diate reaction and yielded an amorphous, gray-blue solid which was not obtained sufficiently pure for analysis.

The mild conditions found to be necessary and the short reaction times observed in these experiments indicate azulene to be markedly more reactive with respect to electrophilic substitution than the isomeric naphthalene. The rapid reaction of mercuric chloride with azulene is noteworthy as the chloromercuration of thiophene requires several days.[4]

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[4] F. C. Whitmore, "Organic Compounds of Mercury," Am. Chem. Soc. Monograph No. 3, Chemical Catalog Co., New York, N. Y., 1921.

[5] Shell Oil Fellow, 1949-1950.

BACTERIAL DESOXYPENTOSE NUCLEIC ACIDS OF UNUSUAL COMPOSITION

Sirs:

Previous work in this laboratory[1] has shown that the desoxypentose nucleic acids (DNA) of different species differ in composition. All specimens examined so far, however, were, with one exception, considerably richer in adenine and thymine than in guanine and cytosine. Only in the DNA of avian tubercle bacilli[2] were the molar ratios of adenine to guanine or to cytosine and of thymine to cytosine lower than 1.

Two other instances of microbial DNA of unusual composition have now been found, namely in preparations from *Serratia marcescens* and from a facultatively autotrophic hydrogen organism, *Bacillus Schatz*, kindly given us by Drs. van Niel and Schatz.

Because of the strong DNA depolymerase activity of *Serratia marcescens* cultures a modification of a previously described procedure[3] was used. Washed cells from a 48-hr. culture on nutrient agar at room temperature were ground in 3.5 *M* aqueous NaCl with pyrex powder. The supernatants (20,000 x g, 0.5 hr.) from repeated extracts of the ground material (0°, 3.5 *M* NaCl) were injected into cold alcohol, the precipitated fibers deproteinized and processed as described before[3]; yield 0.08% of wet cells, 92–97% DNA, 1.1–2.6% RNA.

Similar procedures led to the isolation of DNA from the hydrogen organism, *Bacillus Schatz*. The fibrous preparations were freed of tenaciously held RNA (9%) by dialysis of their solution against dilute NaOH of *p*H 13.5 for 18 hr. at 30°; yield, 0.1%, 100–108% DNA, 0.5–3% RNA.

Three independently prepared samples from each of the organisms were analyzed for purines and pyrimidines by a modification[4] of previously published procedures.[5] The molar ratios reproduced in Table I represent averages for these preparations.

TABLE I

MOLAR RATIOS IN TWO BACTERIAL DNA

	Serratia marcescens	Hydrogen organism, *Bacillus Schatz*
Adenine/guanine	0.76	0.68
Thymine/cytosine	.63	.59
Adenine/cytosine	.64	.63
Purines/pyrimidines	.92	.98

Several generalizations can be made. DNA, apart from smaller differences in composition characteristic of the species, appears to occur in two main groups: the "*AT type*" (DNA from animal tissues, yeast, etc.) in which adenine and thymine preponderate, and the "*GC type*" (DNA of tubercle bacilli and compounds discussed here) in which guanine and cytosine are the major constituents. Adenine and thymine occur mostly in almost equimolar quantities, as do guanine and cytosine and also total purines and pyrimidines.

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[1] Chargaff, *Experientia*, **6**, 201 (1950).

[2] Vischer, Zamenhof and Chargaff, *J. Biol. Chem.*, **177**, 429 (1949).

[3] Chargaff and Zamenhof, *J. Biol. Chem.*, **178**, 327 (1948).

[4] Chargaff, Green and Lipshitz, unpublished experiments; Zamenhof and Chargaff, *J. Biol. Chem.*, in press.

[5] Vischer and Chargaff, *J. Biol. Chem.*, **176**, 703, 715 (1948).

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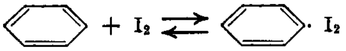
THE HEAT OF FORMATION OF THE BENZENE–IODINE COMPLEX

Sir:

Benesi and Hildebrand[1] have recently reported the existence of an intense ultraviolet absorption peak for solutions of iodine in benzene with a maximum at $\lambda = 297$ mμ. This characteristic absorption serves as part of the evidence for the formation of a 1:1 complex:



The absorption by this complex for various concentrations of iodine and benzene in a non-complexing solvent, such as carbon tetrachloride or *n*-heptane, has been used by Benesi and Hildebrand for determining equilibrium constants for the above reaction. They assumed that the equilibrium constant is the same for all concentrations of the benzene, and evaluated K and the extinction coefficient of the complex ϵ_c by a linear extrapolation. This led to radically different values of ϵ_c in carbon tetrachloride and *n*-heptane and involved extrapolation of two curves through a single point (pure benzene, $x_a = 1$).

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[1] H. A. Benesi and J. H. Hildebrand, THIS JOURNAL, **71**, 2703 (1949).