIN 30

MER G / BERNAU M
THE ATTRACTION OF MOSQUITOES BY HUMAN BEINGS
PARASITOL 38 1 47

MERCHANT D
HANDBOOK OF CELL AND ORGAN CULTURE
BURGESS MINN 60

MERRIAM H
ZZU TEXAS DEPT OF ZOOL
LOW FREQUENCY TELEMETRIC MONITORING OF WOODCHUCK
MOVEMENTS XX

MERRIAM J EISENMAN W
INTERPRETATION OF PHOTODETECTOR PARAMETERS
ZZRES DEPT, NAVAL ORDNANCE LAB, CORONA, CAL
PHOTODETECTOR SERIES, REP 49 NOLC-558 JANUARY 15 62

MERRITT C
TECHNIQUES FOR THE DETERMINATION OF VOLATILE COMPONENTS OF
FOODSTUFFS, USE OF GAS CHROMATOGRAPHY AND MASS SPECTROMETRY
PRESENTED FOR QMREC TO AMER CHEM SOC CHICAGO 58

MERRITT C
RECENT DEVELOPMENTS IN THE APPLICATION OF ANALYTICAL
METHODS TO THE EVALUATION OF FLAVOR AND ODOR
PRESENTED FOR QMREC TO NEW ENGLAND SECTION AMER CHEM SOC
CAMBRIDGE 59

MERRITT C
IDENTIFICATION OF FLAVOR COMPOUNDS
IN SYMPOSIUM ON FLAVOR AND ODOR OF FOODS FOR TECHNOL LAB
BUR OF CMCL FISHERIES, GLOUCESTER MASS, AND QMREC 61

METHODS OF BIOCHEMICAL ANALYSIS, GLICK, D, ED ANNUAL VOLS
INTERSCIENCE 63

MIDDLETON A
SMELL, THE PHYSICAL SENSE
PERFUM AND ESSENT OIL RECORD 47 237 56

MILES D LEPPING R
GEO MAGNETIC FLUCTUATION STUDIES
ZZANTI SUB WAR LAB, NAVAL AIR DEV CENT, JOHNsville, PA
ZZZ AD294968
REP NO NADC-AW-6240 DECEMBER 28 62

MILLER H LYBRAND W
A SELECTED BIBLIOGRAPHY ON UNCONVENTIONAL WARFARE
ZZSPECIAL OPNS RES OFC, AMER UNIV, WASH
ZZDEPT OF THE ARMY
ZZZ AD265056
PART 1 OCT 61

MILLER L
(EXPERIMENTS ON SMELL IN BIRDS)
CONDOR 44 3 42

MILLER R PIATT V
THE PRESENT STATUS OF CHEMICAL RESEARCH IN ATMOSPHERE
PURIFICATION AND CONTROL ON NUCLEAR-POWERED SUBMARINES

MIMURA K
ON THE PHYSIOLOGICAL SIGNIFICANCE OF THE EEG CHANGES CAUSED
BY SONIC STIMULATION
EEG CLIN NEUROPHYSIOL 14 683
62

MINNICH D
THE CHEMICAL SENSES OF INSECTS
QUART REV BIOL 4 100
29

MINTZ B STONE L
TRANSPLANTATION OF TASTE ORGANS IN ADULT TRITURUS
VIRIDESCENS
PROC SOC EXP BIOL MED 31 1080
34

MIT LINCOLN LAB, LEXINGTON MASS
RADIO PHYSICS
ZZU.S. AIR FORCE
ZZ AD296492
QUARTERLY PROGRESS REP, DIVISION 3 JAN 15
63

MITCHELL E
NUTRITION AND CLIMATIC STRESS
THOMAS SPRINGFIELD
51

MITCHELL H EDMAN M
NUTRITIONAL SIGNIFICANCE OF DERMAL LOSSES OF NUTRIENTS IN
MAN, PARTICULARLY OF NITROGEN AND MINERALS
AM J CLIN NUTRIT 10 162
62A

MITCHELL H HAMILTON T
THE DERMAL EXCRETION UNDER CONTROLLED ENVIRONMENTAL
CONDITIONS OF NITROGEN AND MINERALS IN HUMAN SUBJECTS WITH
PARTICULAR REFERENCE TO CALCIUM AND IRON
J BIOL CHEM 178 345
49

MITCHELL H
COMPARATIVE NUTRITION OF MAN AND DOMESTIC ANIMALS
ACADEMIC PRESS NY
62B

MITCHELL J
DETERMINATION OF ORGANIC ACIDS
ORGANIC ANALYSIS J 68 INTERSCIENCE
56

MITTELDORF A
SPECTROGRAPHIC ANALYSIS OF AGRICULTURAL AND BIOLOGICAL
MATERIALS
J OPTICAL SOC AMER 41 286 APR
51

MITZ M BLANCHARD G
BIOCHEMICAL DETECTION METHODS FOR BACTERIA AND VIRUSES
ZMELPAR FALLS CHURCH VA
ZZ ARMY CHEM CORPS BIOL LABS FT DETRICK
ZZ AD296244
REPORT OF DEC
62

MIVART
A MONOGRAPH OF THE CANIDAE /FOX DISCUSSING ANAL SCENT
GLANDS/HARVARD MUSEUM COMPAR ZOO LIBRARY NO MA-C-2-4

MOAMIN GHATRIT
TRAITS DE FAUCONNERIE ET DES CHIENS DE CHASSE
FRITZE STOCKHOLM 45

MODY J
TEXTBOOK OF MEDICAL JURISPRUDENCE AND TOXICOLOGY
TRIPATHE AND CO BOMBAY INDIA 47

MOIR R
URINE RECYCLE SYSTEM STUDY
ZBOEING AIRPLANE CO SEATTLE WASH REPORT D7-2581 59

MOLYNEUX L
BIOLOGICAL SIGNALS AND NOISE
NATURE 197/4870/ 855 63

MONAHAN T COOPER B
SPECTRAL CHARACTERISTICS OF THE THERMAL RADIATION OF AN
ATOMIC EXPLOSION
ZMATERIAL LAB, N.Y. NAVAL SHIPYARD, BROOKLYN
ZZZ AD104956 FINAL REP MAY 24 51

MONCRIEFF R
THE CHEMICAL SENSES
LEONARD HILL, LOND 49

MONCRIEFF R
THE CHEMISTRY OF PERFUME MATERIALS
UNITED TRADE PRESS LONDON 49

MONCRIEFF R
THE CHARACTERIZATION OF ODORS
J PHYSIOL, LOND 125 453 54

MONCRIEFF R
ELECTRO OLFACTOGRAMS IN THE RABBIT
AMER PERFUMER 76 24 61

MONCRIEFF R
OLFACTORY ADAPTATION
AMER PERFUM AND COSMET 78 15 63

MONKMAN J
GAS CHAMBER MICROAPPARATUS IN IDENTIFICATION OF AIRBORNE
POLLUTANTS
ANAL CHEM 27 704 55

MONTGOMERY K C
THE EFFECT OF ACTIVITY DEPRIVATION UPON EXPLORATORY BEHAVIOR
J COMP PHYSIOL PSYCHOL 66 438 53

MOORE H BERNSTEIN H REYNOLDS R
A SOURCE AND DETECTOR OF RADIATION IN THE WAVELENGTH REGION
1500-50 ANGSTROMS SUITABLE FOR RADIATION EFFECTS STUDIES ON
MATERIALS IN VACUO
ZZELECTRO-OPTICAL SYSTEMS, PASADENA CAL 69
MORGAN J B
DIFFERENCES IN ULTRASONIC TESTING OF VARIOUS MATERIALS
NON-DEST TESTING 21 121

MORITA H
GENERATOR POTENTIAL OF INSECT CHEMORECEPTOR
SCIENCE 129 922

MORITA H TAKEDA K
INITIATION OF SPIKE POTENTIALS IN CONTACT CHEMOSENSORY HAIRS
OF INSECTS II, THE EFFECT OF ELECTRIC CURRENT OF TARSAL
CHEMOSENSORY HAIRS OF VANESSA
J CELL COMP PHYSIOL 54 177

MORITA H YAMASHITA S
RECEPTOR POTENTIALS RECORDED FROM SENSILLA BASICONICA ON THE
ANTENNA OF THE SILKWORM LARVAE, BOMBYX MORI
J EXP BIOL 38 851

MORRISON G A
TRACE ELEMENT ANALYSIS
MICROCHEM J SYMP SER 1 37

MORROW R SIEPEL J
EXISTENCE OF A MAGNETIC FIELD ABOUT NEURONS/
J WASH ACAD SCI 50 1

MORROW W LOCKE R
THE INFLUENCE OF TERRAIN SHIELDING ON RADIO WAVE
PROPAGATION AT 8000 MCPS
LINCOLN LAB, MIT, DIVISION THREE, LEXINGTON MASS
NO 36G-1 NOVEMBER 20

MOSEBACH K
PHARMACOLOGICAL ACTION OF DEGRADATION PRODUCTS OF HISTIDINE
AND HISTAMINE ON ISOLATED INTESTINE OF GUINEA PIGS
KLIN WOCHSCHR 39 80

MOTOKAWA K SUZUKI K
A NEW METHOD FOR MEASURING FATIGUE
JAP MED J 1 200

MOTOKAWA K IWAMA K
THE ELECTRIC EXCITABILITY OF THE HUMAN EYE AS A SENSITIVE
INDICATOR OF OXYGEN DEFICIENCY
TOHOKU J EXP MED 50 319

MOTOKAWA K
FIELD OF RETINAL INDUCTION AND OPTICAL ILLUSION
J NEUROPHYSIOL 13 413

MOTOKAWA K IWAMA K
RESONANCE IN ELECTRICAL STIMULATION OF THE EYE
TOHOKU J EXP MED 53 201
SELECTIVE STIMULATION OF COLOR RECEPTORS WITH ALTERNATING CURRENTS
科学   116 92
MOWBRAY G H GEBHARD J W BYHAM C L
SENSITIVITY TO CHANGES IN THE INTERRUPTION RATE OF WHITE NOISE
J Acoust Soc Amer  28 106
MOYER J
A BIBLIOGRAPHY OF SPEECH COMMUNICATION IN NOISE
Zzmit, Cambridge Mass
ZzrcA engng products div, camden nj for army signal corps
Zzz AD62745
Supplemental report a, january
MULAY I
DEVELOPMENTAL ANOMALIES ON FRUIT FLIES IN MAGNETIC FIELDS
Nature  193 1244
MULLER N GOLDERSON J
RAPID ANALYSIS OF REACTION MIXTURES BY NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY
J Am Chem Soc  78 5182
MURAOKA J
SHELTER HABITABILITY STUDIES, ODORS AND REQUIREMENTS FOR VENTILATION
Zznaval civil engng lab, port hueneMe calif
Zzz AD256381
Tech rep 146 may 8
MURATAR T
THE EXCRETION OF AMINO ACIDS IN THE JAPANESE KUMAMOTO pharmacist BULL  7 264
MURRAY E J WILLIAMS H I LUBIN A
BODY TEMPERATURE AND PSYCHOLOGICAL RATINGS DURING SLEEP DEPRIVATION
J Exp Psychol  56 271
MURRAY M
A BIBLIO OF THE RESEARCH IN TISSUE CULTURE 1884 1950
Acad press ny
MURRAY R W
THE RESPONSE OF THE LATERALIS ORGAN OF XENOPUS LAEVIS TO ELECTRICAL STIMULATION BY DIRECT CURRENT
J Physiol  134 408
MURRAY R W
THE RESPONSE OF THE AMPULLA OF LORENZINI TO COMBINED STIMULATION BY TEMPERATURE CHANGE AND WEAK DIRECT CURRENTS
J Physiol  145 1
MURRAY R W
THE RESPONSES OF THE AMPULLAE OF LORENZINI OF ELASMOBRANCHS TO ELECTRICAL STIMULATION
J Exp Biol  39 119
MURRAY R
TEMPERATURE RECEPTORS
ADVAN IN COMPAR PHYSIOL, ACAD PRESS 1 117

MYRTENKO V
GORODESKA
/EFFECTS OF RADIO RADIATION ON ORGANISMS/
ZZUSAF FOREIGN TECH DIV, WPAFB
ZZZ AD292205
FTD-TT-62-1361 NOV

MYRTENKO V I
A STUDY OF THE LOCAL THERMAL ACTION OF 3 CM ELECTROMAGNETIC
WAVES IN ANIMALS
FIZIOL ZHUR AKAD NAUK UKRAIN SSR 8 382
NAGEL M
ILLUMINATION CONTRAST SPECTRUM AND COLOR CONDITIONS IN AN
AVERAGE OUTDOOR SCENE AS FUNCTIONS OF GROUND REFLECTANCE
OBJECT ORIENTATION AND VIEWING DIRECTION
ZZAERIAL RECON LAB, WRIGHT AIR DEV CENT WP-afb, OHIO
ZZZ AD97137
WADC-TR-56-14 AUGUST 56

NAPIER S
MANUAL OF METEOROLOGY

NAVES Y
/ CHEMICAL COMPOSITION OF SCENT SUBSTANCE CASTOREUM/
PARFUMS, FRANCE 12 126

NAVES Y MAZUYER G
NATURAL PERFUME MATERIALS
REINHOLD NY

NAYLER W
ACTION OF SALICYLATE, DINITROPHENOL, AND CARDIAC GLYCOSIDES
ON THE ISOLATED TOAD HEART
AUSTRAL J EXP BIOL MED SCI 35 471

NEAL E
THE BADGER
BOOK, LONDON

NESTLER F SMITH W
SUBMARINE HABITABILITY-ATMOSPHERE SAMPLING ANALYSIS
NRL MEMO REPT 866 OCT

NESTLER F SMITH W
SUBMARINE HABITABILITY-ATMOSPHERE SAMPLING AND ANALYSIS, II
NRL MEMO REPT 982 OCT

NEUHAUS W
OLFACTORY THRESHOLDS IN DOGS
ZTSCHR VERGL PHYSIOL 38 238

NEUHAUS W
BODY ODOR IN MAN, ITS RECEPTION SIGNIFICANCE AND CONTROL
MUEN MED WSCHR 103 1752

NEW YORK ACAD OF MED
HUMAN NUTRITION, HISTORICAL AND SCIENTIFIC
INTERNAT UNIV PRESS, NY

NEWBRY L
TERRAIN RADAR REFLECTANCE STUDY
PHOTOGRAHMETRIC ENGNG 26 630 SEPT

NEWBURGH
PHYSIOLOGY OF HEAT REGULATION AND THE SCIENCE OF CLOTHING
SAUNDERS, PHILA

NEWMAN R
/ANTHROPOMETRIC DIFFERENCES AND REACTIONS TO HEAT IN
VARIOUS ETHNIC GROUPS/
AM J PHYS ANTHROPOLOGY 13 386
NICOLL G  WARNER F
ATMOSPHERIC ATTENUATION MEASUREMENTS AT EIGHT MM WAVELENGTH
TELECOMMUN RES ESTAB, GT BRIT 

NICHOLLS L
TROPICAL NUTRITION AND DIETETICS
BAILLIÈRE, TINDALL AND COX, LOND

NICHOLSON E
RAMAN SPECTRA FOR RENZFNE WITH CARY SPECTROMETER
ANAL CHEM 32 1634

NIESET R  PINNFO L  BAUS R
THE NEURAL EFFECTS OF MICROWAVE IRRADIATION
ZBIOPHYSICS LAB, TULANE UNIV
ZZROME AIR DEV CENT.
ZZ AD257198
ANNUAL REPORT RADC-TR-61-65 NOVEMBER

NOLTE W
/SMELL CAPACITY IN DUCKS/
ZOOOL ANZ 71 115

NORINS A
FREE RADICAL FORMATION IN SKIN FOLLOWING EXPOSURE TO
ULTRAVIOLET LIGHT
J INVEST DERMATOL 39 445

NORMAN C
SOLAR SIMULATION INSTRUMENTATION
ZAEROSPACE ENVIR FACIL, ARO, SVERDRUP AND PARCEL
ZZARNO LD ENGNG DEV CENT AF
ZZ AD294149
AEDC-TDR-62-191 JANUARY

NORRIS R
STUDIES IN SEARCH FOR A CONSCIOUS EVADER
ZLINCOLN LAB, MASS INST TECH
ZZ AD294832
TECH REP 279 SEPT

NOTTERMAN J  MARTIN T
NOTE ON BEHAVIORAL AND PHYSIOLOGICAL INDICES OF STRESS
PSYCHOL REP 4 649

NOVARO A
SKIN REACTION TO LONG AND SHORT WAVES
BULL SCI MED 122 429

NYBORG W  MINTZER D
REVIEW OF SOUND PROPAGATION IN THE LOWER ATMOSPHERE
ZUSAF AEROMED LAB, WPAFB
TECH REP WADC 54-602 MAY

NYMAN W
FINAL REPORT ON THE DEVELOPMENT OF THE MARK 3 PARTICHROME
CONTINUOUS PROCESSOR
ZPHOTOMECHANISMS, HUNTINGTON STATION, NEW YORK
ZUS ARMY BIOL LARS, FT DETRICK
ZZ AD297015
FINAL REP
OPPEL T HARDY J
STUDIES IN TEMPERATURE SENSATION, I A COMPARISON OF
SENSATION PRODUCED BY INFRARED AND VISIBLE RADIATION
J CLIN INVEST 16 517

ORMISTON D FINKELSTEIN B
THE EFFECTS OF CONFINEMENT ON INTELLECTUAL AND PERCEPTUAL
FUNCTIONING
BEHAVIORAL SCI LAB AND BIOMED LAB AEROSPACE MED LAB WPAFB
ZZZ AD272181
ASD-TR 61-577 OCTOBER 61

OSANKA F
COUNTERINSURGENCY TRAINING - A SELECTED SUBJECT BIBLIOGRAPHY
GEORGE WASH U, WASH
DEPT OF THE ARMY
ZZZ AD295021
RES MEMO NOV 62A

OSANKA F
A BIBLIOGRAPHY ON THE ROLE OF AIR POWER IN GUERRILLA AND
COUNTERGUERRILLA OPERATIONS
GEORGE WASH U, HUMAN RESOURCES RES OFF
DEPT OF THE ARMY
ZZZ AD295020
RESEARCH MEM NOV 62B

OSBORNE M FINLAYSON L
THE STRUCTURE AND TOPOGRAPHY OF STRETCH RECEPTORS IN
REPRESENTATIVES OF SEVEN ORDERS OF INSECTS
QUART J MICROSCOPIC SCI 103 227

OTTOSON D
ANALYSIS OF THE ELECTRICAL ACTIVITY OF THE OLFATORY
EPITHELIUM
ACTA PHYSIOL SCAND 35 122

OTTOSON D
STUDIES ON THE RELATIONSHIP BETWEEN OLFATORY STIMULATING
EFFECTIVENESS AND PHYSICO CHEMICAL PROPERTIES OF ODOROUS
COMPounds
ACTA PHYSIOL SCAND 43 167

OTTOSON D
SOME ASPECTS OF THE FUNCTION OF THE OLFATORY SYSTEM
PHARMACOL REV 15 7

OUCHAKOFF A
ESSAIS D-APPLICATION PRATIQUE CONCERNANT LA RELATION ENTRA
L-ODORAT ET L-ABSORPTION DES SUBSTANCE ODORANTES
REV DE LARYNGOL 51 77

OUCHAKOFF A
L-ADSORPTION DES SUBSTANCE ODORANTES ET L-ODORAT
ACTA OTOLARYNGOL 14 470

OWEN R
ANATOMY OF VERTEBRATES, VOL 3 /SECTIONS ON HARE AND DEER,
ANIMAL SCENT GLANDS/
OWEN W
CONTACT CHEMORECEPTION IN ADULT MOSQUITOES
J INSECT PHYSIOL 6 13 61

OWEN W B
THE CONTACT CHEMORECEPTOR ORGANS OF THE MOSQUITO AND THEIR
FUNCTION IN FEEDING BEHAVIOR
J INSECT PHYSIOL 9 73 63

OWENS E SHERMAN A
MASS SPECTROGRAPHIC LINES OF THE ELEMENTS
MIT LINCOLN LAB
AD275468
TR-265 APRIL 62
PARKER A
STIMULI INVOLVED IN THE ATTRACTION OF AEDES AEGYPTII TO MAN
BULL ENTOM RES 39 387

PARKER G H
VAN HEUSEN A
THE RESPONSES OF THE CAT FISH, AMIURUS NEBULOSUS TO METALLIC
AND NON-METALLIC RODS
AMER J PHYSIOL 44 405

PARKER R
METHODS OF TISSUE CULTURE
HOEBER

PARKES A
OLFACTORY STIMULI IN MAMMALIAN REPRODUCTION ODOR EXCITES
NEUROHUMORAL RESPONSES AFFECTING OESTRUS PSEUDOPREGNANCY
AND PREGNANCY IN MOUSE
SCIENCE 134 1049

PARRY E
THE RAW MATERIALS OF PERFUMERY
PITMAN, ENGLAND

PARRY E
PARRYS ENCYCLOPEDIA OF PERFUMERY
CHURCHILL LONDON

PATHAK J
BHATT B
EXCRETION OF SULFUR IN URINE OF INDIANS IN GUJARAT
IND J PHYSIOL PHARMACOL 5 67

PATWARDHAN V
NORMAL LEVELS OF URINARY EXCRETION OF ESTROGENS,
PREGNADIOL AND SEVENTEEN KETOSTEROIDS IN ADULTS
IND J MED SCI 11 4

PAUKER G
RECENT COMMUNIST TACTICS IN INDONESIA
ZLZRAND, SANTA MONICA, CAL
ZLZ AD248078
RM-2619-RC AUG

PEAKE W
THE APPARENT TEMPERATURE OF ISOLATED OBJECTS
ZLZ ANTENNA LAB, OHIO STATE U
ZLZ NASA, WASH DC
ZLZ AD295193
1388-2 OCTOBER 1
<table>
<thead>
<tr>
<th>Author</th>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson O</td>
<td>Scents Glands of the Short-Tailed Shrew</td>
<td>46</td>
</tr>
<tr>
<td>Peck R Ed</td>
<td>Principles and Practice of Gas Chromatography</td>
<td>59</td>
</tr>
<tr>
<td>Peiss C</td>
<td>Kinetics of Evaporative Water Loss from the Skin</td>
<td>51</td>
</tr>
<tr>
<td>Peck R E</td>
<td>Principles and Practice of Gas Chromatography</td>
<td>59</td>
</tr>
<tr>
<td>Penndorf R</td>
<td>Luminous and Spectral Reflectance as Well as Colors of Natural Objects</td>
<td>56</td>
</tr>
<tr>
<td>Penner S</td>
<td>Quantitative Molecular Spectroscopy and Gas Emissivities</td>
<td>59</td>
</tr>
<tr>
<td>Peryam D</td>
<td>Food Attitudes in an Unusual Environment</td>
<td>60</td>
</tr>
<tr>
<td>Peryam D</td>
<td>Sensory Difference Tests / Flavour Research and Food Acceptance</td>
<td>58</td>
</tr>
<tr>
<td>Pfaffmann C</td>
<td>Somesthesis and the Chemical Senses</td>
<td>51</td>
</tr>
<tr>
<td>Pfaffmann C</td>
<td>Species Differences in Taste Sensitivity</td>
<td>55</td>
</tr>
<tr>
<td>Pfaffmann C</td>
<td>The Sense of Taste</td>
<td>59</td>
</tr>
<tr>
<td>Pfleiderer H</td>
<td>Spectral Photometric Measurements on the Human Skin in the Area of 220-2500 Millimicrons</td>
<td>62</td>
</tr>
<tr>
<td>Phansaekar S</td>
<td>Partition of Urinary Nitrogen in Indian Adults, Relation Between Urea Nitrogen and Total Nitrogen</td>
<td>54</td>
</tr>
<tr>
<td>Philip C</td>
<td>Tick Talk</td>
<td></td>
</tr>
</tbody>
</table>
PHILLIPS G
POSSIBLE APPLICATIONS FOR RESEARCH ON ATMOSPHERIC AIR IONS
AT THE BIOLOGICAL LABORATORIES
ZZARMY CHEM CORPS BIOL LABS, FT METRICK
ZZZ AD273016
TECH STUDY 40 FEB 62

PHILLIPS P
LADELL W
NITROGEN BALANCE IN NIGERIANS
J TROPICAL MED HYG 62 180

PHINNEY R
SMITH S
PROCESSING OF SEISMIC DATA FROM AN AUTOMATIC DIGITAL RECORDER
ZZCAL INST OF TECH, SEISMO CBCAL INST
ZZZ AD294914
CONTRIBUTION NO 1119 OCTOBER 62

PIATT V
RAMSKILL E
WHITE J
CHEMICAL CONSTITUENTS OF SUBMARINE ATMOSPHERES
NRL REP 5456 JAN 60A

PIATT V
CHEMICAL CONSTITUENTS OF SUBMARINE ATMOSPHERES
NRL REP 5465 15 APRIL 21

PICK W
SENSE OF SMELL IN THE LOUSE
DERMATOL WOCHSCHR 83 1020 26

PIERCE C
THE MEASUREMENT OF SURFACE MOTION BY MEANS OF PROXIMALLY LOCATED INSTRUMENTATION - AN ANNOTATED BIBLIOGRAPHY
ZZLOCKHEED MISSILES AND SPACE CO, SUNNYVALE CALIF
ZZZ AD296371
SPECIAL BIBLIO SB-62-36 NOV 62B

PIERCE G
THE SONGS OF INSECTS
HARVARD U PRESS, CAMBRIDGE 48

PIERON H
THE SENSATIONS
YALE PRESS, NEW HAVEN 52

PIERSON R
FLETCHER A
GANTZ E
CATALOG OF INFRARED SPECTRA FOR QUALITATIVE ANALYSIS OF GASES
ANAL CHEM 28 1218 56

PIEZ K
MORRIS L
A MODIFIED PROCEDURE FOR THE AUTOMATIC ANALYSIS OF AMINO ACIDS
ANAL BIOCHEM 1 187

PILGRIM F
PERYAM D
SENSORY TESTING METHODS - A MANUAL
ZZQM FOOD AND CONTAIN INST, NATICK 200
PILGRIM F
SENSORY FACTORS IN FOOD ACCEPTANCE BY MAN
ZQM RES AND ENG CENT, NATICK
PRES AT AAAS MEETING, DENVER DEC 30

PINNEO L
DIRECT CURRENT POTENTIALS OF THE CENTRAL NERVOUS SYSTEM - A REVIEW
ZBIOPHYS LAB, TULANE U, NEW ORLEANS, LA
ZROME AIR DEV CENT, AIR RES AND DEV COMM, GRIFFISS AFB, NY
ZZ AD214692
RADC-TN-59-137 JUNE

PINSON E A
EVAPORATION FROM HUMAN SKIN WITH SWEAT GLANDS INACTIVATED
AMER J PHYSIOL 137 492

PIPPES W
WASTE-RECOVERY PROCESSES FOR A CLOSED ECOLOGICAL SYSTEM
ZARMED FORCES, NRC CMTEE ON BIOASTRONAUTICS
ZZ AD261193
PUBLICATION 898 APRIL

PIRON-REATEGUI
BODY COMPOSITION AT SEA LEVEL AND AT HIGH ALTITUDE
J APPL PHYSiol 16 589

PIRON-REATEGUI E
CREATININE EXCRETION AND BODY COMPOSITION
AM J CLIN NUTRIT 10 128

PLYLER E DANTI A BLAINE L
VIBRATION-ROTATION STRUCTURE IN ABSORPTION BANDS FOR THE CALIBRATION OF SPECTROMETERS FROM 2 TO 16 MICRONS
J RES NAT BUR STDS 64 JAN R-6164 60

POBINER
INFRARED ABSORPTION SPECTRA FOR CARBOXYLIC ACIDS
ANAL CHEM 35 680

POCOCK R
TASTE OR SMELL IN THE LAUGHING JACKASS
NATURE 89 425

POCOCK R
ON THE FEET AND GLANDS AND OTHER EXTERNAL CHARACTERS OF THE PARADOXURINE GENERA
ZOOL SOC Proc, LOND, p387

POCOCK R
WHITE BOAR SCENT SECRETION
PROC ZOOL SOC LOND 16A

POCOCK R
SCENT GLANDS IN MAMMALS
PROC ZOOL SOC, LOND 16B

PODOLSKY E
RELATION OF THE NOSE TO SEXUAL ACTIVITY
PODOMORDVINOV A
ATTRACTION OF ANOPHELES BY VARIOUS ANIMALS
MEDIT PARAZITOL 11 61

POLIAKOFF K
PHYSIOLOGY OF SMELL AND HEARING IN THE TURTLE
RUSS J OF PHYSIOLOGY 13 161

POLLACK H ED
SYMPOSIUM ON NUTRITION IN THE FAR EAST /SEVENTEEN ARTICLES/
METABOLISM 5 203

POLLACK L MURPHY T
SAMPLING OF /AIR/ CONDENSATION NUCLEI BY MEANS OF A MOBILE
PHOTOELECTRIC COUNTER
ARCH METRO, WIEN A5 110

POPE SCHNEIDER BERNSTEIN
HIGH RESOLUTION NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY
TECHN OF ORGANIC CHEMISTRY, PHYSICAL METHODS VOL 1, PT 4
P2794 INTERSCIENCE

PORGES K
MINE DETECTION BASED ON X-RAY FLUORESCENCE TECHNIQUES
ZARMOUR RES FOUNDATION OF ILL INST OF TECH, CHICAGO ILL
ENGINEER RES AND DEV LABS, FT BELVOIR VA,
ZZZ AD222934
FINAL REPORT JUNE 24

PORTER R PARKER M
A SURVEY OF MICROWAVE RADIOMETERS WITH TERRAIN MAPPING
APPLICATIONS
ZAVCO RES AND DEV DIV, WILMINGTON MASS
ZZUSAFBMD
ZZZ AD243229
REP RAD-TR-9-60-20 AUG

PORTMAN A
ANIMALS AS SOCIAL BEINGS
NY

PORTMAN A
SENSORY ORGANS SKIN TASTE AND OLFACTION
P37 IN BIOLOGY AND COMPARATIVE PHYSIOL OF BIRDS /MARSHALL A
ED/ VOL 2
ACAD PRESS, NY

POSENER D
MICROWAVE SPECTRUM OF THE WATER MOLECULE
MIT PHYSICS THESIS

POSTMUS S VANDERRIJST P
NUTRITION BIBLIOGRAPHY OF INDONESIA
U OF HAWAII PRESS, PACIFIC AREA BIBS FROM FISKETT BIB

POUCHER
PERFUMES, COSMETICS, AND SOAPS /2 VOLS/

PRATT AND WHITNEY AIRCFT CO
MEASUREMENT OF SPECTRAL AND TOTAL EMITTANCE OF MATERIALS AND SURFACES UNDER SIMULATED SPACE CONDITIONS
REP PWA-1863 JUNE 30 60

PRICE G
WHITE SETTLERS IN THE TROPICS
AMER GEOGRAP SOC, NY PUB 25 39

PROSSER C
COMPARATIVE PHYSIOLOGY OF NERVOUS SYSTEMS AND SENSE ORGANS
ANN REV PHYSIOL 16 103 54

PROSSER C
COMPARATIVE ANIMAL PHYSIOLOGY
SAUNDERS, PHIL 61

PROSTAK A
ATMOSPHERIC TRANSMISSION COEFFICIENTS AND CONSTANTS
PROC OF IRIS INFRARED SYMPOS, US GOVT/ 5, 3 JULY 60

PROVAZEK L SMITH H BOSTICK F
FURTHER STUDIES OF THE DIRECTIONAL PROPERTIES OF MAGNETOTELLURIC SIGNALS
ZZELECTRICAL ENGNR RES LAB, U OF TEXAS, AUSTIN TEXAS ZZOFFICE OF NAVAL RESEARCH ZZZ AD252440
REPORT NO 119 FEBRUARY 20 61

PRUITT W LUCIER C HUFMAN L
SOME CONTRIBUTIONS OF SMALL MAMMAL BIOCLIMATE STUDIES TO AIR FORCE NEEDS IN NORTHERN REGIONS ZZARCTIC AEROMED LAB, LADD AFB ZZZ AD293081
REPORT TN-56-8 56

PUMPHREY R
HEARING SYMPOSIA SOC EXP BIOL 50

PUK
SOILS, PHYSICS AND CHEMISTRY REINHOLD, NY 55

PURNELL J QUINN C
AN APPROACH TO HIGHER SPEEDS IN GAS-LIQUID CHROMATOGRAPHY P 184 IN GAS CHROMATOG SYMPOS, EDINBURGH 60

PURNELL J
GAS CHROMATOGRAPHY WILEY, NY 62

PYCRAFT W
CAMOUFLAGE IN NATURE HUTCHINSON, LOND 25
RAHM U
VARIOUS FACTORS IN THE ATTRACTION OF INSECTS TO MAN
REV SUISSE ZOOL 64 236

RAHM U
ON THE SIGNIFICANCE OF HUMAN ODOR AND SWEAT IN THE ATTRACTION
OF AEDES AEGYPTI MOSQUITOES
ACTA TROP 14 208

RAHM U
THE FUNCTION OF ANTENNAE, PALPAE AND TARSAE OF AEDES EGYPTI
MOSQUITO /IN HOST FINDING BY ODOR/
REV SUISSE ZOOL 63 779

RAHM U
ATTRACTION MECHANISMS RELATING HUMAN ODOR TO AEDES AEGYPTI
MOSQUITOES
Z TROPEN MED U PARASIT 9 146

RAJEWSKY B
ULTRAKURZWELLEN, IN
ERGBEN BIOPHYSIK FORSCH, VOL 1
LEIPZIG

RAMACHANDRAN M VENCATACHALAN
URINARY EXCRETIONS OF 17-KETOSTEROIDS IN NORMAL AND
UNDERNOURISHED SUBJECTS
IND J MED RES 44 227

RAMAMURTI K
STUDIES ON THE NITROGEN PARTITION IN THE URINE OF
RAJASTHANIS
IND J MED RES 43 61

RAMANATHAN N
CHANGES IN THE SALT CONCENTRATION OF SWEAT DURING EXERCISE
IN MONSOON WEATHER
IND J MED RES 44 377

RAMANATHAN N CROPALAN C
SOME OBSERVATIONS ON THE CHEMICAL COMPOSITION OF HUMAN
SEBUM
IND J MED RES 46 461

RAMANATHAN N
FIELD METHOD FOR THE DETERMINATION OF URINARY CHLORIDE
IND J MED RES 48 103

RAMSKILL E
NUCLEAR SUBMARINE HABITABILITY
THE 5TH NAV SCI SYMPOS NAV RES, ANNAPOLIS APRIL 18
ZZZ AD260241
REP ONR-9-VOL 3

RANDALL W C KIMURA K K
PHARMACOLOGY OF SWEATING
PHARMACOL REV 7 365

RAU P RAU N
SEX ATTRACTION AND RHYTHMIC PERIODICITY IN THE GIANT
SATURNID MOTHS
<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
<th>Authors</th>
<th>Year</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCTIC AEROMED LAB REP 7</td>
<td></td>
<td></td>
<td>57B</td>
<td></td>
</tr>
<tr>
<td>ROEDER E</td>
<td>INSECT PHYSIOLOGY</td>
<td>WILEY NY</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>ROEDER K</td>
<td>THE INSECT NERVOUS SYSTEM</td>
<td>ANN REV ENTOMOL 3 1</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>ROEDER K</td>
<td>TREAT A THE DETECTION AND EVASION OF BATS BY MOTHS</td>
<td>AMER SCIENTIST 49 135</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>ROGERS L</td>
<td>THE INFRARED ABSORPTION SPECTRA OF SOME SUGARS AND FURANS</td>
<td>J AM CHEM SOC 60 2619</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>ROGERS T</td>
<td>FACTORS AFFECTING THE WIDTH AND SHAPE OF ATMOSPHERIC MICROWAVE ABSORPTION LINES</td>
<td>AF CAMBRIDGE RES CENT REP E-5078</td>
<td>51</td>
<td></td>
</tr>
<tr>
<td>ROLLINS F</td>
<td>STUDY OF ULTRASONIC TECHNIQUES FOR THE NONDESTRUCTIVE MEASUREMENT OF RESIDUAL STRESS</td>
<td>ZAERONAUTICAL SYST DIV, WP-AFB OHIO</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td></td>
<td>QUARTERLY PROGRESS REP NO 9 DECEMBER 1</td>
<td>ZA MIDWEST RESEARCH INSTITUTE</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>ROMANES G</td>
<td>SENSE OF SMELL IN DOGS</td>
<td>NATURE /LOND/ 36 273</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td>ROMANES G</td>
<td>EXPERIMENTS ON THE SENSE OF SMELL IN DOGS</td>
<td>J LINNEAN SOC, LONDON, ZOOL 20 65</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>ROONEY W</td>
<td>TERRESTRIAL MAGNETISM AND ELECTRICITY</td>
<td>DOVER NY 49</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>ROOS C BARRY J</td>
<td>BIBLIOGRAPHY OF MILITARY PSYCHIATRY 1952-1958</td>
<td>PHS PUB 693, BIBLIO SERIES NO 27 MAY</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td>ROOS C</td>
<td>BIBLIOGRAPHY OF MILITARY PSYCHIATRY, 1947-1952</td>
<td>ARMED FORCES MED LIBRARY REFERENCE DIVISION, WASH DC</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>ROSEN A</td>
<td>ODOR THRESHOLDS OF MIXED ORGANIC CHEMICALS</td>
<td>J WATER POLL CONTROL FED 34 7</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>ROSENBTH W, ED</td>
<td>SENSORY COMMUNICATION</td>
<td>207</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
A PHYSICO CHEMICAL TREATMENT OF TASTE THRESHOLDS
NATURE 195 362

RUCH F
BIBLIOGRAPHY ON MILITARY LEADERSHIP
ZZPSYCHOLOGICAL SERVICES INC, LOS ANGELES CALIF
ZZHUMAN RESOURCES RES INST, MAXWELL AFB, ALA
ZZZ AD25681
TECH RES REP NO 18 JUNE

RUDOLPH K
UBER DEN GERUCHSSINN DER HUNDE
PSYCHE /BERLIN/ 7 99

RUESCH J
PRESTWOOD A
ANXIETY, ITS INITIATION, COMMUNICATION AND INTERPERSONAL
MANAGEMENT
ARCH NEUROL PSYCHIAT 62 527

RUNGE J
GREEN D
BIBLIOGRAPHY OF ELECTRO-OPTICAL AND MAGNETO-OPTICAL
PHENOMENA AND THEIR APPLICATIONS
ZZNAVAL ORD TEST STAT, CHINA LAKE
ZZZ AD235612
TP-2377 DECEMBER

RUNGE W
FUSARO R
ZZDEPT MED, U OF MINN
BIOPHYSICAL CONSIDERATIONS OF LIGHT PROTECTION
J INVEST DERMATOL 39 431

RUPERT A
MOUSHEGIAN G
GALAMBOS
UNIT RESPONSE TO SOUND FROM AUDITORY NERVE OF THE CAT
J NEUROPHYSIOL 26 449

RUSSEK M
PARTICIPATION OF HEPATIC GLUCORECEPTORS IN THE CONTROL OF
INTAKE OF FOOD
NATURE /LOND/ 197 79

RUSSELL W
FALCONRY, A HANDBOOK FOR HUNTERS
SCRIBNERS NY

RUTHERFORD R
A LARGE DIAMETER X-RAY SENSITIVE CAMERA TUBE
ZZCBS LABS, STAMFORD, CONN
ZZARMY MATERIALS RES OFFICE, WATERTOWN ARSENAL, MASS
ZZZ AD295502
TECH REP TR142/68 OCTOBER 1

RUTHERFORD T
HA WK P
A STUDY OF THE COMPARATIVE CHEMICAL COMPOSITION OF THE HAIR
OF DIFFERENT RACES
J BIOL CHEM 3 499

RUZIEKA L
/CHEMICAL COMPOSITION OF MUSK/
HELV CHIM ACTA 9 715,1008
SADTLER LABORATORIES, PHIL
STANDARD INFRA RED AND ULTRAVIOLET SPECTRAL DATA BOOK

SAGARIN E
(PERFUMERY ANIMALS)
DRUG AND COSMETIC INDUSTRY DEC 44

SAGARIN E
THE SCIENCE AND ART OF PERFUMERY
MCGRAW HILL NY 45

SAGARIN E ED
COSMETIC SCIENCE, AND TECHNOLOGY
INTERSCIENCE NY 57

SAITO M
EXAMINATION OF URINE
SAISHIN IGAKU 15 2594 60

SALAKE LUCK
ORGANIC COLORIMETRY, ARGinine/
BULL SOC CHIM BIOL 40 1743 58

SALATI O
MICROWAVE ABSORPTION MEASUREMENTS
ZZROME AIR DEVELOPMENT CENTER NY
IN PROC MICROWAVE INVESTIGATORS CONF PATRICK AFB FLA RADC-TR-69-67 59

SALGANIK R
NUTRITION IN HIGH ENVIRONMENTAL TEMPERATURE
AM J CLIN NUTRIT 7 599 59

SAN DIEGO STATE COLLEGE FOUNDATION
COMPARISON AND INTERACTION AMONG SENSORY INPUT CHANNELS, BIB
ZZJOINT SERVICES CMTEF, HUM ENG GUIDE TO EQUIPT DESIGN ZZZ AD95131 MARCH 1 55

SANZ M
COMPREHENSIVE REVIEW OF TECHNICAL APPARATUS IN
ULTROMICROANALYSIS
CHIMICA 13 192 59

SARGENT F
THE EFFECT OF DIET ON RENAL FUNCTIONS IN HEALTHY MEN
J AM CLIN NUTRIT 4 466 56

SAITO M
ELECTROPHYSIOLOGY OF GUSTATORY RECEPTORS IN THE ELECTRICAL
ACTIVITY OF SINGLE CELL
JAP J PHYSIOL 10 620 60

SCHAERFFENBERG B
AMINO ACIDS AS MOSQUITO ATTRACTANTS
NATURWISS 46 457 59

SCHAFFER J
SCENT PRODUCING ORGANS OF THE HUMAN BODY
WIEN KLIN WOCHSCHR 50 790 37
SCHEER B  
/STUDIES OF THE EMF SOURCE IN ISOLATED FROG SKIN/  
J CELL COMP PHYSIOL 55 259

SCHMID B  
NASAL FUNCTION AND PSYCHIC ABILITY OF THE DOG  
UMSCHAU WISS U TECH 39 457

SCHMIDT U  REINWEIN H  
THE INFRARED SPECTROSCOPY OF AMINO ACIDS  
NATURFORSCH 76 270

SCHNEIDER D  
ELECTROPHYSIOLOGICAL INVESTIGATION ON THE ANTENNAL  
RECEPTORS OF THE SILKWORM MOTH DURING CHEMICAL AND  
MECHANICAL STIMULATION  
EXPERIEN 13 89

SCHNEIDER D  
IDENTIFICATION OF HUMAN AND ANIMAL INDIVIDUAL SCENTS BY THE  
DOG  
Z VERGLEICH PHYSIOL 22 524

SCHNEIDER D  HECKER E  
ON ELECTROPHYSIOLOGY OF THE /ISOLATED/ ANTENNA OF THE  
SILKWORM MOTH ON STIMULATION BY ENRICHED EXTRACT OF THE  
SEXUAL ATTRACTANT /CYCLOHEPTANONE/  
Z NATURFORSCH 11 121

SCHNEIDER D  FULLER J  
DOG BREED DIFFERENCES IN LOCATING HIDDEN PERSONS AND ANIMALS  
AMER ZOOL 2 446 ABSTR

SCHNITZER S  
FULLER J  
J MAMMOL 28 180

SCHOLANDER P  
HEAT REGULATION IN SOME ARCTIC AND TROPICAL MAMMAL AND  
BIRDS  
BIOL BULL 99 237

SCHORGER A  
SENSE OF SMELL IN THE SHORT TAILED SHREW  
J MAMMOL 28 180

SCHOTLAND R  NATHAN A  CHERMACK E  
OPTICAL SOUNDING, EXPERIMENT AND INSTRUMENTATION DESIGN  
CONSIDERATIONS  
ZZNY UNIV COLL OF ENG, NY
SCHOTLAND R NATHAN A
THE USE OF LASERS FOR THE REMOTE DETERMINATION OF
ATMOSPHERIC TEMPERATURE
SYMPOS ON REMOTE SENS OF ENVIRON, U MICH OCT 17

SCHULTZ A LEAVITT W
THE FEASIBILITY OF USING NEUTRON RADIOGRAPHY AS A
NON-DESTRUCTIVE TESTING TECHNIQUE
ZZWATERTOWN ARSENAL LABS, MASS
TR 142/67 DEC

SCHULTZ E
REGENERATION OF OLFATORY CELLS
PROC SOC EXP BIOL MED 46 41

SCHULTZ W
REACTIIONS OF SENSITIZED ISOLATED GUINEA PIG PIG INTESTINE
TO ANTIGENS
J PHARMACOL 2 221

SCHUMAN S
HOST FACTORS AND ENVIRONMENT IN STUDIES OF HUMAN SWEAT
INDUSTR MED SURG 31 443 62

SCHUTZ H
RELATION OF ODOR TO PHYSICOCHEMICAL PROPERTIES OF
COMPOUNDS
ZBATTELLE MEMORIAL INST, COLUMBUS, OHIO
ZQUARTERMASTER RES AND ENG COMM, WM RES AND ENG CENT, MASS
ZZ AD278541
FINAL REP - NO 8 DECEMBER

SCHWAN H P PIERSOL G M
THE ABSORPTION OF ELECTROMAGNETIC ENERGY IN BODY TISSUES, 1
AMER J PHYS MED 33 371 54A

SCHWAN H CARSTENSEN E LI K
COMPARATIVE EVALUATION OF ELECTROMAGNETIC AND ULTRASONIC
DIATHERMY
ARCH PHYS MED 35 13

SCHWAN H PIERSOL G
THE ABSORPTION OF ELECTROMAGNETIC ENERGY IN BODY TISSUES
2. PHYSIOLOGICAL AND CLINICAL ASPECTS
AMER J PHYS MED 34 424 JUNE

SCHWAN H P LI K
HAZARDS DUE TO TOTAL BODY IRRADIATION BY RADAR
PROC IRE 44 1572 56A

SCHWAN H P LI K
THE MECHANISM OF ABSORPTION OF ULTRAHIGH FREQUENCY
ELECTROMAGNETIC ENERGY IN TISSUES, AS RELATED TO THE PROBLEM
OF TOLERANCE DOSAGE
IRE TRANS PGME 4 45 56B

SCHWAN H
BIOPHYSICS OF DIATHERMY
ZZSCHOOLS OF EE AND MEDICINE, U OF PENNA, PHILA
ONR
ZZZ AD149534
TECH REP 21 57A

SCHWAN H
ELECTRICAL PROPERTIES OF TISSUE AND CELL SUSPENSIONS
IN ADVAN IN BIOL AND MED PHYS VOL 5 57B

SCHWAN H
EFFECTS OF MICROWAVES ON MANKIND
ZUNIV OF PENNA PHILA
ANN PROG REPORT FOR USAF MAR 59 59

SCHWARTZ I
EXTRARENAL REGULATION WITH SPECIAL REFERENCE TO THE SWEAT
GLANDS
IN MINERAL METABOLISM C COMAR EDIT ACADEMIC PRESS NY 60 60

SCHWARZ F
UEBER DIE WIRKUNG VON WECHSELSTROM AUF DAS SEHORGAN
Z SINNESPYSIOL 67 227 38

SCHWARZ F
UEBER DIE REIZUNG DES SEHORGANS DURCH NEIDERFREQUENTE
ELEKTRISCHE SCHWINGUNGEN
Z SINNESPYSIOL 68 69 40A

SCHWARZ F
QUANTITATIVE UNTERSUCHUNGEN UBER DIE OPTISCHE WIRKUNG
SINUSFORMIGER WECHSELSTROME
Z SINNESPYSIOL 69 1 40B

SCHWARZ F
UEBER DIE REIZUNG DER SEHORGANS DURCH DOPPELPHASIGE UNDER
GLEICHGERICHTFTE ELEKTRISCHE SCHWINGUNGEN
Z SINNESPYSIOL 69 158 41

SCHWARZ F
UEBER DIE ELEKTRISCHE REIZBARKEIT DES AUGES BEI HELL- UND
DUNKELADAPTATION
PFLUG ARCH GE PHYSIOL 249 76 47

SCHWARZ R
OLFACTORY THRESHOLDS OF HONEYBEES
ZTSCHR VERGL PHYSIOL 37 180 55

SCHweisheimer W
ANIMAL ODOURS AND PERFUMES
PERFUM AND ESSENT OIL REC 47 57 56

SCHWINK I
/INSECT MALE ANTENNA OLFRACTORY RECEPOTORS RESPONSIVE TO SEX
ATTRACTANTS/
Z VERGLEICH PHYSIOL 37 439 55

SCOTT J
ANIMAL BEHAVIOR
U OF CHICAGO PRESS 58
SCOTT R
CHROMATOGRAPHY
BUTTERWORTHS LOND

SCRIBER B
/EXCRETION OF BASIC AMINES/
AMER J PHYSIOL 196 1135 59

SEDIN J
APPLIED RESEARCH ON A HIGH-POWER MILLIMETER-WAVE GENERATOR
ZZWATKINS-JOHNSON COMPANY, PALO ALTO, CALIF
ZZELECTRONIC TECHNOLOGY LAB, AERO SYSTEMS DIV, USAF
ZZ AD295005
INTERIM ENGINEERING REPORT NO 6 NOVEMBER 30 62

SELLS S
MILITARY SMALL GROUP PERFORMANCE UNDER ISOLATION AND STRESS
AN ANNOTATED BIBLIOGRAPHY 3, ENVIRONMENTAL STRESS AND
BEHAVIOR ECOLOGY
ZZDEPT OF PSYCHOL, TEXAS CHRISTIAN U, FORT WORTH
ZZARCTIC AEROMED LAB, FT WAINWRIGHT, ALASKA
ZZ AD276829
TR-61-21 OCT 61

SENDROY J COLLISON H
POTABLE WATER RECYCLED FROM HUMAN URINE
ZZNAV MED RES INSTITUTE BETHESDA
ZZ AD220837
RES REPORT OF MAY 59

SENGUN A
UBER DIE BIOLOGISCHE BEDEUTUNG DES DUFTSTOFFES VON BOMBYX
REV FAC SCI UNIV ISTANBUL 819 281 54

SERRA C
A NEUROBIOLOGICAL CONTRIBUTION TO ACTION MECHANISMS OF
INTERMITTENT PHOTIC STIMULATION
EUG CLIN NEUROPHYSIOL 3 427 57

SHAMBAUGH G
TEMPERATURE RECEPTORS, AN ANNOTATED BIBLIOGRAPHY
ZZENVIRON PROT RES DIV, QM RES DEV CEN, NATICK, MASS
ZZ AD100292
TECH REP EP-24 APRIL 56

SHAW T ELSKEN R
DETERMINATION OF HYDROGEN IN LIQUIDS AND SUSPENSIONS BY
NUCLEAR MAGNETIC RESONANCE
ANAL CHEM 27 1983 55

SHAW J
SURVEY OF THE LITERATURE ON RADIATION IN THE ATMOSPHERE
ZZOHIO STATE UNIV RESEARCH FOUNDATION, COLUMBUS
ZZARMY SIGNAL SUPPLY AGENCY, FT MONMOUTH N J
ZZ AD210805
RF 845 SEPTEMBER 58

SHELLEY W
THE PHYSIOLOGY OF THE SKIN
ANN REV PHYSIOL 20 179 58
SHELLEY W
THE APOCRINE SWEAT GLANDS IN HEALTH AND DISEASE
THOMAS, SPRINGFIELD 60

SHELMIRE J
SOME INTERRELATIONS BETWEEN SEBUM SWEAT AND THE SKIN SURFACE
J INVEST DERMAT 32 471 59

SHENKLE W
GLOSSARY OF PHOTOGRAPHIC AND RECONNAISSANCE TERMS
ZZAERIAL RECON LAB WRIGHT AIR DEV CENT WP-AFB, OHIO
ZZZ AD110595
WADC TECH NOTE 56-510 NOVEMBER 56

SHEPHEARD-WALWYN H
HARMONIES OF NATURE SCENT
NATURE MAGAZ: 7 153 26

SHETH V MARATHE S
ADRENALINE AND NORADRENALINE EXCRETION IN INDIAN ADULTS
IND J MED RES 50 205 62

SHIBATI K
SPECTROPHOTOMETRY OF OPAQUE BIOLOGICAL MATERIALS BY
REFLECTANCE METHODS
METHODS OF BIOCHEM ANALYSIS, VOL TEN XX

SIGGIA STOLTEN
INTRODUCTION TO MODERN ORGANIC ANALYSIS
INTERSCIENCE 56

SIGLING D
PROBLEM OF BLOODHOUNDS/
TIJDENSCHRIJF DIERGENEESK 55 573 28

SIMMONS F
EAT NOT THIS FLESH
U WISCON PRESS, MADISON 61

SIRONS J
LASERS FOR AEROSPACE WEAPONRY
ZNAVIGATION AND GUIDANCE LAB AF SYS COMMAND, WP-AFB, OHIO
ZZZ AD278521
ASD-TDR-62-440 MAY 62

SKEGGS L
AN AUTOMATIC METHOD FOR COLORIMETRIC ANALYSIS
AM J CLIN PATHOL 58 311 57

SKOUBY A
INFLUENCE OF ACETYL-CHOLINE-LIKE SUBSTANCES, MENTHOL, AND
STRYCHNINE ON OLFACTORY RECEPTORS IN MAN
ACTA PHYSIOL SCAND 32 292 54

SLEGGS G
THE ADULT ANATOMY AND HISTOLOGY OF THE ANAL GLANDS OF THE
RICHARDSON GROUND SQUIRREL /CITELLUS RICHARDSONII SABINE/
ANAT RECORD 32 1 26

SLIFER E
THE DETECTION OF ODORS AND WATER VAPOR BY GRASSHOPPERS
ORTHOPTERA ACRIDIDAE, AND SOME NEW EVIDENCE CONCERNING
THE SENSE ORGANS WHICH MAY BE INVOLVED
J EXP ZOOL 130 301 55

SLIFER E
CHEMORECEPTORS AND OTHER SENSE ORGANS ON THE ANTENNAL
FLAGELLUM OF THE GRASSHOPPER
J MORPHOL 105 45 59

SLIFER E SEKHON S
THE FINE STRUCTURE OF THE SENSE ORGANS ON THE ANTENNAL
FLAGELLUM OF THE YELLOW FEVER MOSQUITO Aedes aegypti
J MORPHOL 3 49 62

SLIFER E SEKHON S
SENSE ORGANS ON THE ANTENNAL FLAGELLUM OF THE SMALL MILKWEED
BUG
J MORPHOL 112 165 63

SLOTWINSKI J
SUR LE CARACTERE DE LA SECRETION DES GLANDES OLFCTIVES DE
BOWMAN CHEZ LES MAMMIFERES
COMPT RENT SOC BIOL 108 599 31

SMART M BROWN A
STUDIES ON THE RESPONSE OF THE FEMALE AIDES MOSQUITO
ONE, THE EFFECT OF SKIN TEMPERATURE, TIME AND
MOISTURE ON THE ATTRACTIVENESS OF THE HUMAN HAND
BULL ENT RES 47 89 56

SMITH A
HOUNDS AND DOGS, THEIR CARE TRAINING AND WORKING FOR
HUNTING SHOOTING COURSING HAWKING POLICE PURPSES
LIPPINCOTT, PHILA 32

SMITH K
INTERMITTENT LOUD NOISE AND MENTAL PERFORMANCE
ZzZAVAIL FROM COMM ON HEARING AND BIO-ACOUSTICS, NRC WASH, DC
ZzZ 50

SMITH L
RECENT ADVANCES IN ATMOSPHERIC ELECTRICITY
PERGAMON, LOND 59

SMITH M
THE BRITISH AMPHRHANS AND REPTILES
LOND 51

SMITH R ED
PROCEEDINGS OF INTERNATIONAL SYMPOSIUM ON TEMPERATURE
ACCLIMATION, LEIDEN SEPT 1962
FED PROC 22 687 63

SMITH R COX J
METHODS OF REDUCTION OF PSYCHOLOGICAL STRESS DUE TO
RADIATION
ZzZPERSONNEL LAB, PER AND TRAIN CENT, LACKLAND AFB
ZzZ ADP98922
AFPTRC-TN-57-19 FEB 57

SNOW W B
EFFECT OF ARRIVAL TIMES ON STEREOPHONIC LOCALIZATION  
J ACOUS SOC AMER 26 1071 NOV 54

SOSNOW M  
ELECTRODES FOR RECORDING PRIMARY BIOELECTRICAL SIGNALS  
ZLITTON INDUSTrICAL  
ZMBIOMED LAB WPAFB  
ZZ AD267056  
REPORT 61

SOUDEK S  
SENSE OF SMELL IN BIRDS  
VERHANDL TENTH INTERN CONGR ZOOL, BUDAPEST 1 795 29

SOUPART P  
URINARY EXCRETION OF FREE AMINO ACIDS IN NORMAL ADULT MEN AND WOMEN  
CLIN CHEM ACTA 4 265 59

SPACkMAN D  
STEWART W  
MOORE S  
AUTOMATIC RECORDING APPARATUS FOR USE IN THE CHROMATOGRAPHY OF AMINO ACIDS  
ANAL CHEM 30 1190 58

SPECTOR H  
PETERSON M  
nUTRITION UNDER CLIMATIC STRESS  
ZQARTERMASTER FOOD AND CONT INST  
ZZ AD67453  
MAY 54A

SPECTOR H  
FD  
METHODS FOR EVALUATION OF NUTRITION ADEQUACY AND STATUS  
ZQADVIS BD QM RES COMM ON FOODS, WASH 54B

SPECTOR H  
ED  
PERFORMANCE CAPACITY, A SYMPOSIUM  
QM FOOD AND CONTAIN INST, CHICAGO 61

SPECTOR W  
ED  
HANDBOOK OF BIOLOGICAL DATA  
ZZ AD110501  
PREPARED UNDER THE DIRECTION OF NRC-NAS CMTEE ON HANDBOOK OF BIOL DATA, PUBLISHER WP-AFB, DAYTON 0 WADC TR-56-273 OCT 56

SPENCER R  
AN ETHNO-ATLAS  
BROWN, DUBUQUE 57

SPERBER I  
SECRETION OF ORGANIC ANIONS IN THE FORMATION OF URINE AND BILE  
PHARMACOL REV 11 109 59

ZZSPERRY GYRO, MARINE DIV, SYOSSET NY  
AN INVESTIGATION OF PASSIVE RANGING TECHNIQUES FOR MICROWAVE AND SUBMILLIMETER SURVEILLANCE RADIOMETERS  
ZZWADD, WPAFB, OHIO  
ZZ AD246568  
QUARTERLY REP 1 NOV 60
STAMBAUGH R  DAVIDSON D
VARIATIONS IN EXCRETION OF CERTAIN AMINO ACIDS WITH AGE
CLIN CHEM 9 210

STANCHO Z
HOUNDS
BOOK PUB HOUSE, BUCHAREST

STECHER, ED
MERCK INDEX
MERCK AND CO, RAHWAY, NJ

STEEDMAN W  BAKER C
TARGET SIZE AND VISUAL RECOGNITION
AZAEROSPACE MED LAB, WRIGHT AIR DEV DIV, WPAFB, OHIO
ZZ AD235129
WADD-TR-60-93 FEBRUARY

STEGERDAR F  CLARK W
THE EFFECTS OF THE INTRODUCTION OF GAS INTO THE COLON
AND ITS PRESSURE AND ACTIVITY
FED PROC 6 211

STEGERDAR F R  CLARK W C  DANHOF I E
MOTILITY AND TONE OF THE HUMAN COLON AT VARIOUS SIMULATED
ALTITUDES
J AVIAT MED 26 189

STEIN W H
/FREE AMINO ACIDS IN URINE/
J BIOL CHEM 201 45

STEINER G
/SYSTEMATIC RESEARCH ON THE SMELL ORIENTATION OF FLESH-FLIES
Z VERGLEICH PHYSIOL 30 1

STEPHENS E
THE ATMOSPHERE, A REVIEW
ZZFLIGHT RES LAB, WRIGHT AIR DEV CENT, WP-AFB OHIO
ZZ AD8140
TECH NOTE WCRR 52-16 OCTOBER

STEPHENSON E  STEWART
ANIMAL CAMOUFLAGE
BLACK, LOND

STEVENS S
HANDBOOK OF EXPERIMENTAL PSYCHOLOGY
WILEY NY

STEWARD C  ATWOOD C
THE SENSORY ORGANS OF THE MOSQUITO ANTENNA
CANAD J ZOOL 41 577

STEWARD R D
RAPID INFRARED DETERMINATION OF ACETONE IN THE BLOOD AND THE
EXHALED AIR OF DIABETIC PATIENTS
NATURE 191 1008

STEWART H  CURCIO J
THE INFLUENCE OF THE FIELD OF VIEW ON MEASUREMENTS OF
ATMOSPHERIC TRANSMISSION
J OPTICAL SOC AMER 42 11 NOV 52

STEWART J
JAMMING AND ANTI-JAMMING IN SPEECH COMMUNICATIONS
ENG RES INST, U OF MICH TR NO 66 /SECRET REPORT/ JAN 56

STEWART J
MICROQUANTITATIVE INFRARED ANALYSIS
PITTSBURGH CONF ANALYT CHEM AND APPLIED SPECTROS MARCH 59

STEVERMARK
QUANTITATIVE ORGANIC MICROANALYSIS
ACAD PRESS NY 61

STIMSON M
THE INFRARED AND ULTRAVIOLET ABSORPTION SPECTRA OF CYTOSINE
J AM CHEM SOC 74 1805 52

STOLLER L
CIVET, FACTS AND FABLES
THE GIVAUDANIAN PAGE 3 MAY 61

STOLLER L
THE BEAVER AND CASTOREUM, FACTS AND FABLES
THE GIVAUDANIAN PAGE 3 NOV 62

STOLYAROV K
GRIGORIEN N
MICROMICROGRAM SENSITIVITY BY ELECTRODEPOSITION ANALYSIS FOR
ANTIMONY
ZH ANAL CHEM USSR 14 71 54

STORY H
THE EXTERNAL GENITALIA AND PERFUME GLAND OF ARCTICTIS
BINTURONG
J MAMMOL 26 64 45

STRANDBERG M
MICROWAVE SPECTROSCOPY
METHUEN, LOND

STRAUSS J
KLIKMAN A
THE BACTERIA RESPONSIBLE FOR APOCRINE ODOR
J INVEST DERMATOL 27 67 56

STRAUSS J
MESCON H
THE CHEMICAL DETERMINATION OF SPECIFIC LIPASES IN COMEDONES
J INVEST DERMATOL 33 191 59

STRAUSS J
POCHI P
QUANTITATIVE GRAVIMETRIC DETERMINATION OF SEBUM PRODUCTION
J INVEST DERMATOL 33 293 61

STRAUSS J
POCHI P
EFFECT OF ENOVID ON SEBUM PRODUCTION IN FEMALES
ARCH DERMATOL 87 366 63
TABOR HANSER LODGE
CHARACTERISTICS OF THE ORGANIC PARTICULATE MATTER IN THE
ATMOSPHERE OF CERTAIN AMERICAN CITIES
J AMER MED ASSN 17 NO 1 JAN 58

TAIMUTY S
A REVIEW OF DOSIMETRY FIELD
STANFORD RES INST, MENLO PARK, CALIF
FOOD AND CONTAINER INST, ARMY RES AND ENG COMND, CHICAGO
AD296591 S-611 REPORT 4 SEPT 62

TAKAGI S SHIBUYA T
THE ELECTRICAL ACTIVITY OF THE OLFATORY EPITHELIUM
STUDIED WITH MICRO AND MACRO ELECTRODES
JAP J PHYSIOL 10 385 60

TAKAGI S SHIBUYA T
STUDIES ON THE POTENTIAL OSCILLATION APPEARING IN THE
OLFACTORY EPITHELIUM OF THE TOAD
JAP J PHYSIOL 11 23 61

TAKAKURA T
RADIO NOISE RADIATED ON THE DETONATION OF EXPLOSIVE
A. S. JAPAN 7 210 55

TAKEDA K
THE NATURE OF IMPULSES OF SINGLE TARSAL CHEMORECEPTORS
IN THE BUTTERFLY VANESSA INDICA
J CELL COMP PHYSIOL 58 233 61

TAMAR H
TASTE RECEPTION IN THE OPOSSUM AND THE BAT
PHYSIOL ZOOL 34 86 61

TATEDA H MORITA H
INITIATION OF SPIKE POTENTIALS IN CONTACT CHEMOSENSORY
HAIRS OF INSECTS
J CELL COMP PHYSIOL 54 171 59

TAVERNER P
SENSE OF SMELL IN BIRDS
AUK 59 462 42

TAYLOR C L BUETTNER K
INFLUENCE OF EVAPORATIVE FORCES UPON SKIN TEMPERATURE
DEPENDENCY OF HUMAN PERSPIRATION
J APPL PHYSIOL 6 113 53A

TAYLOR C BUETTNER K
THE EVAPORATIVE EFFECT ON HUMAN PERSPIRATION
ZU OF CALIFORNIA, LOS ANGELES
AERO MED LAB, WRIGHT AIR DEV CENT, WPAFB, OHIO
WADC TECH REP 53-345 SEPT 53B

TAYLOR C W
A NOTE ON DIFFERENTIAL TASTE RESPONSES TO P TC
PHENYL-THIO CARBAMIDE
HUMAN BIOLOGY 33 220 61

TAYLOR J
SYMPOSIUM ON THE ROLE OF STRESS IN MILITARY OPERATIONS
Z OPERATIONS RES OFF, JOHNS HOPKINS U, CHEVY CHASE, MD
Z DEPT OF THE ARMY
ORO-T-256 DEC 53

TAYLOR J YATES H
ATMOSPHERIC TRANSMISSION IN THE INFRARED
IN PROC SYMPOSIUM ON IR BACKGROUNDS /CONFIDENTIAL REPORT/
Z UNIV MICH ENG RES
ZZ AD121010
2389-2-S

TENGHSIHSIEN
ROLE OF TRICARBOXYLIC ACID CYCLE IN MECHANISMS OF
CHEMORECEPTION
BULL EXP BIOL MED USSR 51 1

TERAUDS A IRWIN A MCGRATH J
A BIBLIOGRAPHY OF SMALL GROUP RESEARCH
Z HUMAN SCIENCES RESEARCH INC, ARLINGTON VIRGINIA
Z AIR FORCE OFF OF SCI RES, AIR RES AND DEV COMMAND WASH DC
ZZ AD237304
AFOSR TN 60-365 APRIL

TEUBER W
LES AMOURS DES PAPILLONS DE NUIT
INDUSTRIE PARFUM 9 133

TFAO B
(ORGANIC COLORIMETRY, LACTIC ACID)
ANAL CHEM 24 722

THAYER G
CONCEALING COLORATION IN THE ANIMAL KINGDOM
MACMILLAN NY

THEISSING H CAPLAN P
ATMOSPHERIC ATTENUATION OF SOLAR MILLIMETER WAVE RADIATION
J APPL PHYSICS 27 538

THOMAS F
REMOVAL OF CARBON MONOXIDE, HYDROGEN AND ORGANIC
CONTAMINANTS
NRL REP 5465 55 APRIL 21

THOMAS F
TARGET ACQUISITION FROM THE ARMED HELICOPTER
Z ARMY AVIAT HUM RES UNIT, FT RUCKER ALA
PRESENTED AT VIS SEARCH SYMPO OF ARMED FORCES - NRC COMM
ON VISION, SAN DIEGO, APRIL

THOMPSON R BROWN A
THE ATTRACTIVENESS OF HUMAN SWEAT TO MOSQUITOES AND THE ROLE
OF CARBON DIOXIDE
MOSQUIT NEWS 15 80

THOMPSON R KING E EDS
BIOCHEMICAL DISORDERS IN HUMAN DISEASE
ACAD PRESS NY

THOMPSON S P

2-2-3
A PHYSIOLOGICAL EFFECT OF AN ALTERNATING MAGNETIC FIELD
PROC ROY SOC LONDON 82B 396

THORPE W JONES F
OLFACTORY CONDITIONING IN A PARASITIC INSECT AND ITS
RELATION TO THE PROBLEM OF HOST SELECTION
PROC ROY SOC 124 56

THORPE W
OLFACTORY CONDITIONING IN A PARASITIC INSECT
PARASITIC INSECT
PROC ROY SOC LOND 126 370

THORPE W
OLFACTORY CONDITIONING IN A PARASITIC INSECT
PROC ROY SOC LOND 127 424

THURSTON G STERN R
A BIBLIOGRAPHY ON ACOUSTIC SOURCES AND THEIR RELATED FIELDS
ZUUNIV OF MICHIGAN WILLOW RUN LABS
ZUOFFICE OF NAVAL RES, DEPT OF THE NAVY
ZZ AD213504
2784-2-5 FEBRUARY

TIDSTROM B
QUANTITATIVE DETERMINATION OF PROTEIN IN NORMAL URINE
SCAND J CLIN AND LAB INVEST 15 167

TIMMERMANS J
ODOUR AND CHEMICAL CONSTITUTION
NATURE, LOND 774 235

TINBERGEN W
SOCIAL BEHAVIOR IN ANIMALS
BOOK NY

TINBERGEN W
THE EVOLUTION OF ANIMAL COMMUNICATIONS, A CRITICAL
EXAMINATION OF METHODS
IN EVOLUTIONARY ASPECTS OF ANIMAL COMMUNICATION
SYMPOS ZOOL SOC LOND 8

TOBIAS C DUNN R
ANALYSIS OF MICRO-COMPOSITION OF BIOLOGICAL TISSUE BY MEANS
OF INDUCED RADIOACTIVITY
SCIENCE 109 109

TOLBECT C STRALTON A TIPTON C
PROPAGATION STUDIES AT 8.6 MM WAVELENGTH ON THREE, FIVE
SEVEN AND TWELVE MILE PATHS
ZUUNIV OF TEX, ELECT ENG RES LABS
REP 69

TOLLIN G
ELECTRICAL AND MAGNETIC PROPERTIES OF ORGANIC SOLIDS
ZU U OF ARIZONA, DEPT OF CHEMISTRY, TUCSON ARIZONA
ZGEOPHYSICS RES DIRECTORATE, AF CAMB RES LABS, BEDFORD MASS
ZZ AD296273
FINAL REPORT NOVEMBER 15

TOLSON J
THE INFRARED SPECTROSCOPY OF LIPIDS AND RELATED COMPOUNDS
CATHOLIC UNIV OF AMER, WASH
AD285225
DISSERTATION FOR MS SEPT 62

TORRANCE E
SURVIVAL PSYCHOLOGY
HUMAN FACTORS OPERAT RES LABS ARDC WASH
AD25664
HFORL MEMO 42 DEC 53

TRAFFALIS J NEHLSEN W
INVESTIGATION OF UNPRESSURIZED SHELTER REQUIREMENTS
AND EQUIPMENT, ODOR PROBLEMS
US NAVAL CIVIL ENGNG LAB, PORT HUENEME, CALIF
TN-225 MAY 55

TREATT C
CIVET
PERFUM ESSENT OIL REC 3 73

TRUMBULL R
AN ANNOTATED BIBLIOGRAPHY AND CRITICAL REVIEW OF DRUGS
AND PERFORMANCE
OFF OF NAVAL RES, WASH
AD163401
ONR REP ACR-29 AUG 58

TUCKER D
PHYSICAL VARIABLES IN THE OLFATORY STIMULATION PROCESS
J GEN PHYSIOL 46 453 63

TUDDENHAM W
INFRARED TECHNIQUES IN IDENTIFICATION AND MEASUREMENT OF
MINERALS
ANAL CHEM 32 1630 60

TUFTS UNIV, HUM ENG INFO AND ANAL SERVICE, MEDFORD MASS
HUMAN ENGINEERING BIBLIOGRAPHY 1958-1959
ONR WASH
AD258705
ONR REP ACR-55 OCTOBER 60

TURK A SLEIK H MESSER P
DETERMINATION OF GASEOUS AIR POLLUTION BY CARBON ADSORPTION
AM IND HYG ASSOC QUART 13 23 52

TURK A
CATALYTIC REACTIVATION OF ACTIVATED CARBON IN AIR
PURIFICATION SYSTEMS
IND ENG CHEM 47 966 55

TURNER J
THE EFFECTS OF RADAR ON THE HUMAN BODY
ARMY ORDNANCE MISSLE COMMAND, REDSTONE ARSENAL, ALA
AD273787
RM-TR-62-1 MARCH 21 62

TYHURST J
BEHAVIOR UNDER STRESS
DEFENSE RES BOARD, CANADA
UCHIIZONO K
THE STRUCTURE OF POSSIBLE PHOTORECEPTIVE ELEMENTS IN THE
SIXTH ABDOMINAL GANGLION OF THE CRAYFISH
J CELL BIOL 15 151 62

UCHIYAMA H KATSUKI Y
RECORDING OF ACTION POTENTIALS FROM THE ANTENNAL NERVE OF
LOCUSTS BY MEANS OF MICROELECTRODES
PHYSIOL COMP OECOL 4 154 56

UDENFRIEND S
FLUORESCENCE ASSAY IN BIOLOGY AND MEDICINE
ACADEMIC PRESS NY 62

ULETT G JOHNSON L
PATTERN, STABILITY AND CORRELATES OF PHOTO-
ENCEPHALOGRAPHIC ACTIVATION
J NERV MENT DIS 126 153 58

UMSTEAD M E CHRISTIAN J JOHNSON J
A STUDY OF THE ORGANIC VAPORS IN THE ATMOSPHERE OF THE USS
SKATE
NRL MEMO REP 1057 JUNE 60

UNDERWOOD E
TRACE ELEMENTS IN HUMAN AND ANIMAL NUTRITION
ACAD PRESS NY 56

UNGRADE H
ORGANIC ELECTRONIC SPECTRAL DATA
INTERSCIENCE NY

UNGSTRUP F PETERSEN B
THE CORRELATION BETWEEN EARTH CURRENTS AT GODHAVN AND
MAGNETIC DISTURBANCES
CAMBRIDGE LAB, ROYAL TECH UNIV OF DENMARK, COPENHAGEN
CAMBRIDGE RESEARCH LAB, EUROPEAN OFFICE, AEROSPACE RES AF
AD293833
TECH NOTE - 1 JUNE 62

UNITED NATIONS FOOD AND AGRIC ORGZN, NY
CLASSIFIED CATALOG OF LIBRARY OF INTERNATIONAL INSTITUTE
OF AGRICULTURE, AND SUPPLEMENTS, ROME 48

UNITED NATIONS WORLD HEALTH ORGZN, GENEVA
HUMAN PROTEIN REQUIREMENTS 57

UNITED RES CORP, CAMBRIDGE, MASS
LOCALIZATION OF SOUND PART 1, CHARACTERISTICS OF HUMAN
LOCALIZATION OF SOUND
US NAVAL ORDNANCE TEST STATION, CHINA LAKE, CALA
AD294853
NOTS TP 3109 DECEMBER 62

USAF ACAD LIBRARY
UNCONVENTIONAL WARFARE PART I, GUERRILLA WARFARE
AD277053
SPECIAL BIBLIO SERIES NO 21 61

USAF ACAD LIBRARY
UNCONVENTIONAL WARFARE PART 2 - PSYCHOLOGICAL WARFARE

USAF AEROSPACE MED LAB, WPAFB, OHIO
BIBLIOGRAPHY OF RESEARCH REPORTS AND PUBLICATIONS ISSUED BY THE BIO-ACOUSTICS BRANCH
ZZZ AD252734
DECEMBER

USAF AEROSPACE MED DIV, WPAFB
NUCLEAR RADIATION / A RADIOBIOLOGY GUIDE /
MIL-TDR-62-61 NOV

USAF AEROSPACE MED LAB, PROCUREMENT OFF, WADD, OHIO
INVESTIGATION OF OLFAC TORY TECHNIQUES FOR DETECTING ENEMY TROOPS OR ARMAMENT BY GASES AND EFFLUENTS FROM USAF PROCUREMENT REQUEST NO 121169 RNR NOV

USAF, AEROSPACE MED LAB, PROCUREMENT OFF, WADD, OHIO
RESEARCH ON THE CHARACTERIZATION OF INFRARED EMISSION FROM THE MAMMALIAN NERVOUS SYSTEM NOT DUE TO SIMPLE HEAT RADIATION
WADD, OHIO, EXHIBIT A OF PR AM-3-60083 DECEMBER

USAF AIR WEATHER SERVICE, SCOTT AFB, ILL
LIST OF AVAILABLE AWS TECHNICAL REPORTS
ZZZ AD297202
AWSP 0-18/1 MARCH

USAF ARCTIC AEROMED LAB, FAIRBANKS
PUBLICATIONS OF THE ARCTIC AEROMED LAB, BIBLIOGRAPHY
ZZZ AD293409
OCTOBER

USAF EUROPEAN OFF AEROSPACE RES
SUPPLEMENT TO THE BIBLIOGRAPHY OF TECHNICAL NOTES AND TECHNICAL REPORTS
ZZZ AD272347
JAN

USAF PROCEEDINGS THIRD ANNUAL TRI SERVICE CONFERENCE ON BIOLOGICAL EFFECTS OF MICROWAVE RADIATION EQUIPMENT
BERKELEY CAL

USAF RES DIV, ARDC
BASIC RESEARCH RESUMES, A SURVEY OF BASIC RESEARCH ACTIVITIES IN THE AIR RESEARCH AND DEVELOPMENT COMMAND
ZZZ AD239933
AFOSR TR-59-204

USAF SCHOOL OF AEROSPACE MED, RANDOLPH AFB, TEX
PHYSICAL AND PHYSIOLOGICAL DATA FOR BIOASTRONAUTICS

USAF SCHOOL OF AEROSPACE MED, RANDOLPH AFB, TEX
SUBJECT INDEX OF SCHOOL OF AVIATION MEDICINE RESEARCH REPORTS, 1942-1956
DECEMBER

2-2-F
US ARMY EXPERIMENT STATION
PLAN OF TESTS; TROPICAL SOIL STUDIES AND VEGETATION IN
CENTRAL AND SOUTH AMERICA; REPORT OF OCT

US ARMY OPERATIONS RES OFFICE
ASIAN GUERILLA MOVEMENTS, BIBLIOGRAPHY
ZZZ AD22149
ORO-T-244 MARCH

US ARMY, OPERATIONS RES OFF, CHEVY CHASE, MD
HUMAN ACCURACY IN LOCATING FIRING ENEMY MACHINE GUNS
ZZZ AD236151L
ORO-SP-49 APRIL

US ARMY QMR AND E CENT PROCUR OFF, NATICK
ANALYSIS OF RADAR CROSS SECTION OF CLOTHED SOLDIER, K, X,
AND MM BANDS, AND RESEARCH ON ANTI-RADAR DETECTION
CLOTHING
RFP AMC/X/-19-129-64-29-BQ AUG

US ARMY RES OFFICE
EIGHTH ANNUAL ARMY HUMAN FACTORS ENGINEERING CONFERENCE,
16 OCTOBER, 1962
ZZ ARMY INFANTRY CENTER, FT BENNING, GA
ZZZ AD294897
OCT

US ARMY SERV GRAD SCHOOL, WASH
SYMPOSIUM ON STRESS
WALTER REED AMS REPORT

US ARMY SPECIAL WARFARE SCHOOL, FT BRAGG, NC
SPECIAL WARFARE BIBLIOGRAPHY

US ASTIA /NOW DDC, ALEXANDRIA
THE EFFECTS OF PHYSIOLOGICAL AND PSYCHOLOGICAL STRESSES
ON PERFORMANCE - COVERAGE 1952 THROUGH DEC 1962
ZZZ AD293090
DEC

US ASTIA /NOW DDC, ALEXANDRIA
GASEOUS ENVIRONMENT FOR MANNED SPACECRAFT, AN ASTIA BIBLIO
ZZZ AD290793

US ASTIA /NOW DDC, ALEXANDRIA
THIRST AND WATER BALANCE IN SURVIVAL CONDITIONS,
BIBLIOGRAPHY
ZZZ AD99651

US ATOMIC ENERGY COMM
SPECTRAL AND TOTAL EMISSIVITY - A GUIDE TO THE LITERATURE
1910-1951
AMES LAB REP ISC-364 JUNE 1
SIXTH AEC AIR CLEANING CONFERENCE - JULY 7-9, 1959
TID-7593 OCTOBER

ZZUS CENTRAL INTELL AGENCY
BIBLIOGRAPHY, GUERRILLAS, UNDERGROUNDS, AND RESISTANCE
MOVEMENTS
MAY 23

ZZUS CENTRAL INTELL AGENCY
A SELECTED READING LIST ON GUERRILLA WARFARE AND
COUNTERINSURGENCY
MAY 1

US DIRECTOR OF DEFENSE RES AND ENG
REPORT OF THE RDT AND E LIMITED WAR TASK GROUP
ZZZ AD327690
AUG 15 REPORT SECRET

US DIRECTOR OF DEFENSE RES AND ENG, OFF ELECTRONICS, WASH
IMPORTANT AREAS OF ELECTRONIC RESEARCH, STATEMENTS BY
LEADERS IN THE FIELD
ZZZ AD253881
JAN

US INTERDEPARTMENTAL CMTEE ON NUTRIT FOR NAT DEFENSE
ETHIOPIA, NUTRITION SURVEY

US INTERDEPARTMENTAL CMTEE ON NUTRIT FOR NAT DEFENSE
LEBANON, NUTRITIONAL SURVEY REP

US INTERDEPARTMENTAL CMTEE ON NUTRITION IN NAT DEFENSE
MANUAL FOR NUTRITION SURVEY FOR NATIONAL DEFENSE
MAY

US INTERDEPARTMENTAL CMTEE ON NUTRITION FOR NAT DEFENSE
THAILAND NUTRITIONAL STUDY
NOV

US JOINT CHIEFS OF STF SPEC ASST FOR CTNR INSRG AND SPEC ACT
SPECIAL BIBLIOGRAPHY ON COUNTERINSURGENCY AND RELATED
MATTERS

US JOINT SERV STEER SOMM FOR THE ENG GUIDE TO EQUIP DSGN
TENTATIVE BIBLIOGRAPHY ON WORK AND FATIGUE
ZZZ AD95137
MARCH

ZZUS LIBRARY OF CONGRESS, AERO INFO DIV
SOVIET SEISMOLOGY AND SEISMOMETRY, A PRELIMINARY BIBLIO
ZZZ AD265437
AID REPORT 61-135 SEPTEMBER 5

ZZUS LIBRARY OF CONGRESS, AERO INFO DIV
X-RAY AND OPTICAL SPECTRA ANNOTATED BIBLIOGRAPHY OF SOVIET
LITERATURE
ZZZ AD295868
AID REPORT B-63-10 JANUARY 11
US LIBRARY OF CONGRESS DIV OF BIBLIOGRAPHY
LIST OF REFERENCES ON HOUNDS AND HUNTING
REF LIST 989 AUG 30 26

ZZUS MARINE CORPS
SELECTED BIBLIOGRAPHY ON COUNTERINSURGENCY
MARINE CORPS BULL 1500 APRIL 10 62

US NAT BUR STANDARDS
CATALOG OF SELECTED INFRARED ABSORPTION SPECTROGRAMS
ZZAMER PETROLEUM INST, WASH, DC RES PROJ 44 46

ZZUS NAVAL RES LAB, WASH
TRANSMISSION OF LIGHT IN WATER /BIBLIO/ /1818-1959/
ZZZ AD256765 60

ZZUS NAVY DEPT, BUREAU UNKNOWN
BIBLIOGRAPHY ON GUERRILLA AND ANTI-GUERRILLA WARFARE,
1942-1962, IN EAST AND SOUTHEAST ASIA, WITH SPECIAL
REFERENCE TO THE NAVY
MAY 62

US OFFICE OF NAVAL RESEARCH, WASH
THE FIFTH NAVY SCIENCE SYMPOSIUM, NAVAL RESEARCH
ZZZ AD260241 AT ANNAPOLIS, MD APRIL 61

US OFFICE OF NAVAL RES, PSYCHOL SCI DIV, WASH
PHYSIOLOGICAL PSYCH BR, BIBLIO OF UNCLASSIFIED RESEARCH REPORTS
ZZZ AD242965 SUPPLEMENT NO 3 JULY 57

US SMITHSONIAN INSTITUTION
METEOROLOGICAL TABLES

UNIV OF MARYLAND, DEPT OF PSYCHOL
ZZARMY OFF SURG GEN
A REVIEW OF THE LITERATURE ON INDUCED SYSTEMIC FATIGUE
ZZZ AD31307 TECH REP NO 7 MARCH 52

URSILLO R
ELECTRICAL ACTIVITY OF THE ISOLATED NERVE URINARY BLADDER
STRIP PREPARATION OF THE RABBIT
AM J PHYSIOL 201 408 61

USINGH H
/ACTIVE TRANSPORT OF SODIUM AS A SOURCE OF SHORT CIRCUIT
CURRENT IN FROG SKIN/
J GEN PHYSIOL 43 135 60
VEGHTE J, SOLLER G
DETERMINING ARCTIC CLOTHING DESIGN BY MEANS OF INFRARED
RADIOMETRY
ZABARNE ENG CO, STANFORD CONN
ZALASK AIR COMM, ARCTIC AEROMED LAB
AD275967
TECH REP 61-31 OCTOBER 61

VERRILL A
PERFUMES AND SPICES
PAGE BOSTON 40

VIGNERAS M
PRELIMINARY BIBLIOGRAPHY ON COUNTERINSURGENCY AND RELATED
MATTERS
RES ANALYSIS CORP, BETHESDA, MD
TP 73 62

VINSON L, CHOMAN B, MASURAT T
BASIC STUDIES IN PERCUTANEOUS ABSorption
LEVER BROS, EDGWARE NJ
DIR MED RES, ARMY CHEM CENT, EDGWOOD MD
AD260231
SEMI-ANNUAL REPORT JUNE 61

VIRGIL N
BIBLIOGRAPHY ON GUERRILLA WARFARE
MILITARY AFFAIRS 24 146 60

VIRGIL N
GUERRILLA WARFARE, ANNOTATED BIBLIOGRAPHY
MILITARY REVIEW 41 97 NOV 61

VONBEKESY G
SIMILARITIES BETWEEN HEARING AND SKIN SENSATIONS
PSYCHOL REV 66 1 59

VONBEKESY G
LATERAL INHIBITION OF HEAT SENSATIONS ON THE SKIN
J APPL PHYSIOL 17 1003 62

VON BUDDENBROCK W
VERGLEICHENDE PHYSIOL VOL 1 SINNESPYSIOL
BIRKHAUSEN VERLAG, BASEL 52

VONFRISCH K
COMPARATIVE PHYSIOLOGY OF TASTE PARTICULARLY IN HONEY
BEES
ZTSCHR VERGL PHYSIOLOG 21 1 34

VON FRISCH K
BEES, THEIR VISION, CHEMICAL SENSE, AND LANGUAGE
CORNELL U PRESS, ITHACA 50

VON GIERKE, H
MEASUREMENT OF THE ACOUSTIC IMPEDANCE AND THE ACOUSTIC
ABSORPTION COEFFICIENT OF THE SURFACE OF THE HUMAN BODY
ZABRIGHT AIR DEV CENT, OHIO
AF TECH REP 6010 MARCH 50
VON GIERKE H
PHYSICS OF VIBRATIONS IN LIVING TISSUES
J APPLI PHYSIOL  4 12 52

VON GIERKE H
TRANSMISSION OF VIBRATORY ENERGY THROUGH HUMAN BODY TISSUE
PROC FIRST NAT BIOPHYS CONF, KM  YALE U PRESS 59

VON SKRAMLIK E
ON THE MINIMAL NUMBER OF MOLECULES REQUIRED TO STIMULATE
TASTE AND SMELL SENSF IN MAN
ARCH GES PHYSIOL  249 702 48

VON WITTERN W
BALLISTOCARDIOGRAPHY WITH ELIMINATION OF THE INFLUENCE OF
THE VIBRATION PROPERTIES OF THE BODY
AM HEART J  46 705 53
PETER SMITH NY

WARD S DOUGLASS J
THE RECORDING OF EARTH CURRENTS
ZZSPACE SCI LAB, U OF CALIF, BERKELEY
ZZOFFICE OF NAVAL RESEARCH
ZZAD294971
SERIES NO 3 ISSUE NO 28 OCTOBER

WARDEN C J WARNER L H
THE SENSORY CAPACITY AND INTELLIGENCE OF DOGS
QUART REV BIOL 3 1

WARE F
MEMBRANE POTENTIALS IN NORMAL ISOLATED PERFUSED FROG HEARTS
AM J PHYSIOL 190 194

WARE F
EFFECTS OF CALCIUM DEFICIENCY ON CELL MEMBRANE POTENTIAL OF ISOLATED FROG HEARTS
AM J PHYSIOL 198 547

WARING C, ED
TRANSMISSION AND RECEPTION OF SOUNDS UNDER COMBAT CONDITIONS
SUMMARY TECH REP OF DIV 17, NDRC, VOL 3

WATANABE K ZELIKOFF M
ABSORPTION COEFFICIENTS OF WATER VAPOR IN THE VACUUM ULTRAVIOLET
J OPT SOC AMER 43 753

WATANABE K ZELIKOFF M INN E
ABSORPTION COEFFICIENTS OF SEVERAL ATMOSPHERIC GASES
ZZAF CAMBRIDGE RES CENTER
GEOPHYS RES PAPERS 21

WATKINS W
EFFECTS OF CERTAIN NOISES UPON DETECTION OF VISUAL SIGNALS
ZZU OF TEXAS, AUSTIN, TEXAS
ZZAD294582
PHD DISSERTATION JANUARY

WATSON C
(FAT CONTENT OF FECES)
ARCH INT MED 59 196

WATTS H
HOUND AND QUARRY
ROUTLEDGE

WEBB H BROWN F BRETT W
EFFECTS OF IMPOSED ELECTROSTATIC FIELD ON RATE OF LOCOMOTION IN ILYANASSA
BIOL BULL 118 367

WEBER D
SPECTRAL EMISSIVITY OF SOLIDS IN THE INFRARED AT LOW TEMPERATURES
J OPT SOC AMER 49 815
WEDDELL G, PALMER E, PALLIE W
NERVE ENDINGS IN MAMMALIAN SKIN - A REVIEW
BIOL REV 30 159 55

WEINER J, LEIKIND M, GIBSON J
VISIBILITY - A BIBLIOGRAPHY
ZLIBRARY OF CONGRESS, REFERENCE DEPT, TECH INFO DIV
ZZ AD10557 JULY 52A

WEINER J S
A SPECTROPHOTOMETER FOR MEASUREMENT OF SKIN COLOR
MAN 1 253 52B

WEINER J, VAN HEYNINGEN R
RELATION OF SKIN TEMPERATURE TO SALT CONCENTRATION OF
GENERAL BODY SWEAT
J APPL PHYSIOL 4 725 52

WEISBERGER A
PHYSICAL TECHNIQUES IN ORGANIC CHEMISTRY
MULTIVOLUME BOOKSET

WEISENBERGER E
TEN MICROMICROGRAM SENSITIVITY BY ELECTRODEPOSITION ANALYSIS
FOR COPPER
MIKROCHIM ACTA PAGE 946 60

WEISSLER G
QUANTITATIVE MEASUREMENTS OF RADIATION OF THE EXTREME
ULTRAVIOLET
ZZ DEPT OF PHYSICS, U OF SOUTHERN CAL, LA
ZZ ARMY OFFICE OF ORDNANCE RES
ZZ AD295132 NOV 30 62

WEISZ A, LICKLIDER J, SWETS J
HUMAN PATTERN RECOGNITION PROCEDURES AS RELATED TO
MILITARY RECOGNITION PROBLEMS
ZZ BOLT BERANEK AND NEWMAN, CAMBRIDGE MASS
ZZ ELECTRONICS RES DIR, AF CAMBR RES LAB, BEDFORD MASS
ZZ AD278540 AFCRL-62-387 JUNE 15 62

WELCHER F
STANDARD METHODS FOR CHEMICAL ANALYSIS
VAN NOSTRAND NY 63

WELKOWITZ W
MECHANICAL MECHANISM OF DESTRUCTIVE EFFECTS OF SOUND ON
TISSUE
J ACOUST SOC AMER 27 1142 55

WELLS W, MAKITA M
THE QUANTITATIVE ANALYSIS OF FAECAL NEUTRAL STEROLS BY
GAS-LIQUID CHROMATOGRAPHY
ANALYT BIOCHEM 4 204 62

WENZEL B
TECHNIQUES IN OLFACTOMETRY A CRITICAL REVIEW OF THE
LAST ONE HUNDRED YEARS
PSYCHOL BULL 45 231  48

WENZEL B
PRACTICAL APPLICATIONS OF OLFACCTOMETRY
PROC SCI SECT TOILET GOODS ASS 14 11  50

WENZEL B
THE CHEMICAL SENSES
ANN REV PSYCHOL 5 111  54

WESCOTT J  KUSHNER S
ACOUSTIC BACKGROUND AT THE EARTH'S SURFACE
ACOUST AND SEISMIC LAB, INST OF SCI AND TECH, U OF MICH
ARMY SIGNAL MISSILE SUPPORT AGENCY, WHITE SANDS
AD297481  63

WEYBREWF B
BIBLIOGRAPHY OF SENSORY DEPRIVATION ISOLATION AND CONFINEMENT
NAVAL MED RES LAB, NEW LONDON CONN
AD234102  60

WHARTON D
THE ODOROUS ATTRACTANT OF THE COCKROACH PERIPLANETA AMERICANA
J GEN PHYSIOL 37 461  61A

WHARTON D  WHARTON M L
EFFECTS OF RADIATION ON NITROGEN AND PHOSPHORUS EXCRETION BY
THE COCKROACH, PERIPLANETA AMERICANA, L
RADIATION RESEARCH 14 432  61B

WHARTON M  WHARTON D
THE PRODUCTION OF SEX ATTRACTION SUBSTANCE AND OF OOTHECAE
BY THE NORMAL AND IRRADIATED AMERICAN COCKROACH
PERIPLANETA AMERICANA L
J INSECT PHYSIOL 1 229  57

WHEATLEY V
THE ESTIMATION OF SQUALENE IN SEBUM AND SEBUM LIKE MATERIALS
BIOCHEM J 55 637  53

WHEATLEY V
SEBUM, ITS CHEMISTRY AND BIOCHEMISTRY
AMER PERFUM AROM 68 37  56

WHEATON J
FACT AND FANCY IN SENSORY DEPRIVATION STUDIES
DEPT NEUROPSYCH, AIR UNIV, BROOKS AFB TEX
AD226325  59

WHEATON R
HUMAN WASTES IN A SIMULATED MANNED SPACE CRAFT
IN /BIOLOGISTICS FOR SPACE SYSTEMS/
AEROSPACE MED LAB WADD DAYTON
AMRL-TDR-62-116  62

WHITCOMB M  239
BIBLIOGRAPHY OF REPORTS ACQUIRED BY CHABA ZZCOMM ON HEARING AND BIO-ACOUSTICS, WASH, DC
JANUARY

WHITE P
CULTIVATION OF ANIMAL AND PLANT CELL
RONALD PRESS, NY

WHITEHAIR L MATSUMURA K
THE INFLUENCE OF DIET ON VOLUME AND MAJOR MOLECULAR
COMPOSITION OF GASTROINTESTINAL GAS IN RATS
ZZARMED FORCES FOOD AND CONTAIN INST, NATICK, MASS.
ZZ AD292637
INTERIM REP, AMXFC REP NO 38-62 NOVEMBER

WHITNEY L
DOGS AND KENNEL SCIENCE
KENNEL SCI PUBL CO NEW HAVEN

WHITNEY L
BLOODHOUNDS
WHITNEY NY

WHITNEY L
BLOODHOUNDS
JUDD PUBL CO NY

WIGGLESWORTH V
PRINCIPLES OF INSECT PHYSIOLOGY
METHUEN, LOND

WILLIAMS C LEONARD R
MICROANALYTICAL DETERMINATIONS OF DIHYDROXY AROMATIC ACID BY
GAS CHROMATOGRAPHY
ANALYT BIOCHEM 5 362

WILLIAMS C SWEELEY C
A NEW METHOD FOR THE DETERMINATION OF URINARY AROMATIC
ACIDS BY GAS CHROMATOGRAPHY
J CLIN ENDOCRIN 21 1500

WILLIAMS D SMITH S
THE DETERMINATION OF MICROGRAM QUANTITIES OF
MONOEthanolamine and ammonia in air
ZZNAV RES LAB WASH
NRL MEMO REP 898

WILLIAMS H
IMPAIRED PERFORMANCE WITH ACUTE SLEEP LOSS
PSYCHOL MONOGR 73 NO 14

WILLIAMS R
QUANTITATIVE DETERMINATION OF ORGANIC STRUCTURES BY NUCLEAR
MAGNETIC RESONANCE, INTENSITY MEASUREMENTS
ANN NY ACAD SCI 70 890

WILLIAMS R
DETOXICATION MECHANISMS, METABOLISM AND DETOXICATION OF
DRUGS, TOXIC SUBSTANCES AND OTHER ORGANIC COMPOUNDS
CHAPMAN AND HALL, LOND
WILLIAMS R
NUCLEAR MAGNETIC RESONANCE IN PETROLEUM ANALYTICAL RESEARCH
SPECTROCHIM ACTA 14 24 59B

WILLIAMS R
DETOXICATION MECHANISMS /DRUGS/
CHAPMAN AND HALL, LOND 59C

WILLIAMSON A
DETECTION AND RAPID DIFFERENTIATION OF GLUCOSAMINE AND
GALACTOSAMINE, GLUCOSAMINE-URONIC ACID AND
GALACTOSAMINE-URONIC ACID
ANAL BIOCHEM 5 47 63

WILLIS E
OLFAC TORY RESPONSES OF FEMALE MOSQUITOES
J ECON ENTOMOL 40 769 47

WILLIS E
OLFAC TORY RESPONSES OF FEMALE MOSQUITOES—RESPONSES OF AEDES
AEGYPTI AND ANOPHELES QUADRIMACULATUS TO HUMAN ODOR AND TO
CO2 IN AN OLFACTOMETER
OHIO STATE U — ABSTRACTS OF DOCTORAL DISSERTATIONS
54 395 48

WILSON E
CHEMICAL RELEASERS OF NECROPHORIC BEHAVIOR IN ANTS
PSYCHE 65 108 58

WILSON E
GLANDULAR SOURCES AND SPECIFICITY OF SOME CHEMICAL
RELEASERS OF SOCIAL BEHAVIOR IN DOLICHODERINE ANTS
PSYCHE 66 70 59

WILSON E
CHEMICAL COMMUNICATIONS AMONG WORKERS OF THE FIRE ANT
SOLENOPSIS SAEVIISSIMA
ANIM BEHAV 10 134 62

WILSON W
PULSED AND MODULATED ULTRAVIOLET AND INFRARED SYSTEMS
ZZZ AD320189
MAY 31 60

WING J
A BIBLIOGRAPHY OF THE EFFECTS OF TEMPERATURE ON HUMAN
PERFORMANCE
ZZZBEHAVIORAL SCI LAB, AEROSPACE MED DIV, WPAFB, OHIO
AMRL—TDR—63—13 FEB 63

WINKELMANN R
THE HISTOCHEMISTRY AND MORPHOLOGY OF THE CUTANEOUS
SENSORY END-ORGANS OF THE CHICKEN
J COMPAR NEUROL 117 27 61

WINSTON P
POSSIBLE HUMIDITY RECEPTOR MECHANISM IN THE CLOVER MITE
J INSECT PHYSIOL 9 89 62

WITHE Y S
REACTION TO UNCERTAIN THREAT
WITTKOGEL K
FOOD SCIENCE IN CHINA AND INDIA
P 61 IN HUMAN NUTRITION, HISTORIC AND SCIENTIFIC /GALDSTON/

WOLBARSHT M
WATER TASTE IN PHORMIA
SCIENCE 125 1248

WOLBARSHT M
ELECTRICAL ACTIVITY IN THE CHEMORECEPTORS OF THE BLOWFLY
J GEN PHYSIOL 42 393

WOLBARSHT M
DENDRITIC ACTION POTENTIALS IN BIPOLAR CHEMORECEPTORS
ABSTR 11 ANN MTG BIOPHYS SOC, NYC ITEM WF 5

WOLF A
THIRST
THOMAS, SPRINGFIELD

WOLF E
ULTRAVIOLET TRANSMITTER DESIGN AND DEVELOPMENT PROGRAM
ZZSYLVANIA ELECTRONIC SYST CENT, BUFFALO NY
ZZCOMMUN LAB, AERONAUT SYS DIV, WP-AFB OHIO
ZZZ AD297894
TECH DOC REP ASD-TDR-63-69 DEC

WOLKIN J
PHOTORECEPTOR STRUCTURES IN BIOLOGICAL SYSTEMS
INT REV CYTOL 2 195

WOLCHOW H
DETECTION OF AIRBORNE MICROORGANISMS THROUGH THEIR UNIQUE COMPOUNDS
ZZNAVAL BIO LAB, U CAL, BERKELEY, CALIF
ZZBUREAU OF YARDS AND DOCKS, OFF OF NAVAL RES
ZZZ AD211120
JANUARY 15

WOOD C
FYDE M, EDS
THE ART OF FALCONRY /OF FRIEDRICH 2, EMPEROR OF GERMANY/
BRANFORD, BOSTON

WOOD W
DEEM H
METHODS OF MEASURING EMITTANCE
ZZDEFENSE METALS INFO CENT, BATTELLE MEMORIAL INST, COLUMBUS
ZZZ AD248977
DMIC MEMO 78 DEC 27

WOOD W
SNELL J
QUANTITATIVE SYSTEM FOR CLASSIFYING LANDFORMS
ZZQM RES AND ENG CENT, NATICK
TECH REP EP-124 FEB
WYNNE-EDWARDS V
ANIMAL DISPERSION IN RELATION TO SOCIAL BEHAVIOR
HAFNER, NY 62
YAMAMOTO Y
QUANTITATIVE CORRELATION ON THE BASES IN URINE
FUKUSHIMA MED J 9 601 59

YAMASHITA S
STIMULATING EFFECTIVENESS OF CATIONS AND ANIONS AS
CHEMORECEPTORS IN THE FROG
JAP J PHYSIOL 13 54 63

YAROSLAWSKI N STANEWICK A
ABSORPTION OF HUMID AIR IN THE FORTY TO TWO THOUSAND MICRON
REGION
OPTICS AND SPECTROS 6 799 59

YATES H
TOTAL TRANSMISSION OF THE ATMOSPHERE IN THE INFRARED
NAVAL RES LAB, WASH
NRL 3858 SEPT 10 51

YOSHIMI T
THE DIURNAL RHYTHM OF SALT EXCRETION
J PHYSIOL SOC, JAPAN 21 981 59

YUNKER W
PURE ROTATIONAL SPECTRUM OF WATER VAPOR 1 TABLE OF LINE
PARAMETERS
WHITE SANDS MISSILE RANGE, N M
AD298151
ERDA-2 FEBRUARY 63 63
ZAHN W  
OLFACTORY SENSE OF CERTAIN BIRDS/  
Z VERGLEICH PHYSIOL 19 785

ZEFF J  
BAMBENEK  
DEVELOPMENT OF A UNIT FOR RECOVERY OF WATER AND DISPOSAL OR STORAGE OF SOLIDS FROM HUMAN WASTES — PART 1— THE STUDY PHASE  
ZAMER MACHINE AND FOUNDRY, MECHANICS RES DIV  
ZAEROSPACE MED LAB, WRIGHT AIR DEV CENT, WPAFB, OHIO  
ZZ AD234007  
WADC TECH REP 58-562-1 NOVEMBER

ZIMMER H  
MELTZER M  
AN ANNOTATED BIBLIOGRAPHY OF LITERATURE RELEVANT TO THE INTERROGATION PROCESS  
ZEGEOGETOWN MED CENT, WASH  
ZAIR FORCE PERSONNEL AND TRAINING CENT  
ZZZ AD220465  
DEC

ZOTTERMAN Y  
THE NERVOUS MECHANISM OF TASTE  
ANN NY ACAD SCI 81 358