value of 200, as a result of which during the next 5 hr he expends not 300 but 320 kcal, at the end of which time the metabolic rate has returned to the basal level, and extra kilocalories equivalent to 10% of those provided have been expended. The basal expenditure of this individual is 1440 kcal/day. If just the basal requirements are supplied by this particular food, therefore, there will be an expenditure of 10% more, or 144 extra kcal; and even if the individual remains under the same conditions his total energy requirements will not be met. In this hypothetical case they will just be met, however, by 1600 kcal (1440 plus 10% of the ingested), and there will be positive caloric balance with anything over 1600—e.g., a surplus of 45 calories from 1650, of 810 kcal from 2500, etc.—which could be used to support activity over the basal. Such a presentation should be suitable and adequate to explain what specific dynamic action is, without leading to any misunderstanding, and would occupy no more time than should be devoted to the subject in a general or elementary course.

At this stage, however, the student might be aided in evaluating specific dynamic action as a metabolic phenomenon by the following facts. Practically all our knowledge of specific dynamic action has been derived from studies of animals kept warm in the fasting state, but otherwise under basal conditions. Practically nothing is known about it in human beings under ordinary conditions of activity and everyday living, and under normal food consumption at the usual intervals. Ten per cent of the basal used to be regarded as the allowance to be made for specific dynamic action in human energy economy, but it probably should be smaller. The supposition that, because of its greater specific dynamic action, a high-protein diet is particularly beneficial in a cold environment has not received experimental support.

Our knowledge of the etiology and mechanism of specific dynamic action is at a stage where nothing more than brief reference should be made until students have gained considerable knowledge of intermediary metabolism.

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Transportation of Live Materials for Research

Many papers have been published regarding the value of live materials for instruction and research. Numerous specific reports of results of research projects, based on the ready availability of live animals, may be found in any scientific or medical periodical, In many instances the researcher may have had to collect the animals himself, spending his time and money transporting them home with his effects and equipment after solving the difficulties of collecting them in the field.

In other research programs, particularly in physiology, parasitology, pharmacology, and in innumerable projects directed toward public health, fresh, specific live materials are required on a series of delivery dates, as needed in the course of experiments, in the conduct of which the researcher has to have such facilities as pertinent literature, equipment, and qualified assistants to be sure of getting satisfactory results. Under these circumstances he must depend on the performance of a reliable supplier. For 12 years the writer has supplied specimens from the subtropical zone of Florida on a business basis, and many institutions have depended on his services.

Transportation handicaps beyond our control are critically interfering with our supply effort. Fast, dependable transportation is no longer available. Live materials are perishable. They are expected to arrive fresh and not *just* alive, for they may be used for weeks, or even months. We are confronted with embargoes of air express on shipments of live materials of any kind. They were put into effect first by a few airlines three years ago and are now applied by most American airlines with scheduled service, thus eliminating the most efficient and, all factors considered, the most economical way of shipping. Canadian airlines have no such embargo.

For all practical purposes there is an embargo on air parcel post, because of a ruling that admissible live materials should be so packed that they can be put into canvas mail sacks during transit, and this would result in suffocation. Small mammals are excluded from air parcel post. This service used to be excellent and economical. We used it for numerous shipments without any loss. A recent further restriction prohibits acceptance by first-class post offices of air parcel post in excess of 20 pounds. Acceptance up to 70 pounds is allowed by any second- or third-class post office. This rule forces us to take our shipments miles out of town to a second-class post office, which sends the packages back by rail to the first-class post office here in town, where acceptance was originally refused.

We have what practically amounts to an embargo of railway express service. When restrictions were placed on the competitive transportation services of air express and air parcel post, the Railway Express Co. priced itself out of the market for shipment of live materials, first by raising the basic rates, then by raising rate classifications and charging for live materials twice the first-class rate, by giving deficient service in transit, and finally by refusing claims.

It is difficult to see how this rate can be justified for any small-animal shipments, because they do not require extraordinary attention, such as feeding, watering, and cleaning of cages. As a matter of fact, these are not wanted. From 1939 to 1951 we rarely had any losses, although thousands of research animals were handled during this period. Our packages are clean, without any noticeable odor, and the animals are in uniform, patented, individual wire cages. The rates charged can only be considered penalties on animals shipped for research, because live tropical fish for fish fanciers, baby chicks and chickens, frozen fresh fish, which require periodical icing and much attention, have continued to benefit from reduced, and even second-class, rates.

Business is seriously hurt by these unwarranted charges, since we often have to use Railway Express to get live materials from collecting stations on the long Florida Peninsula to the laboratory for processing, with the result that we incur the same high transportation charges twice. Commonly, the transportation costs are considerably in excess of the invoice value of the materials.

Our experiences with air freight were uneconomical and disastrous. In this service delivery dates could not be planned, because most of the flights are unscheduled and are completely suspended on Saturdays and Sundays, thus reducing the work week in collecting and in the laboratory to three days. Besides, a total air freight embargo on any live materials has eliminated Eastern Airlines, which operates the only route directly north, with connecting flights to the west. As a consequence air freight shipments are transported over a grand detour—e.g., from Tampa to Jacksonville to New York, to reach Chicago, and from Chicago by Railway Express to Champaign, Ill. The charges for this service are, of course, on a mileage basis. One shipment that we entrusted to the "fast service" by air freight took *7 days* to make this distance, and the animals arrived dead of dehydration and malnutrition. We replaced them by private plane and delivered the animals in Chicago within *6 hours.* Larger animals requiring feeding and watering have been shipped exclusively by Railway Express after this experience.

This account of transportation problems in the supply of live materials shows that immediate relief is a necessity.

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Book Reviews

Medicinal Chemistry: Chemistry, Biochemistry, Therapeutic and Pharmacological Action of Natural and Synthetic Drugs, Vol. II. Alfred Burger. New York–London: Interscience, 1951. 506 pp. $10.00.

The first volume of this two-volume text was reviewed in a previous issue (SCIENCE, **114,** 559 [1951]). In this second volume Burger has maintained the same admirable style and organization. Although there is an excellent chapter on the hormones, the book is chiefly concerned with the chemotherapy of diseases caused by pathogens. A chapter of especial merit is the one dealing with the theories of metabolite antagonism.

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The Barker Index of Crystals, Vol. I: *Crystals of the Tetragonal, Hexagonal, Trigonal and Orthorhombic Systems,* Part 1: Introduction and Tables; Part 2: Crystal Descriptions. M. W. Porter and R. C. Spiller. Cambridge, Eng.: Heffer, 1952. Part 1, 250 pp., 30s; Part 2, 1027 pp., £4 10s; £6 for both.

The first 120 pages of Part 1 of this giant reference book deal primarily with an introduction to the Barker Index. They give a highly condensed summary of elementary crystallography and of the important types of crystallographic projections—all from the standpoint of an amateur worker in such fields. This is followed by a short description of the Barker protractor and a short discussion of its five scales. This leads to a discussion of the multiple tangent table, followed by a worked-out "identification of an unknown crystal." Detailed consideration is given to symmetry determination, projection, setting and orientation, and the calculation of the classification angles, for the crystal systems: cubic, orthorhombic, tetragonal, hexagonal, and trigonal.

The Barker Index deals with data obtained from single crystals, not with data obtained from powdered crystals, as is the case with the "ASTM, Hanawalt," method of chemical identification. The Barker Index, therefore, requires a pretty accurate knowledge of the orientation of the single crystal with respect to some base line taken from the x-ray diffraction equipment. This has required the assembly, mainly from existing literature, of large quantities of "single crystal" data. These data have been arranged in three tables, as follows: Classification angles for tetragonal, hexagonal, and orthorhombic crystals. Other data, useful in confirming conclusions reached by other methods are tabulated as follows: (1) refractive indices for tetragonal, hexagonal, trigonal, and orthorhombic crystals; (2) densities of tetragonal, hexagonal, trigonal, and orthorhombic crystals; (3) melting points of tetragonal, hexagonal, trigonal, and orthorhombic crystals.

The last half of Part 1 includes two additional tabulations—an alphabetical list of English chemical and mineralogical names, and an alphabetical list of German chemical names as used by Groth. None of the tabulations of classifications angles is made with reference to page numbers. Instead they are tabulated with reference to known quantities, such as Cr, Am, and Bq, which appear systematically in crystallographic calculations.