used for preservation, *i.e.*, 1/5,000 to 1/15,000. The results are in Table 1.

DISCUSSION

In Systems 4 and 5, Table 1, Merthiolate (Lilly) in the concentrations used had an essentially negligible effect on the amount of precipitate. However, in Systems 2, 6, and 7 Merthiolate (Lilly) caused appreciable inhibition of precipitation, while in Systems 1 and 3 there were appreciable increases in the amounts of precipitate. The decrease in System 6 and the increase in System 3 definitely demonstrate that Merthiolate (Lilly) interacts with the antibody, since the same antigen was used in both experiments.

The effect of the hapten on the precipitation of the homologous serum, *i.e.*, anti-X serum, was to increase precipitation when Chrom X'_2 was used as the antigen (System 1) and to decrease precipitation when X-ovalbumin was used (System 2). The phenomenon of increased precipitation of anti-X serum with Chrom X'_2 caused by benzoic acids with large groups in the ortho position has been demonstrated previously.[5]

Others of our experiments (unpublished) have shown that precipitation of anti-R serum may be increased by negatively charged haptens other than arsonic acids, as is evidenced here also (System 3). It is interesting that maximum inhibition was observed with anti-R′ serum. This may well be due to the same phenomenon that has been discussed previously,[4] *i.e.*, looseness of fit of this antibody with hapten and antigen.

TABLE 1

EFFECT OF MERTHIOLATE (LILLY) ON SPECIFIC PRECIPITATION

Antisermu and borate buffer. Volumes as indicated; antigen solution, 1 ml; Merthiolate (Lilly) solution, 1 ml; pH of supernates, 8.1.

	Antiserum used		Antigen used		Vol. Buffer used	Moles of Merthiolate (Lilly)[a] added X 10^9			
	Type	Vol. ml	Type	Wt. μg	ml	0	550	1650	4950
						Amount of precipitate, μg[b]			
1	Anti-X	0.75	Chrom-X'_2	55.5	0.25	(441)	(364)	(542)	(583)
2	Anti-X	.33	X-ovalbumin	172.	.67	1148	(1104)	[1022]	766
3	Anti-R	.25	XXX	22.2	.75	733	870	(926)	(900)
4	Anti-R	.125	R′-ovalbumin	87.	.875	414	412	410	382
5	Anti-R	.50	XXXI	25.0	.50	456	480	472	452
6	Anti-R′	.50	XXX	29.4	.50	229	169	(98)	62
7	Anti-R′	.25	R′-ovalbumin	131.	.75	173	(158)	(98)	78

[a] These amounts correspond to final Merthiolate (Lilly) concentrations of 0, 1/13,500, 1/4,500, 1/1,500, respectively.
[b] Values for precipitates with azoproteins include precipitated antigen protein. Values are averages of triplicate analyses with mean deviation of ± 3 per cent.; duplicate analyses in parentheses, single analyses in brackets.

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SUMMARY

Merthiolate (Lilly), a substituted benzoic acid, has been shown to interfere, in concentrations usually used for preservation, with the specific precipitation of antisera against beef serum or sheep serum coupled with diazotized *p*-aminobenzoic acid, *p*-arsanilic acid, or *p*-(*p*-aminophenylazo)phenylarsonic acid. In some systems increased precipitation was observed, while in others decreased precipitation was observed.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A STRAIN GAGE RECORDER FOR PHYSIOLOGICAL VOLUME, PRESSURE AND DEFORMATION MEASUREMENTS

To measure and record the variety of pressure and volume changes encountered in physiological research, electrical means are particularly suitable, since they permit a combination of high fidelity of response, a wide variety of sensitivities, flexibility of experimental arrangement and instantaneous visualization of the phenomena to be recorded. Practically all known methods of converting mechanical into electrical energy have been utilized to obtain electrical records of pressure or volume changes or of mechanical deformations. The present report describes a new type.

The resistance wire strain gage, which is becoming increasingly useful in many industrial applications, has been found by us to be particularly suitable for electrical recording of plethysmographic and manometric measurements in physiology. The strain gage is a fine wire which undergoes resistive changes during stretch. In our physiological applications, the strain gage is mounted in conjunction with a volume or pressure capsule provided with a rubber or metal membrane. The gage is made one arm of a Wheatstone bridge. A deformation of the membrane of the capsule is transmitted to the wire and causes a resistive change in the gage. This produces an imbalance

voltage in the bridge. After suitable amplification, the imbalance voltage activates a direct writing instrument, such as the GE Photoelectric Recorder or an ink-writer of the type used in electroencephalography.

The block diagram of Fig. 1 shows the general

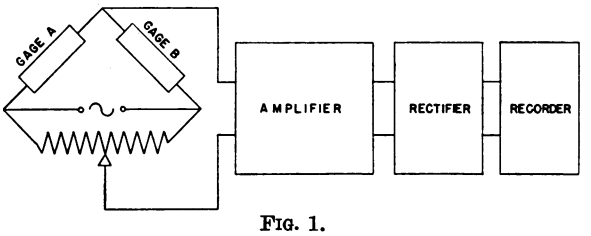

FIG. 1.

arrangement of the apparatus. The amplifier used in our present recorder is specially designed for extremely high sensitivity, low noise and low drift. These design features make the recorder useful in measuring and recording phenomena which are to be observed over a period of many hours.

A sample of direct ink records made with this recorder and the GE Photoelectric Recorder is shown in Fig. 2. The record represents the finger pulse

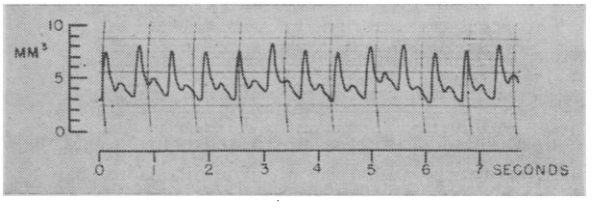

FIG. 2.

volume of the first phalanx of a human finger.

Simple modifications of the equipment make possible electrical recording of blood pressure, arterial pulse, muscle movements and other physiological variables. The sensitivity and stability of the amplifier have also proved useful in engineering applications of the strain gage.

The strain gage recorder was developed by the authors while they were senior physiologist, associate electrical engineer and senior pharmacologist, respectively, at the Climatic Research Unit, Fort Monmouth Signal Laboratory. It has been employed for about six months in the investigations of that Unit.

A full description of the strain gage recorder and of its various physiological applications will be published in an engineering memorandum of the Climatic Research Unit.

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A MODIFIED TECHNIQUE FOR READING THE RAPID SLIDE AGGLUTINATION OF LEPTOSPIRA

CONSIDERABLE difficulty has been experienced by the author in reading weak (1+ or 2+) reactions in the macroscopic agglutination test for Leptospirosis.[1] The antigen often forms an amorphous precipitate that seriously interferes with the accurate reading of these weak reactions.

In an effort to alleviate this difficulty it was decided to check each dilution with a modified dark-field technique similar to that used in the test-tube agglutination method for Leptospirosis.

The ordinary Abbe condenser is used in combination with a metallic dark-field stop placed in the slot provided beneath the Abbe condenser. Any light source may be utilized. A small drop of each dilution of the test is placed on a slide and examined, without a coverglass, under the low power objective. The condenser is then adjusted so that the organisms appear brilliant in the dark field.

This method clearly demonstrates the slightest clumping or agglutination. A strong positive reaction shows large definite clumps of organisms with a clear background. A weak positive reaction shows smaller clumps of organisms with a few individual organisms in the field. A negative reaction shows a homogeneous field of individual organisms. In all cases artifacts or precipitates appear as distinct brightly illuminated particles easily distinguishable from clumps of organisms.

In order to become familiar with the appearance of these reactions, it is advisable to make dilutions of known positive and negative sera and examine them in this manner.

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[1] Using Leptospira Diagnostic Antigen marketed by Lederle Laboratories, Inc., 30 Rockefeller Plaza, New York, N. Y.

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