at this point that the present investigation was undertaken by the author.

The addition of manganese or cobalt salts, brought to pH 4, with the immediate addition of an excess of phosphate buffer of pH 9 cleared the solution, apparently by coprecipitation, of all colored substances, with loss of only 35–45 per cent of activity. Details of the method will be given elsewhere.

The Tiselius curve (Fig. 1) shows the presence of only two constituents, presumably only one besides the arginase. The arginase is found in the slow fraction.

The spectrophotometric curve (Fig. 2) of the cobalt-purified solution (A) and a solution before purification (B) shows a considerable drop in the peak at 412 mμ.

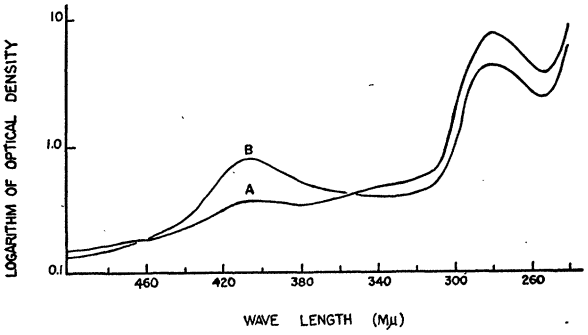

FIG. 2. Spectrophotometric curve of purified (A) and unpurified (B) arginase. (Courtesy of L. A. Strait, University of California Hospital.)

It may be considered established that arginase is a colorless enzyme, with the properties of an albumin. Further studies are under way to complete the purification and to increase the yield.

TABLE 1
EFFECT OF DIVALENT CATIONS

Salt	Clarification	Yield
Co^{++}	Excellent	Good
Mn^{++}	Good	"
Ni^{++}	"	"
Cd^{++}	"	Poor
Zn^{++}	"	"
Sr^{++}	Slight	Good
Ba^{++}	"	Fair
Ca^{++}	"	"
Mg^{++}	"	"
Pb^{++}	"	Poor

Another series of tests shows similar effects in varying degrees from the following divalent cations: barium, cadmium, calcium, lead, magnesium, nickel, strontium, and zinc. Cobalt, manganese, and nickel give the best combination of clarification and yield; cadmium and zinc give excellent clarification but less than half the yield; while barium, lead, magnesium, and strontium give comparatively slight clarification and widely varying yields (Table 1).

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Letters to the Editor

On Filing Reprints

L. R. Richardson (*Science*, 1946, **104**, 181–182) explained a method of filing which he has found to be very satisfactory for a reprint collection. He recommended filing by author in large, 10- by 13-inch, open-ended manila envelopes, one author per envelope. There seem to be some objections to this system. These will be mentioned and another system proposed.

In the first place, many bookcases are not provided with sufficient clearance between shelves so that the 13-inch envelopes can be placed on end as suggested, and if they are, a lot of potential shelf space is lost. Secondly, a great percentage of reprints do not require envelopes of such size, but because of the occasional one of large format or the possible future one, extra room must be provided in all envelopes. Thirdly, many reprint collections contain only one or two papers by some authors and dozens by others. A manila envelope for a single paper might be considered extravagant both in money and space, while a prolific writer would require many envelopes. The last objection is that the reprints stand in a vertical position, which is not the best from the point of view of preservation, particularly for old papers.

After having tried several systems, the present writer has found one that is workable and conserving of space. The fundamental assumption is that the place of original publication rather than subject or author is the best basis for filing. This method does away with the difficulty of subject classification and with the problem of joint authorship—the best-known author's name does not always come first. Under this system papers are filed with others of the same size, since journals do not constantly change their format, and it is not necessary to provide unnecessary space for the occasional large paper as under the system proposed by Richardson.

Cardboard boxes with deep covers are used, to which are pasted labels listing the periodicals contained. Within the box, papers are filed by date of publication. Reprints

from some journals may be so abundant that more than one box is needed; on the other hand, some boxes may contain the reprints from three or more journals. An unclassified box takes care of the occasional reprint from journals represented by only a few papers which can easily be moved to a classified box as soon as their number justifies. Large boxes are provided for those publications using a big format and small for those of small format. Under this system the reprints lie flat, are well protected, and widely spaced shelves are not needed.

As in Richardson's system, a card catalogue or bibliography is needed, but once the reference has been found, it is as easy to go to the correct box by publication as it is to go to the envelope by author.

LAWRENCE WHITCOMB
Department of Geology, Lehigh University

New Data on the Extraction of B_1 From Natural Material (Yeast)

Investigation was made to determine the most suitable conditions for the extraction of B_1 from yeast.

In a series of assays, using yeast from the same container and using the same enzyme (papain) but a different pH with each assay, it was found that optimum results were obtained at pH 1.0–1.5.

At the same time it was confirmed that synthetic B_1 is best conserved at pH 4.0–4.5.

For the checking of the B_1 the colorimetric method of Melnick and Field was used.

Further work is needed to determine whether the findings apply to the extraction of B_1 from other natural materials; also, on the use of different enzymes or a combination of enzymes.

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The Rh System in the Chimpanzee

The present writer's theory of multiple allelic genes, to account for the hereditary transmission of the Rh-Hr blood types, has received adequate confirmation from family and statistical studies (A. S. Wiener, E. B. Sonn, and H. R. Polivka. *Proc. Soc. exp. Biol. Med.*, 1946, **61**, 382). On the other hand, no substantial evidence has been adduced to support Fisher's theory of gene triplets, which only leads to contradictions and paradoxes (A. S. Wiener. *Brit. med. J.*, 1946, **1**, 982; J. Murray. *Brit. J. exp. Path.*, 1946, **27**, 102). A new argument for Fisher's theory has now been advanced in your columns by Mourant and Race (*Science*, 1946, **104**, 277).

M. Wade and I (*Science*, 1945, **102**, 177) reported that the bloods of every one of 15 chimpanzees tested did not absorb anti-Rh′, anti-Rh″, or anti-Rh_0 agglutinins from human antisera, but did absorb anti-Hr′. This is confirmed by tests on a single additional chimpanzee by Mourant and Race, who also report that the blood of their chimpanzee did not absorb the anti-Hr″ agglutinin. Based on this finding, Mourant and Race conclude that the factors Rh″ and Hr″ are absent from chimpanzee blood and suggest that the hypothetical locus E-e of Fisher is lacking in this species. They consider this apparent separation of one gene pair from Fisher's three sets of hypothetical genes an argument favoring Fisher's theory of closely linked genes, as against my multiple allele theory.

The reasoning used by Mourant and Race has a number of fallacies which can best be demonstrated by citing analogous observations involving other blood agglutinogens. Rhesus red cells are not clumped by, nor do they absorb, human anti-Rh_0 agglutinins, which, according to Mourant and Race, would indicate that the Rh_0 factor is entirely lacking in this species. However, the original antisera for detecting the Rh_0 factor were prepared by injecting Rhesus blood into rabbits and guinea pigs; in fact, that is how the Rh factor got its name. The correct conclusion is that Rhesus blood does not contain a factor identical with human Rh_0—only a related factor, that is, an Rh_0-like factor. Similarly, it seems highly likely that chimpanzee blood actually does contain Rh″-like or Hr″-like factors, or both.

Another obvious fallacy is to assume that every separate agglutination reaction given by an antigen proves the presence of comparable separable components within the antigen. The agglutination test is merely a diagnostic test, and one might just as unreasonably conclude that every time a new qualitative test is devised for a chemical substance this proves the presence of another structure within its molecule. K. Landsteiner (*Specificity of serological reactions.* (Rev. ed.) Cambridge, Mass.: Harvard Univ. Press, 1945. Pp. 114–116) has repeatedly demonstrated how simple chemical compounds can give rise to several distinct but specific immune antibodies, and he has also demonstrated that the number of qualitatively different antibodies is not necessarily correlated with the existence of distinct structures within the antigen molecule. If we were to apply Mourant and Race's arguments in the case of the A-B-O blood groups and the M-N types, we would be faced with a number of queer paradoxes. Studies on the evolution of the M agglutinogen reveal the existence of at least four distinct partial antigens in the human M agglutinogen and two partial antigens in the N agglutinogen (A. S. Wiener. *Amer. Nat.*, 1943, **77**, 199). According to Fisher, it would therefore be necessary to postulate that agglutinogen M of human blood is determined by a gene complex, $M_iM_{ii}M_{iii}M_{iv}$, while agglutinogen N is determined by a linked gene complex, N_iN_{ii}. This leads to a situation where corresponding portions of a pair of homologous chromosomes are not homologous, and, if this conclusion were correct, it would be very strange that in millions of tests no evidence of crossing-over, such as a blood $M_iM_{ii}N_{ii}$, has ever been obtained. It seems much more reasonable to conclude that the complicated M and N agglutinogens of human blood are each determined by corresponding genes forming an allelic pair, in accordance with the generally accepted theory of Landsteiner and Levine. The reactions of the bloods of chimpanzees and monkeys with anti-M and anti-N sera can be explained most reasonably and simply by postulating the presence in these species of M-like and N-like agglutinogens rather than portions of a complicated gene complex; that is, the phenomena described are undoubtedly examples of the evolution of complicated chemical