$[\alpha]^{25}D$ +87.5° (*c* 1.02, 50% EtOH) from (+)-α-methylbenzylamine].

Anal. Calcd for $C_{11}H_{15}NO_2$: N, 7.27; Found: N, 7.23.

(*R*)(−)-Alanine and (*R*)(−)-Aspartic Acid from Oxaloacetic Acid and (*R*)(−)-Phenylglycine.[5]—A mixture of oxaloacetic acid (1.32 g, 0.01 mol), (−)-phenylglycine [1.51 g, 0.01 mol; $[\alpha]^{25}D$ −168° (5 *N* HCl)], and water (5 ml) was dissolved in 2 *N* sodium hydroxide (15.5 ml). The mixture was allowed to stand for 2 hr at room temperature. To the mixture, 10% palladium on charcoal (2.5 g) was added, and hydrogenation and hydrogenolysis were carried out at room temperature for 24 hr. The catalyst was filtered and washed with water. To the solution, 6 *N* hydrochloric acid was added to bring the pH to about 2. Ether extraction was carried out to remove the phenylacetic acid. The aqueous solution was evaporated to dryness. Absolute alcohol (50 ml) was added to the residue to extract the amino acid hydrochloride. Sodium chloride was removed by filtration. The alcoholic solution was evaporated, and the residue was dissolved in water (15 ml). The aqueous solution was treated with a Dowex 50 × 2 column in the same way described above. A mixture of alanine and aspartic acid was obtained (0.46 g, 38%). (Yields of amino acids at various times are almost constant: 12 hr, 36%; 24 hr, 35%.) The amino acid mixtures (0.36 g) were separated into alanine and aspartic acid by the use of an AG 1 × 8 column (formate form, 100–200 mesh, 1.5 × 16 cm). Alanine was eluted with water; then aspartic acid was eluted with 1 *N* formic acid. (*R*)(−)-Alanine (0.09 g) and (*R*)(−)-aspartic acid (0.26 g) were obtained, respectively: (*R*)(−)-alanine, $[\alpha]^{25}D$ −7.9° (*c* 3.91, 5 *N* HCl); (*R*)(−)-aspartic acid, $[\alpha]^{25}D$ −12.8° (*c* 3.14, 5 *N* HCl); alanine:aspartic acid = 35:65.

Separation of DNP-Alanine and DNP-Aspartic Acid.—The alanine and aspartic acid mixture (0.10 g) was treated with 1-fluoro-2,4-dinitrobenzene (0.4 g) and sodium hydrogen carbonate (0.4 g) by the usual method. Crude DNP-amino acid was separated by Celite column chromatography by the method described in previous reports:[3,10] DNP-(*R*)(−)-alanine, yield 0.073 g, $[\alpha]^{25}D$ −89.5° (*c* 0.57, 1 *N* NaOH); DNP-(*R*)(−)-aspartic acid, yield 0.184 g, $[\alpha]^{25}D$ −49.1° (*c* 0.56, 1 *N* NaOH); DNP-alanine:DNP-aspartic acid = 33:67.

Alanine from Oxaloacetic Acid and Pyridoxamine.—A mixture of oxaloacetic acid (0.66 g, 0.005 mol), pyridoxamine dihydrochloride (1.2 g, 0.005 mol), 2 *N* sodium hydroxide (10 ml), and water (10 ml) was allowed to stand for 2 hr at room temperature. To the mixture, palladium hydroxide (2.0 g) was added, and hydrogenation and hydrogenolysis were performed for 24 hr at room temperature. The reaction mixture was treated as above. Amino acid mixture was obtained (0.15 g, 20%). The ratio of alanine and aspartic acid was determined by the use of the automatic amino acid analyzer: alanine:aspartic acid = 63:37. Separation of DNP-amino acids was carried out as above: DNP-alanine:DNP-aspartic acid = 65:35.

Isolation of Barium Carbonate.—In a three-necked flask with a nitrogen gas inlet tube, outlet tube, and dropping funnel, a mixture of oxaloacetic acid (1.32 g, 0.01 mol), α-methylbenzylamine (3.63 g, 0.03 mol), and ethanol (70 ml) was placed. The carbon dioxide evolved was collected in traps containing 0.2 *M* barium hydroxide. After 30 min, 6 *N* hydrochloric acid (10 ml) was added to the mixture. Then nitrogen gas was passed through until the evolution of carbon dioxide ceased (30 min). Precipitated barium carbonate was collected by filtration and washed with water repeatedly. After the residue was dried, barium carbonate (1.90 g, 96.4%) was obtained.

Examination of Racemization of Phenylglycine.—A mixture of oxaloacetic acid (0.66 g, 0.005 mol), (*R*)(−)-phenylglycine [0.75 g, 0.005 mol; $[\alpha]^{25}D$ −168°, (5 *N* HCl)], water (2.5 ml), and 2 *N* sodium hydroxide (7.8 ml) was allowed to stand at room temperature. After 2 hr of standing, 6 *N* hydrochloric acid was added to the mixture to decompose the Schiff base. The mixture was evaporated to dryness *in vacuo*. The dried residue was extracted with absolute ethanol (50 ml). The ethanolic solution was kept in a freezer overnight, and the precipitated inorganic salt was removed by filtration. To the filtrate pyridine was added to precipitate phenylglycine. The precipitating solution was allowed to stand in a freezer overnight. The crystals were filtered to yield 0.73 g (97.3%): $[\alpha]^{25}D$ −166.8° (*c* 1.10, 5 *N* HCl).

Registry No.—(*S*)(+)-alanine, 10333-82-1; (*R*)(−)-alanine, 10353-30-7; oxaloacetic acid, 328-42-7; N-(α-methylbenzyl)alanine, 17791-40-1; (*R*)(−)-aspartic acid, 10333-84-3; (*S*)(+)-aspartic acid, 10353-31-8.

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A New Thiadiazepine Ring System

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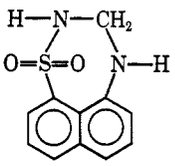
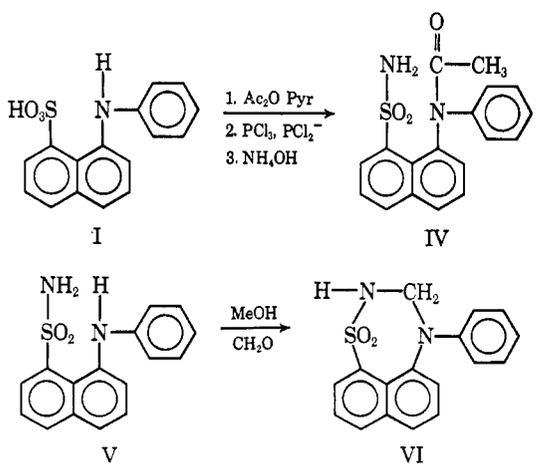
In connection with investigations dealing with the preparation of compounds for diuretic activity, we wish to report the synthesis of a new thiadiazepine ring system by two different methods, A and B. In method



A (Scheme I) the N-acetyl (II) compound was prepared from N-phenyl *peri* acid (I) by refluxing with acetic anhydride in pyridine solution, and II was converted into the corresponding sulfonyl chloride III by refluxing with PCl_5 in PCl_3. Ammoniation of III, using 10% ammonia solution, gave amide IV, and the acetyl group

SCHEME I



was then hydrolyzed by methanolic sodium hydroxide to give V. The ring closure to VI[2] was effected by condensing V with equal molar quantities of 55% Methyl Formcel in methanol.

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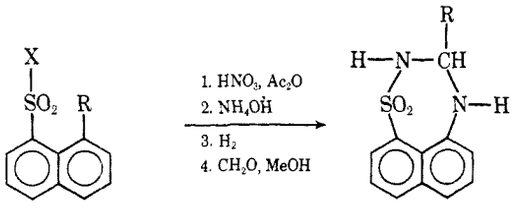
In method B (Scheme II) the intermediate VIII was obtained (as reported by Joy and Bogert[3]) and ammoniated to compound IX which was then reduced with

SCHEME II



VII, X = Cl; R = H
VIII, X = Cl; R = NO_2
IX, X = NH_2; R = NO_2
X, X = NH_2; R = NH_2

XIa, R = H
b, R = $C_6H_5CH_2$

hydrogen in the presence of Raney nickel catalyst. Compound IX was identical with that reported by Heller.[4] The ring closure was performed as described in method A.

Experimental Section

Pyridinium 3-(N-Acetylanilino)-1-naphthalenesulfonate (II).—8-Anilino-1-naphthalenesulfonic acid (I) (100 g, 0.31 mol) was suspended in 200 ml of pyridine and refluxed in 400 ml of acetic anhydride for 2 hr. The crystals were filtered and washed with acetone: mp 217–219°; yield 87 g (63%).

Anal. Calcd for $C_{23}H_{20}N_2O_4S$: C, 67.29; H, 4.91; N, 6.82. Found: C, 67.32; H, 4.88; N, 6.89.

8-(N-Acetylanilino)-1-naphthalenesulfonyl Chloride (III).—Pyridinium 8-(N-acetylanilino)-1-naphthalenesulfonate (II) (42 g, 0.09 mol) and 21 g (0.1 mol) of PCl_5 wih 50 ml of PCl_3 were mixed and refluxed for 5 min. The syrupy mass was poured into ice with good stirring, and the formed crystals, after recrystallizing from benzene, had mp 140–141°; yield 23.0 g (71%).

Anal. Calcd for $C_{18}H_{14}NO_3SCl$: C, 60.08; H, 3.92; N, 3.90; S, 8.92; Cl, 9.86. Found: 59.92; H, 3.87; N, 3.92; S, 8.81; Cl, 9.92.

8-N-Acetylanilino-1-naphthalenesulfonamide (IV).—8-(N-acetylanilino)-1-naphthalenesulfonyl chloride (III) (23 g, 0.064 mol) was boiled with a mixture of 300 ml of 10% ammonia solution and 200 ml of methanol for 2 hr and allowed to stand for 2 hr at room temperature. The fine crystals were then filtered off and washed with 150 ml of water and twice with 50 ml of methanol. After recrystallizing from 50% methanol, the product had mp 212–214°; yield 21.0 g (96%).

Anal. Calcd for $C_{18}H_{16}N_2O_3S$: C, 63.49; H, 4.74; N, 8.24 S, 9.24. Found: C, 63.25; H, 4.80; N, 8.23; S, 8.70.

8-Aniliño-1-naphthalenesulfonamide (V).—8-(N-Acetylanilino)-1-naphthalenesulfonamide (IV) (21 g, 0.062 mol) was hydrolyzed with 350 ml of 5% NaOH solution for 17 hr. The mixture was filtered, and to the filtrate 75 ml of 50% NH_4Cl solution was added. The formed crystals were collected, washed twice with 25 ml of water, and recrystallized from MeOH with the aid of a charcoal decolorizing agent. The yield was 13 g (67%).

Anal. Calcd for $C_{16}H_{14}N_2O_2S$: C, 64.63; H, 4.41; N, 9.42; S, 10.78. Found: C, 64.43; H, 4.43; N, 9.28; S, 11.00.

Naphthalene[1,8-*e,f*]-2,3-dihydro-4H-4-phenyl-[1.2.4]thiadiazepine 1,1-Dioxide (VI).—A solution of 5 g (0.0155 mol) of 8-anilino-1-naphthalenesulfonamide (V) 70 ml of absolute MeOH and 2 ml of 55% Methyl Formcel was refluxed for 8 min. The mixture was cooled and allowed to stand at room temperature overnight. The formed crystals yielded 2.5 g (48%); the product had mp 178°.

Anal. Calcd for $C_{17}H_{14}N_2O_2S$: C, 65.78; H, 4.54; N, 9.02; S, 10.33. Found: C, 65.51; H, 4.27; N, 8.47; S, 10.15.

(3) H. V. Joy and M. T. Bogert, *J. Org. Chem.*, **1**, 236 (1936).
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8-Nitro-1-naphthalenesulfonyl chloride (VIII).—This compound was prepared by the method of Joy and Bogert:[3] yield 17%; mp 153–156° (lit.[3] mp 161–162°).

8-Nitro-1-naphthalenesulfonamide (IX).—This was prepared from compound VIII by boiling the latter in methanolic ammonia: yield 95%; mp 188–190° (lit.[5] mp 190.5–1.5°).

8-Amino-1-naphthalenesulfonamide (X).—The compound IX (1.5 g, 0.0060 mol) was reduced catalytically over Raney nickel in ethanol. The solvent was removed, giving a crystalline product which was then recrystallized from 3 ml of benzene–methanol–petroleum ether (bp 40–60°): yield 1.0 g (75%); mp 189–191°.

Anal. Calcd for $C_{10}H_{10}N_2O_2S$: C, 54.45; H, 4.53; N, 12.60; S, 14.42. Found: C, 54.41; H, 4.56; N, 12.62; S, 14.38.

Naphthalene-[1,8-*e,f*]-2,3-dihydro-4-H-[1,2,4]-thiadiazepine 1,1-Dioxide (XIa).—A solution of 958 mg (0.0044 mol) of 8-amino-1-naphthalenesulfonamide (X) in 450 ml of MeOH was refluxed with 15 drops of Methyl Formcel[2] (55%) for 10 min. The reaction mixture was then reduced to a 70-ml volume, and, on cooling, crystals formed which were collected and recrystallized from 4 ml of benzene: yield 750 mg (75%); mp 214–216°.

Anal. Calcd for $C_{11}H_{10}N_2O_2S$: C, 56.39; H, 4.30; N, 11.95; S, 13.68. Found: C, 56.23; H, 4.46; N, 11.83; S, 13.75.

3-Benzylnaphthalene-[1,8-*e,f*]-2,3-dihydro-4-H-[1,2,4]-thiadiazepine 1,1-Dioxide (XIb).—To a solution of 2.0 g (0.0090 mol) of 8-amino-1-naphthalenesulfonamide (X) in 50 ml of ethanol was added 4 ml of phenylacetaldehyde in ethanol (50%). The mixture was refluxed for 1.5 hr. This mixture was concentrated to one-half volume, and, on cooling, crystals formed which were collected, washed twice with 1 ml of methanol and petroleum ether, and finally recrystallized from 130 ml of methanol: yield 1.5 g (71%); mp 176–176.5°.

Anal. Calcd for $C_{18}H_{16}N_2O_2S$: C, 66.64; H, 4.97; N, 8.63; S, 9.88. Found: C, 66.25; H, 5.06; N, 8.83; S, 10.15.

Registry No.—II, 16888-87-2; III, 16888-81-6; IV, 16888-82-7; V, 16888-83-8; VI, 16932-58-4; X, 16888-84-9; XIa, 16888-85-0; XIb, 16888-86-1.

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The Isolation and Structural Elucidation of 4-Demethylhasubanonine, a New Alkaloid from *Stephania hernandifolia*

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Stephania hernandifolia Walp. is a menispermaceous slender twining shrub found in India on the west and east coasts, in Cachar, Sikkim, East Bengal, and Assam.[2] The roots are reported to have use in the treatment of fever, diarrhea, dyspepsia, and urinary diseases.[3]

(1) (a) University of Wisconsin. The investigation at the University of Wisconsin was supported by Public Health Service Grant No. HE-02952 from the National Heart Institute. M. I. S. was an National Institutes of Health Predoctoral Fellow, 1966–1968. (b) University of Sussex.

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