

TEACHING
with
Biology
Digest

A Guide to Learning
Opportunities Provided
by ***Biology Digest***

Updating the Textbook • Confronting Issues in the Life Sciences • Planning
Current Events Projects • Analyzing Information Sources • Conducting a
Literature Search • Sharpening Research Skills • Maintaining Science Literacy

Biology Digest Teacher's Guide

The Teacher's Guide outlines many of the uses of *Biology Digest*, ranging from leisure reading to science searches, all designed to instill in your students a curiosity for the exciting world of science. Our aim is for your students to develop an appreciation of the life sciences as an area of constantly changing issues and challenges that will have profound effects on their personal lives—their health, their environment, and even the ethics of society.

With this guide and *Biology Digest* to augment and enliven your life science curriculum, you have a ready source of information for assigned reading and classroom reports, a starting point for research projects, and a reference tool for science searches. Most importantly, you can use the guide to help students to confront specific issues in the life sciences, to seek the facts, to examine viewpoints, and to make informed decisions.

Many of the suggestions in this guide come from teachers who have taken the time to share their ideas with us. If you have devised other methods of using *Biology Digest* in your classes, we would welcome hearing of them.



Biology Digest

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BIOLOGY DIGEST, an abstracts journal designed for the young adult, covers current scientific literature from science magazines, journals, and research reports. Each issue of *Biology Digest* has 300 abstracts—precise, inclusive synopses of the original articles from over 200 worldwide sources.

Abstracted articles are organized by subject and present the important facts and ideas from the original material. For maximum comprehension, new and difficult concepts and scientific terms are explained and defined as they appear within the abstracts.

THREE DISTINCT SECTIONS characterize each issue of *Biology Digest*. The bulk of the journal is devoted to the actual **abstracts**. Many of the abstracts come from current periodicals in which scientists publish their papers—journals rarely found in the high school or college library. Other abstracts are taken from popular science magazines available on the newsstand. This wide range of information sources effectively provides reading and research material for all life science students.

Preceding the abstracts section of each issue is a **feature article** written specifically for *Biology Digest*. The feature article provides in-depth information about a current topic of interest in the life sciences. Many biology teachers use the feature articles for regular or extra-credit reading assignments and as a starting point for class discussions.

Indexes constitute the final section of the journal. The indexing technique used in *Biology Digest* relies on keywords that spotlight the main points of the abstract. Thus, an abstract describing the reproductive biology of raspberries might be listed in the Keyword Index under all of the following keywords: RASPBERRY, RED RASPBERRY, RUBUS SPECIES, POLLINATION, BERRIES, and PLANT REPRODUCTION. Each entry is followed by all of the associated keyword entries.

This form of indexing offers an easy research method for the student who is searching the index for material on a specific subject. If, for example, information is needed on the effects of air pollution on photosynthesis, the index will guide the student to specific articles of interest. A grouping of keywords appearing in the index under PHOTOSYNTHESIS might read: PHOTOSYNTHESIS, SULFUR DIOXIDE, AIR POLLUTION, TOMATO PLANTS. Obviously, this abstract should be examined by the student. On the other hand, an abstract described by the keywords PHOTOSYNTHESIS, PLANT HORMONES, GIBBERELLIN, KINETIN indicates an abstract describing a different aspect of photosynthesis. It can still be checked for pertinence, but it will not deal in depth with air pollution effects.

Each issue of *Biology Digest* also contains its own author index to facilitate locating research performed by a particular scientist or articles written by a particular author. At the close of the volume year, cumulative subject and author indexes, compiled from the year's issues, simplify science searches.

USING BIOLOGY DIGEST

To Research a Specific Subject

Determine which terms best describe the subject you are researching—such as antibiotics, immunization, bison, algae, etc. Look these terms up in the Keyword Index in the back of the issue. The Keyword Index will refer you by citation number to the corresponding abstracts. If you cannot find a listing for a certain term, try other words that might also describe the research subject. It is especially helpful to consider topics in their next largest category. For instance, you may be looking for material concerning drone bees. In addition to looking under “drone,” you should also consider looking under “bees,” “insects,” “entomology,” and so forth. When researching general topics, on the other hand, it is useful to search under various smaller categories for the topic's components. For example, a searcher looking for the incidence of communicable diseases as a subject should also refer to various diseases of this type, such as smallpox, meningitis, and diphtheria.

Example. You are seeking information on advances in stem cell research. You look up STEM CELLS in the Keyword Index and find the following entry:

98/99-2363 STEM CELLS, UMBILICAL CORD, PLACENTA, CANCER,
LEUKEMIA, BONE MARROW, CORD BLOOD, IMMUNE SYSTEM,
RADIATION, CHEMOTHERAPY, BLOOD STORAGE,

Citation 98/99-2363 would be listed in the index under each of the individual terms mentioned above.

You then turn to abstract number 98/99-2363:

98/99-2363

The Hope, and Hype, of Cord Blood

Denise Grady, The New York Times, December 1, 1998:D6.

Companies have recently sprung up that are urging expectant parents to pay a blood bank to store the blood from their newborn baby's umbilical cord and placenta, in case that child or another family member ever needs it to treat cancer or leukemia. The pitch is based on reports in medical journals showing that cord blood can sometimes be used in place of a bone marrow transplant. Like bone marrow, cord blood is rich in stem cells, which can churn out many different types of cells to rebuild a patient's blood supply and immune system after high doses of radiation and chemotherapy.

Some experts in bone marrow transplantation and blood banking frown on the cord-blood business, arguing that people are being frightened into wasting money on a service they will probably never need. Some scientists worry that private banking will limit public access to cord blood. Cord blood in private banks remains the property of the donor family and is not available to patients seeking a compatible donor. Promotional literature emphasizes that people with cancer in the family may have a special interest in cord-blood banking, along with those who have the hardest time finding matches, including members of racial minorities, especially families in which the parents are of different races.

Cord Blood Registry, which describes itself as the largest private cord-blood banking firm in the U.S., has stored 10,000 samples during the past 3 years. In that time, eight customers have retrieved their cord blood for use in medical treatment. All eight samples were used for siblings or relatives. By contrast, the largest public-access bank of cord blood, at the New York Blood Center in Manhattan, has collected only 8,686 specimens in 6 years, but nearly 800 of those samples have been used to treat patients in the U.S. and overseas.



As a Specific Teaching Tool

Biology Digest lends itself to a variety of projects and study units. Ideally, an initial project would deal with the actual abstract—what it is and how it can help the student.

Because the informational abstracts in *Biology Digest* provide summaries of original articles and research reports, they offer a quick and convenient means of getting information when the original material is not readily available. Students planning a career in science benefit by becoming familiar with the advantages of abstracts.

Suggested Student Projects:

- ◆ Compare an abstract to the original article. Each issue of *Biology Digest* contains a full-length feature article appearing at the beginning of the journal that describes a topic of current interest. This feature article also appears in abstract form within the journal, thus allowing a ready comparison of an original article and its abstract. To find the abstract of the feature article, look up the feature article author's name in the index and look for the reference to the abstract number.

After reading the feature article and its abstract, note the information that has been omitted from the abstract. Do you feel the abstract covers the main points of the article? What would you have done differently in preparing an abstract of this article?

- ◆ Find a feature article from *Biology Digest* that deals with your current unit of study. Distribute copies to the class with instructions to write an abstract of the article. Compare the results with the abstract in *Biology Digest*. What variations were found in the information students chose to include or omit? Can individual viewpoints affect the reporting of even “factual” science news?

To Discuss and Follow Current Events

After even a brief introduction to abstracts and information sources, students will be better prepared to handle current events projects. Unfortunately, many biology classes continue to neglect this area, despite the growing number of issues that confront society and demand attention. Only an awareness of what is happening in the world today, however, will sensitize students to the fact that new situations will surely affect the quality of their lives, perhaps even the continuation of life.

Use *Biology Digest*, for example, to tie the textbook knowledge of genes to recent experiments involving gene manipulation; to supplement the knowledge of human reproduction with information on test-tube babies and fertility drugs; to link understanding of human organs with progress being made in organ transplants and artificial hearts; or to reinforce studies of plants with modern agricultural research aimed at increased food production. Linking the “nuts and bolts” knowledge of biology with its implications for society should be a major goal of the teacher.

Suggested Student Projects:

- ◆ With the start of class in September, choose several general subjects (zoo breeding, endangered species, acid rain) that will be followed throughout the year. Specific headline topics of national (AIDS research) or local (an invasion of gypsy moths) concern that arise during the year can be added to the follow-up list. Check each new issue of *Biology Digest* for progress reports on the topics you select; supplement the abstracts with information from newspapers, magazines, and television reports. Share your findings with the class in a short written or oral report, or start a current events bulletin board.
- ◆ Discuss the problems that often arise when society faces the new and/or unexpected. In the case of AIDS, for example, discuss the fear of contagious spread and prejudice against AIDS victims. In the case of genetic engineering, discuss the fear of a mutant bacteria that could create devastating disease or environmental damage. On the other hand, are the “experts” always correct? Throughout the entire project, examine information with its origin in mind. The “facts” presented by a conservation organization may differ radically from those published by a hunting organization.
- ◆ Organized or informal debates can involve the entire class in issues of the day. Debates can range from animal rights (medical researchers vs. animal

welfare groups) and endangered species (conservationists vs. logging industry) to toxic wastes (chemical industry vs. neighbors of a dump site) and air pollution (power plants vs. public health groups). *Biology Digest*, with its many sources of information, will serve as a take-off point for debates by providing varied viewpoints of a particular issue.

- ◆ Such debates can be used to raise an important question concerning scientific controversies—does our point of view change when the issue affects us directly? Wildlife conservationists, for example, give sound reasons why species extinctions will have detrimental effects on human life. Yet extinctions continue at an unprecedented rate. Use *Biology Digest* to examine issues ranging from whale exploitation to the clearing of tropical forests for short-term benefits. Is it easy to make the “right” or popular decision when we are not directly affected by the consequences? Assuming the position of mediator in one of these controversies, describe the action you would take and the compromises that would be necessary for the involved parties.
- ◆ Choose a film that deals with a life science subject. View the film and then select abstracts from *Biology Digest* that provide additional scientific information about the topic of the movie. For example, *The Andromeda Strain* would be an excellent film to begin acquiring knowledge about bacteria. There are many films that deal with scientific subjects. Just a few of them are *Coma* (medical ethics), *Jurassic Park* (genetics), *The Pride of the Yankees* (Lou Gehrig’s disease), *The Miracle Worker* (handicaps), *Mask* and *The Elephant Man* (physical deformities), *Charly* (mental retardation), *Fantastic Voyage* (anatomy), *Glory Enough for All: The Discovery of Insulin* (medical research), and *Death Be Not Proud* (cancer).

As a Research Aid

Biology Digest provides the ideal starting point for a research paper or science project. Even during the first step—that of selecting a topic—*Biology Digest* will help to guide the research direction of the student. Scanning the abstracts in recent issues of the journal will suggest a wide variety of potential research topics. If the student is already interested in a specific subject, such as plant hormones, a quick check of the Cumulative Indexes of past volumes of *Biology Digest* will direct the student to abstracts that offer general information on the functions of plant hormones as well as the latest research and areas of particular interest.

Once the topic has been selected, *Biology Digest* serves as a means of conducting a science search and as a direct source of information. Starting with the most recent Cumulative Index, the student can locate relevant abstracts by author or by subject, including the general topic (e.g., plant hormones), the specific hormone

(e.g., gibberellin), or the common and scientific names of particular plants. The Keyword Index is a unique asset in the research setting, for it provides a general idea of the contents of the abstract.

After scanning the abstracts for content, the student may wish to seek the original articles of those abstracts that appear particularly pertinent. A student who needs to locate an issue of a journal (to which the school may not subscribe) can take the abstract of the article to the school librarian, who will explain how the information can be obtained. An interlibrary loan may be arranged with a library that receives the journal, or the student may write to the author to request a reprint.

In other cases, the information in the abstracts will suffice. A short paper or extra-credit report can be prepared using only information from the wide variety of abstracts in *Biology Digest*. In fact, periodicals and journals may be the only source of information describing very recent developments in the life sciences. In the case of the formal term paper, *Biology Digest* abstracts will support and update material found in science texts. Since many libraries do not carry technical journals containing original research reports, *Biology Digest* often will serve as a direct source of valuable information.

Although a formal term paper is not an integral part of many biology courses, it is important that students become familiar with research techniques that will sharpen their information-seeking skills. Ideally, all research exercises would involve the gathering of information from several sources, including original articles.

Suggested Student Projects:

- ◆ Create your own textbook update. Using the selector list of keywords as your guide, research a topic that is directly related to your current unit of study. Describe research and developments that have taken place since the publication of your textbook. Do you think the information you have found merits inclusion in a revised edition of the text?
- ◆ Research a topic that concerns your state or geographic area. Toxic dumps? Endangered species? Soil erosion? Acid rain? Air pollution? Use the Cumulative Index of *Biology Digest* as a starting point for your research. Seek information from national as well as local news media.

As a first step, confirm the existence of a problem and define its scope. Then explore the remedial actions, if any, being taken. Send a summary of your views, based on sound research, to appropriate industrial concerns, policymakers, etc. Voice your concerns and ask questions that you want answered. If you agree with the actions being taken, explain why and encourage their efforts.

To Develop Critical Thinking Skills

Biology Digest provides opportunities to have students use and sharpen such critical thinking skills as observing and inferring, comparing and contrasting, and recognizing cause and effect.

Read the following abstract: 98/99-1908 “Strange Fruit.”

98/99-1908

Strange Fruit

Rachel Nowak, *New Scientist*, November 21, 1998, 160(2161):15.

Australian scientists at the Tropical Research Station at Cape Tribulation, part of the Wet Tropics World Heritage site, have found an unusually large number of spectacled flying foxes, *Pteropus conspicillatus*, born with developmental defects. The young bats have extra digits, enlarged heads, and cleft palates and have died shortly after birth. Generally two or three deformed young bats are seen each season, but so far there are at least 50. Over one-third of the lowland forest surrounding the World Heritage area in Queensland has been lost in the past 15 years, as well as some upland forest. Experts believe that shrinking bat habitat may be forcing the animals to alter their diet and consume food that causes birth defects. Pregnant bats may be feeding on fruit sprayed with pesticides or on plants that naturally contain teratogenic chemicals (substances that cause malformations, especially in a developing embryo or fetus).

Habitat loss may be responsible for another problem, the raiding of fruit orchards in southeast Queensland by the grey-headed flying fox, *Pteropus poliocephalus*. Farmers have resorted to electrocuting or shooting the bats. Some peach and nectarine growers have lost three-quarters of their crops.

Since neither the grey-headed nor the spectacled flying fox is listed as endangered or vulnerable, farmers can apply for permits to kill them if they cause excessive damage. Population counts indicate that the number of spectacled flying fox is holding steady, but scientists at the World Heritage site insist that the spectacled flying fox should be protected because it helps to pollinate trees and disperse seeds, and it is vital to the health of the rainforest.

In the abstract, Australian scientists **observed** that a large number of bats had been born with developmental defects. From this observation, the scientists **inferred** that shrinking habitat may be forcing the animals to alter their diet and consume foods that cause birth defects, as the pregnant bats may have been feeding on fruit sprayed with pesticides or on plants that naturally contain teratogenic chemicals. This same abstract also provides students the opportunity to recognize that the birth defects, the **effect**, were probably **caused** by the alteration of the bat's diet.

In order to practice the skills of **compare** and **contrast**, choose a few abstracts that cover a topic that is controversial—for example, herbal medicine, alternative medicine, etc.; **compare** the abstracts for different and similar points of view and list the pros and cons of the topic chosen. When examining science topics, especially controversial issues, it is important to seek varied sources of information. Two interesting abstracts illustrating some controversial issues are 98/99-1815, “To Save My Life,” and 98/99-1450, “A Cure for Quacks.” These abstracts study the various problems dealing with alternative medicine practices.

To Investigate the Use of the Scientific Method

The scientific method is an effective tool that scientists use to prove or disprove their hypotheses. The steps of the scientific method are as follows:

- ◆ As a result of an observation, propose a question (problem).
- ◆ Establish a hypothesis that will attempt to solve the problem.
- ◆ Prepare an experiment using both a control group and a variable group.
- ◆ Write down the results of the experiment (data).
- ◆ Form a conclusion. Based on the conclusion, the hypothesis will be either correct or incorrect. If it is incorrect, the original hypothesis will be rejected and revised, or additional information may be added to the original hypothesis, and another experiment will be carried out.
- ◆ Once scientists confirm a conclusion, they may submit their results for publication.
- ◆ If the hypothesis is found to be correct after many separate trials of the experiment, the hypothesis may become a theory.

Many of the *Biology Digest* abstracts illustrate the scientific method. For example: 98/99-1559, “Adrenocortical Responses to Stress in Breeding Pied Flycatchers *Ficedula hypoleuca*: Relation to Latitude, Sex, and Mating Status,” is a good illustration of scientists using the scientific method.

98/99-1559

Adrenocortical Responses to Stress in Breeding Pied Flycatchers *Ficedula hypoleuca*: Relation to Latitude, Sex, and Mating Status

Bengt Silverin, John C. Wingfield, *Journal of Avian Biology*, September, 1998, 29(3):228-234.

Corticosterone secretion is stimulated in birds in response to many types of stress. Although a temporary rise in corticosterone secretion may mobilize necessary physiological and behavior changes that can aid in survival (i.e., “fight or flight” situations), chronic stress and the resulting persistence of high corticosterone levels can inhibit reproduction and cause severe debilitation and even death in birds. Researchers recently sought to determine if birds who live in sub-Arctic habitats, and therefore must breed under the stressful conditions of a severe environment, are somehow able to suppress the adrenocortical response to stress.

The hypothesis was tested by comparing the circulating levels of corticosterone in the blood of breeding pied flycatchers (*Ficedula hypoleuca*) at a temperate-zone breeding site in southern Sweden with levels found in a population of the same species nesting in a sub-Arctic area in Swedish Lapland. To reduce the potential for confounding variables, researchers were careful to both minimize and equalize the stress experienced by the birds studied during capture and subsequent blood sample collection.

The researchers found that both male and female flycatchers breeding in the harsher Lapland environment had a reduced adrenocortical response to stress, compared to their counterparts in southern Sweden. The highest levels of corticosterone triggered by capture stress were found in single females (usually both males and females share the responsibility of feeding the young). The researchers found, contrary to expectation, that there was no significant relationship between corticosterone levels and body mass or fat score among the Lapland flycatchers.

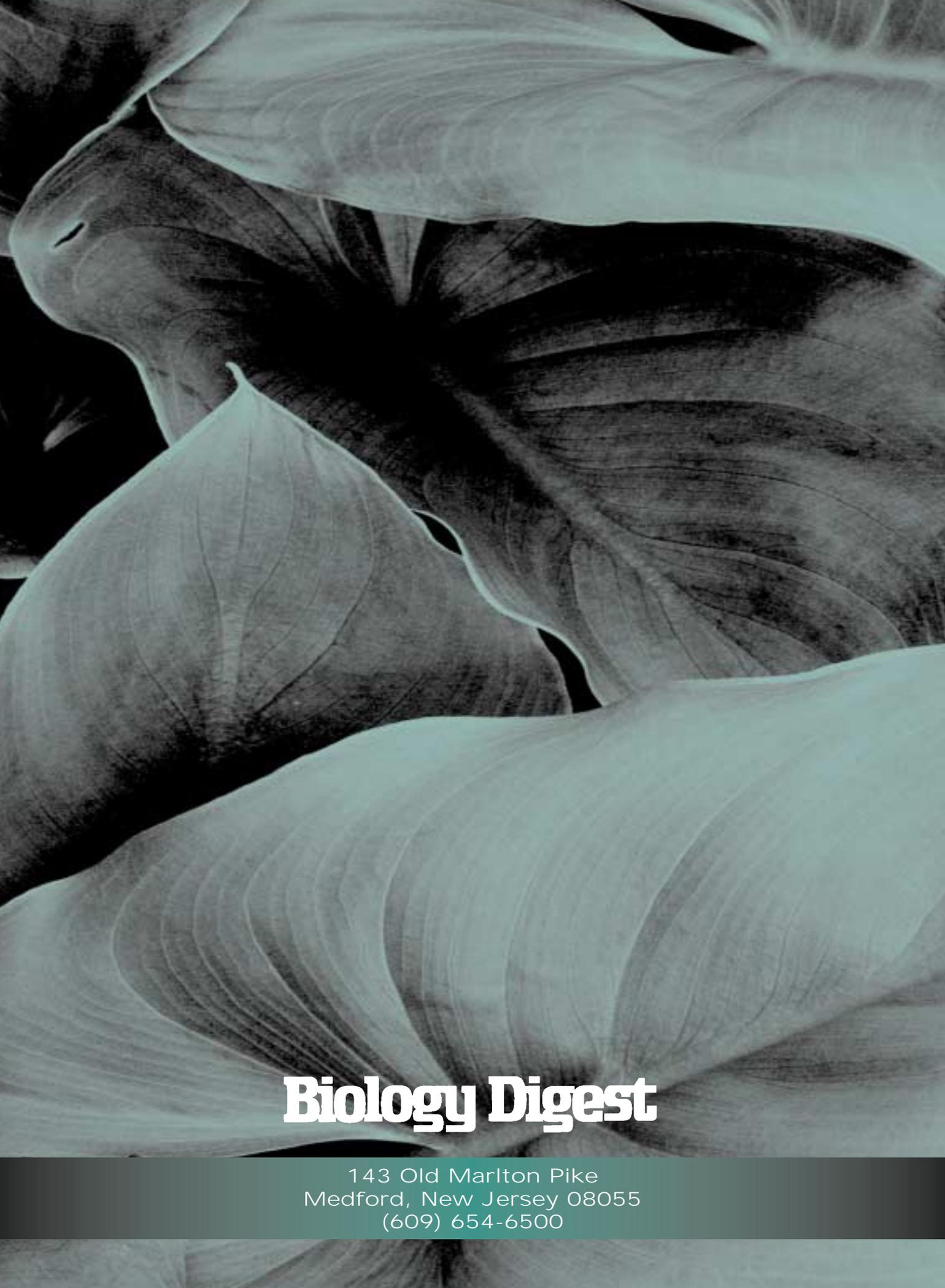
- ◆ Scientists **observed** that corticosterone secretion is stimulated in birds in response to many types of stress. Chronic stress and the resulting persistence of high corticosterone levels can inhibit reproduction and cause severe debilitation and even death in birds.
- ◆ They **hypothesized** that birds living in sub-Arctic habitats, and therefore breeding under the stressful conditions of a severe environment, must somehow be able to suppress the adrenocortical response to stress.
- ◆ The hypothesis was tested by setting up an **experiment** comparing the circulating levels of corticosterone in the blood of breeding pied flycatchers (*Ficedula hypoleuca*) at a temperate-zone breeding site in southern Sweden with levels found in a population of the same species nesting in a sub-Arctic area in Swedish Lapland. To reduce the potential for confounding variables, researchers were careful to both minimize and equalize the stress experience by the birds studied during capture and subsequent blood sample collection.
- ◆ The **results** found that both male and female flycatchers breeding in the harsher Lapland environment had a reduced adrenocortical response to stress, compared to their counterparts in southern Sweden.
- ◆ The **conclusions** confirmed the researchers' hypothesis, and they were then able to **publish** their results.

To Encourage Leisure Reading

And last, but certainly not least, *Biology Digest* can be used as a source of enjoyable reading. Due to the varied topics it covers, *Biology Digest* appeals both to students interested in pure science and to those interested in the application of science to their everyday life. Browsing is best promoted by a prominent, central display of the current issue each month, with back issues nearby.

We hope that you and your students enjoy ***Biology Digest*** as much as we do!

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