papers on crystallographic subjects appear in nearly sixty different periodicals. The committee is satisfied that there are enough British papers yearly to make possible the publication of a quarterly journal. The scope of the journal would be determined by the material investigated, not the methods used; that is, it would cover structure of matter, not diffraction. The American Society for X-ray and Electron Diffraction is discussing a similar project, and cooperation with them might be arranged. The possibility of cooperating with continental workers is also under consideration. The conference expressed its general approval of a new journal and authorized the committee to continue with the project.

PROFESSOR W. J. LUYTEN, of the University of Minnesota, and Martin Dartayet, Cordoba, Argentina, announce the discovery on June 16 of a new white dwarf in the constellation Chamaeleon. They state that the star is of the seventeenth photographic magnitude, and thus by far the faintest white dwarf known. It has a proper motion of 0."57 annually in a direction of 308 degrees which suggests that the star is comparatively near and some 40,000 times less luminous than the sun. This in turn implies that the star is probably not much larger in size than the moon, and must have a density of the order of 10,000,000 times that of water or more than one hundred tons per cubic inch.

THE CASE SCHOOL OF APPLIED SCIENCE held on June 6 a symposium on "Mathematical Analyzers and their Applications in Industry." Included among the speakers, and their subjects, are Dr. H. W. Bode, of the Bell Telephone Laboratories, "Applied Mathematics in Industry"; Dr. H. A. Travers, of the Westinghouse Electric Corporation, "The Use of the Network Analyzer in the Power Industry"; Dr. Sidney W. McCuskey, of Case School, "Harmonic Analysis and Synthesis"; H. A. Peterson, of the General Electric Company, "Solution of Engineering Problems with the Differential Analyzer," and Dr. Wallace J. Eckert, director of the Watson Scientific Computing Laboratory, Columbia University, "Punched Card Methods in Engineering Computations." At the luncheon meeting, Dr. William E. Wickenden, president of the Case School, acted as toastmaster and Charles A. Kirk, vice-president of the International Business Machines Company, spoke on "The Influence of Machine Calculating Methods on Industrial Progress."

THE Public Health Service announces the establishment of National Institute of Health Research Fellowships after July 1. The junior research fellowships will be available to those holding master's degrees in the sciences (such as physics, chemistry, entomology, etc.) allied to public health from an institution of recognized standing. The stipend will be $2,400 per annum. The senior research fellowships will be available to those holding a doctorate degree in one of the sciences allied to public health. The stipend will be $3,000 per annum. These fellowships will offer an opportunity for study and research in association with highly trained specialists in the candidates' chosen field at the institute or some other institution of higher learning. Letters of inquiry should be addressed to The Director, National Institute of Health, Bethesda 14, Maryland.

THE oil companies of the Shell group have given a capital sum of £435,000 and £2,500 a year to the University of Cambridge for the establishment of a school of engineering and the provision of scholarships.

A REUTER'S dispatch from London states that the French Government has made a grant of 10,000,000 francs to the Pasteur Institute, Paris, to enable it to develop research into the preparation of penicillin.

PROFESSOR R. COURRIER, of Paris, would like to receive reprints from 1940 to date in the field of endocrinology. All reprints may be sent directly either to his address, Collège de France, Rue des Ecoles, Paris 5e, or to Dr. Joseph Schiller, Carnegie Institution of Washington, Department of Embryology, Wolfe and Madison Streets, Baltimore 5, Md., who will forward them. The assistance of his colleagues in the United States would be greatly appreciated.

DR. H. F. CHU, of the department of entomology of the University of Illinois, is collecting reprints on all phases of zoology for the National Academy of Peiping, China. He would appreciate receiving literature in zoology, especially in entomology.

SPECIAL ARTICLES

A FILTER-PASSING AGENT PRODUCING INTERSTITIAL MYOCARDITIS IN ANTHROPOID APES AND SMALL ANIMALS[1]

IN November, 1944, the body of a well-nourished, adult male gibbon was brought to our laboratory because of its sudden and unexpected death. The animal had always been well until one morning it suddenly dropped dead without warning. It had shown no paralysis. An autopsy revealed a dilated heart, pericardial effusion, pulmonary edema and a

[1] From the Laboratory Division, AAF Reg. and Conv. Hosp., Miami Beach, Fla.

bilateral hydrothorax. Histological examination showed an intense diffuse interstitial myocarditis and pulmonary edema. The remaining viscera were negative. The brain showed nothing. The spinal cord was not examined. About six weeks later the body of a 5-year-old, well-nourished, male chimpanzee from the same Anthropoid Ape Research Foundation, was delivered to us. The clinical history was identical with that of the gibbon except that the animal had vomited its breakfast and died very suddenly. The body had been overnight in the refrigerator. At autopsy the same gross and histological findings were observed as in the gibbon. The brain was negative. The spinal cord was not examined.

Fluid from the chest cavity and spleen tissue suspended in saline solution were inoculated into five mice each. All these mice developed paralysis of the hind legs and showed microscopically widespread myocarditis. A mixture of organs from these 10 animals, including lung, heart and spleen, was suspended in saline and inoculated intracranially and intravenously into five more mice. These latter animals were all paralyzed on the 4th day and dead on the 8th day after inoculation. The original chimpanzee chest fluid which had been preserved in the frozen state was again inoculated into 4 mice either intravenously, intraperitoneally or intracranially, and these mice were dead in 6 days following paralysis on the 5th day. All this group showed acute myocarditis microscopically. The organs from this last series were suspended in ascitic fluid and used throughout the remainder of the experiments as a source of the agent. Four mice were inoculated intravenously and intraperitoneally with this ascitic fluid suspension and another group of 4 mice was inoculated with a Seitz filtrate of the same suspension. Those inoculated with the unfiltered suspension were paralyzed on the 4th post-inoculation day and those with the Seitz filtrate on the 5th day. The heart of one of the mice inoculated with the Seitz filtrate which showed very marked myocardial damage was then ground up and suspended in ascitic fluid. Four mice were inoculated with this suspension of heart. One animal showed practically no heart damage, one had mild lesions, and two showed very striking myocardial leukocytic infiltration and necrosis. Heart suspensions in ascitic fluid were made of these hearts separately and then passed through a Seitz filter and injected into 10 mice. All these animals developed marked myocarditis. The material from this strain of hearts suspended in ascitic fluid and Seitz filtered is now regularly producing paralysis and myocarditis in its fifth passage.

Berkefeld filtrates from the organs of mice inoculated with the unfiltered basic mouse organ suspension produced the same typical myocarditis as observed in all previous animals. Five mice were given intranasal instillations with organ, ascitic, saline suspension of mice dying with myocarditis. All the first group developed myocarditis and five other mice were inoculated intranasally with nasal washings of a paralyzed mouse; three of the latter group showed distinct cardiac lesions. The organs of these first animals suspended in ascitic fluid were inoculated intranasally, intravenously and intraperitoneally into 4 mice and all developed paralysis and myocarditis.

Heart, spleen and chest fluid from two chimpanzees dying from other causes were suspended in ascitic fluid and inoculated in the same manner as that employed for the original material, and none of these animals developed any lesions but remained quite healthy and showed no visceral microscopic changes when they were sacrificed.

Four, seven-day, fertile hen eggs were inoculated with 10 per cent. serum-saline suspension of two mouse hearts from a third passage of the original ape chest fluid which had previously been passed through a Seitz filter. These eggs were opened on the third day after inoculation and the markedly hyperemic embryos and membranes were frozen. Later these were suspended in ascitic fluid, ground and passed through a Berkefeld filter. This sterile filtrate has consistently produced myocarditis in 31 mice and in 8 of 11 guinea pigs inoculated. The guinea pigs did not show paralysis.

Five mice were inoculated with a potent strain of the agent, heated to 56 degrees for twenty minutes. Two animals showed paralysis and two showed microscopic myocarditis, although none succumbed to the infection.

Four mice were inoculated with a potent strain of the agent that had been heated to 70 degrees for 20 minutes. Neither paralysis nor myocarditis resulted in these animals.

DISCUSSION

A filter-passing agent obtained from pleural fluid and spleen of a chimpanzee that died from acute cardiac failure and acute pulmonary edema has been passed through a series of 122 mice and has, with rare exception, regularly produced paralysis followed by death or apparent recovery after a week or two. At necropsy interstitial myocarditis has been found in almost all animals. Twenty-five control mice have shown no lesions. In the animals that died during the paralytic stage acute myelitis of the cord was observed. Histologically the lesions in the heart muscle ranged from rather small foci of myocardial

necrosis and interstitial leukocytic infiltration to extensive and widespread areas of necrosis and inflammation. In those animals that recovered from their paralysis and appeared to be approaching normalcy, the microscopic myocardial lesions varied, often showing marked calcification in the zones of necrosis, fibroblastic replacement of muscle and early scar tissue formation. These older lesions were always accompanied, however, by varying degrees of leukocytic reaction.

This filter-passing agent has been found to be sterile on repeated culture. It will withstand heating to 56 degrees C for 20 minutes, losing some of its potency but not its specificity and it is completely destroyed by heating to 70 degrees C for 20 minutes.

Extracts of organs of companion chimpanzees dying of other conditions have uniformly failed to produce any lesions in mice. The agent has been passed through Berkefeld and Seitz filters and has been transferred to seven-day chick embryos and again passed through Berkefeld filters without losing its potency or specificity.

On rare occasions small foci of round cells have been found in the kidneys and the pulmonary lesions range from hyperemia to patchy foci of edema and even occasionally broncho-pneumonia. Splenic hyperplasia has also been observed rather frequently. The other viscera have shown no lesions that could be attributed to the agent.

The agent has been found to be potent and specific when introduced intravenously, intraperitoneally, subcutaneously, intracranially and by intranasal instillations. Moreover, it is found to be present in the nasal washings of inoculated animals. Quite recently it has been employed to produce myocarditis in guinea pigs and rabbits and we are now studying these myocardial changes with the electrocardiograph. This work is still in progress.

The cardiac lesions of this ape disease and sporadic human acute interstitial myocarditis of unknown etiology are strikingly similar.

So far as we have been able to learn, this myocarditis producing agent has not been described previously.

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VITAMIN-SYNTHESIZING DEFICIENCIES IN YEASTS SUPPLIED BY HYBRIDIZATION[1]

VITAMIN-SYNTHESIZING deficiencies of *S. cerevisiae* can be supplied by hybridizing it with species able to synthesize the vitamins for which it is deficient. Most strains of *S. cerevisiae* are deficient in the ability to synthesize biotin and vary from good to poor in the ability to synthesize pantothenic acid. This species appears to be heterozygous for the genes controlling the ability to synthesize pantothenic acid. Our culture of *S. carlsbergensis* is capable of synthesizing both pantothenic acid and biotin in large quantities, but is unable to synthesize pyridoxine, which *S. cerevisiae* synthesizes well. Haplophase cultures[2] derived from *S. carlsbergensis* were biotin +, pantothenic acid + and pyridoxine –. They were mated with haplophase cultures of *S. cerevisiae*, which were biotin –, pantothenic acid – and pyridoxine +. The hybrid synthesizes all three vitamins in large quantities.

The technique was that developed by Burkholder[3] in his survey of vitamin-synthesizing ability of various yeast species. The standard medium containing glucose and asparagin and various minerals was supplemented with the six B vitamins (exclusive of B_2). In the medium containing the six vitamins, growth was nearly complete at the end of three days. The cultures were grown in $6 \times \frac{3}{4}$" Kimble test-tubes and the growth was determined by measuring the turbidity with a photoelectric colorimeter. Other nutrient media were made up corresponding to the complete medium described above except that single B vitamins were lacking. Since these B vitamins are essential to cell metabolism, it is assumed that a culture able to produce good growth in a nutrient lacking a given vitamin is able to synthesize this vitamin and that the converse is also true.

TABLE 1

	No vitamins	All vitamins	-pyridoxine	-pantothenic acid	-thiamin	-biotin	-niacin	-inositol
S. cerevisiae diploid	0	315	340	215	306	11	324	300
S. carlsbergensis diploid	1	350	24	280	355	280	340	315
S. cerevisiae haploid	0	309	285	13	290	12	306	230
S. carlsbergensis haploid	3	330	23	204	323	124	322	290
Hybrid	7	303	313	241	314	134	304	282

The amount of inoculum was tested and shown not to carry enough vitamin to obscure the results.

The haplophase segregant of *S. cerevisiae* is pantothenic acid –, while the diploid from which it was derived was pantothenic acid +. This indicates that

[1] This work was supported by a grant from Anheuser-Busch, Inc. St. Louis.

[2] Carl C. Lindegren, *Ann. Mo. Bot. Garden*, 32: 107–123, 1945.

[3] Paul R. Burkholder, I. McVeigh and D. Moyer, *Jour. Bact.*, 48: 385–391, 1944.