all doctorates granted in the last ten years, the median has been 56.6 per cent. in the sciences and 43.4 per cent. in the social sciences and humanities. The maximum variation either way in any one year was less than 2 per cent.

Full tables of science dissertations for the nine years from 1934 to 1942 were printed in SCIENCE a year ago (97: 333–5). We will not repeat them. We show here only the figures for the past three years in which the decline has been taking place. Table 1 is arranged in order of the 1943 ranking of the various sciences.

TABLE 1

	1941	1942	1943
Chemistry	672	588	538
Biochemistry	116	138	129
Physics	191	146	124
Zoology	125	110	103
Psychology	117	125	95
Botany	102	120	89
Agriculture	78	55	61
Bacteriology and microbiology	71	69	56
Physiology	77	66	49
Mathematics	95	85	44
Geology	53	56	36
Entomology	46	44	32
Pharmacology	31	31	29
Genetics	31	23	29
Engineering	76	47	22
Horticulture	23	21	14
Astronomy	11	7	14
Metallurgy	17	11	13
Anthropology	19	14	12
Geography	16	16	10
Anatomy	18	16	10
Medicine and surgery	18	15	10
Public health	15	14	6
Mineralogy	3	6	4
Paleontology	11	6	3
Meteorology	1	3	2
Seismology	1	1	1
	2034	1833	1535

Chemistry and its near-twin biochemistry lead the group in 1943, biochemistry having for the first time taken the lead over physics, which has been in the second place for several years. Chemistry, however, is increasing steadily in relation to all other doctorates granted. In 1939 it was 16 per cent. of the total. In 1940 it was 17 per cent.; in 1941, 18 per cent.; in 1942, 19 per cent., and in 1943, a full 20 per cent. It now totals more than a third of all science doctorates granted in 1943. If biochemistry were to be added in, the percentage would be still higher.

It might be interesting to observe what universities gave 25 or more doctorates in the sciences as a group in 1943.

TABLE 2

1. Minnesota	91	12. Iowa State	47
2. Cornell	87	13. Massachusetts Institute of Technology	47
3. Wisconsin	84	14. Harvard	39
4. California	74	15. Pennsylvania	31
5. Columbia	71	16. Maryland	27
6. Chicago	58	17. New York	27
7. Illinois	57	18. Northwestern	25
8. Michigan	55	19. Purdue	25
9. Ohio	54	20. Texas	25
10. Iowa	49		
11. Pennsylvania State	48		

A comparison of Table 2 with Table 2 in last year's SCIENCE is interesting. Chicago has taken a big drop from 114 science dissertations to only 58. Minnesota, Cornell, Pennsylvania State and Texas gave more science doctorates in 1943 than in 1942. Every other institution gave fewer. When the 1943 totals are added to the nine-year totals given in last year's SCIENCE, the standings are:

1. Cornell	886
2. Wisconsin	879
3. Chicago	857
4. Columbia	755
5. Illinois	741
6. Michigan	740
7. California	723

There are no significant changes of order below the seventh place.

One fact of some interest is that in 1943 forty-three dissertations were reported as "Secret war research." Of these, twenty-two were in chemistry, sixteen in physics, two in psychology and one each in pharmacology, physiology and zoology.

This report makes it clear that the war emergency is seriously reducing the output of doctorates in American universities. Perhaps this is as it should be. However, it is a situation that will demand early attention when the emergency is over because most of our technical and industrial advance ultimately depends upon scientific research in our universities. We are, of course, quite aware that many industries have their own research laboratories, but these depend for manpower upon the output of doctors from the universities.

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SPECIAL ARTICLES

A FILTERABLE VIRUS ISOLATED FROM A CASE OF KAPOSI'S VARICELLIFORM ERUPTION

KAPOSI'S varicelliform eruption is a comparatively rare exanthem occurring in patients with atopic eczema. The condition is characterized by high fever for from 4 to 7 days, by leucopenia and by the presence of umbilicated vesicles, some of which may become pustular, involving only the eczematous portions of the skin. The disease is self-limited, and the prognosis is good.

A filterable[1] virus was isolated from the skin lesions of a 15-month-old child showing a clinical picture typical of Kaposi's varicelliform eruption. Fluid removed from cutaneous vesicles was inoculated on the

[1] Berkefeld fine, V–13.

cornea of a rabbit. Within 3 days lesions were noted. On the fourth day the rabbit cornea was removed, carefully washed in sterile saline and triturated in tryptose-phosphate broth in an agate mortar. After centrifugation, the supernatant fluid was Seitz-filtered and inoculated into mice intracerebrally and onto the retracted chorioallantois of embryonated hen's eggs. Blood agar cultures of the inoculum, aerobic and microaerophilic, were sterile. In 2 to 4 days the mice so inoculated developed convulsions and died. By the fourth day numerous small, opaque, pock-like lesions were observed on the chorioallantoic membranes. The strain has been perpetuated readily by egg and mouse passage. Other samples of vesicular fluid inoculated directly onto the retracted chorioallantoic membrane produced small pock-like lesions in 4 to 5 days. There was no evidence of bacterial infection, and all cultures were consistently negative. The egg strain has been maintained in serial passage on the chorioallantois (6 passages), and transfer from these eggs to mice and to rabbit's cornea gave results identical with the foregoing.

These two strains of virus, one isolated primarily by means of the rabbit's cornea and the other isolated primarily on the chorioallantois, gave similar results in all studies. Both strains have been well established in mice: the egg strain transferred to mice and carried at the present writing for 6 passages, the rabbit strain transferred to mice and carried for 7 passages. Thus far, it has been established by repeated tests that the virus when injected intracerebrally into mice produces convulsions and death in from 2 to 7 days in dilutions of 10^{-1} through 10^{-5}. Detailed titration studies are in progress, but as yet the minimal lethal dose has not been determined definitely. Mouse protection tests using sera of the patient demonstrate increasing titre of antibody to this infectious agent. Serum taken at 15 days and at 30 days after onset of illness showed high protective titre.

The lesions on the chorioallantoic membrane are

Dilutions of Virus	Patient's Serum I 7 days after onset	Patient's Serum III 15 days after onset	Patient's Serum IV 17 days after onset	Patient's Serum V 30 days after onset	Control Broth	Normal Human Serum
10^{-2}	4 4 / 5 7	□ □ / □ □	T 10 / □ □	T □ / □ □	3 3 / 3 3	4 4 / 4 5
10^{-3}	7 7 / 7 7	□ □ / □ □	□ □ / □ □	□ □ / □ □	4 4 / 4 4	5 5 / 5 5
10^{-4}	6 7 / □ □	□ □ / □ □	□ □ / □ □	T □ / □ □	4 4 / 5 5	7 7 / 7 8
10^{-5}	□ □ / □ □	□ □ / □ □	□ □ / □ □	□ □ / □ □	5 5 / 6 7	8 8 / 8 8

□ = Survived T = Died trauma

○ = Died in convulsions, figure within circle indicating day of death

FIG. 1. Mouse Protection Test. Serum-Virus Mixtures Incubated at 37° C. for 2 Hours. Inoculation, 0.03 ml. IC.

small, opaque, whitish pocks which are discrete and can be seen with the unaided eye. Microscopic section reveals the presence of cellular proliferation in the ectodermal layer of the chorioallantois, of marked cellular proliferation in the mesoderm with considerable cellular infiltration, and a slight proliferation of the endodermal layer. Section of rabbit's cornea also shows considerable epithelial cell proliferation. In the mouse brain an encephalitic process is noted. Detailed histological studies are under way, and experimental work is in progress with a view to establishing the identity of the virus.

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VARIABILITY OF THEILER'S VIRUS OF MOUSE ENCEPHALOMYELITIS[1]

ONE of the accepted characteristics of Theiler's virus[2] in albino mice is the high potency of the infectious agent—as demonstrated by intracerebral injection—and its limited infectivity—as determined by intraperitoneal inoculation. In other words, while the virus will abundantly multiply when sowed directly upon susceptible nerve tissue, it evidently has but little ability to reach the same tissue from peripheral channels of infection. The reasons for this discrepancy are not clear. For instance, the virus could be restrained in peripheral invasion by whatever individual protection the immune mouse may interpose; however, the response of Theiler-free cotton rats to intraperitoneal injection does not differ from that of Theiler-carrying albino mice. We are therefore dealing with an intrinsic property of the viral agent itself, probably brought about by prolonged interaction between virus and herd immunity within its natural host.

When Theiler's virus (GDVII strain) is serially passed through cotton rats, the virus will, on certain occasions, mutate and exhibit new biological properties.[3] For instance, cotton rat variants thus produced possess marked peripheral invasiveness for both cotton rats and albino mice; they may also prove capable of paralyzing other hosts, normally refractory to infection with Theiler's mouse virus, such as guinea pigs and rhesus monkeys. Data have recently been collected which show that similar changes can occur spontaneously during rapid mouse-passages of Theiler's virus (GDVII strain), especially following *in vitro* contact with certain normal sera. It is the object of this communication to briefly report these observations.

It has been our practice to maintain the virus in albino mice by serial intracerebral passage, transfers being usually separated by intervals of from two to four weeks. Occasional titrations over a period of almost two years indicated some fluctuation in potency, but, in general, the virus preserved its high intracerebral titer (10^{-6} to 10^{-8}) without gaining appreciably in virulence by intraperitoneal inoculation (10^{-1}). Irregularities were first observed when virus was harvested from mice—serving as controls in neutralization tests—which had become paralyzed following intraperitoneal injection with mixtures of virus and certain normal sera (rabbit, horse, guinea pig, man). The brains of such mice, on subsequent titration, often contained virus capable of paralyzing albino mice, intracerebrally as well as intraperitoneally, in extremely high dilutions. It was not immediately clear whether the observed phenomenon had occurred: (1) as the result of previous contact between virus and serum, (2) because virus was used which had been collected from intraperitoneally injected mice, or, (3) whether the rapid transfer of virus attending these operations, irrespective of derivation, had served to increase its virulence. Investigation of the three possibilities led to the following results: Ten experiments were carried out in which virus was exposed to contact with normal serum by means of intraperitoneal injection of virus-serum mixtures; in seven instances virus obtained from the brains of paralyzed mice reached intraperitoneal titers between 10^{-3} and 10^{-10}. Four experiments were run in which contact between virus and serum was established by intracerebral injection of virus-serum mixtures; in two instances titration of the resulting virus brains revealed intraperitoneal titers between 10^{-3} and 10^{-8}. Four experiments were finally conducted in which virus was passed rapidly, without serum contact, by either intracerebral or intraperitoneal injection. These last experiments were synchronous with an equal number of experiments in which virus was being transferred in combination with serum, the same batch of virus serving as source for both series. In one instance the virus showed unmistakable evidence of an increase in intraperitoneal titer (10^{-9}).

The use of the different methods mentioned yielded a total of ten viral substrains, all of which possessed high intraperitoneal potency for albino mice. When passed over three to five subsequent mouse-passages

[1] Aided by grants from the Dr. Philip Hanson Hiss, Jr., Memorial Fund, the Warner Institute for Therapeutic Research and anonymous donors.

[2] M. Theiler, SCIENCE, 80: 122, 1934; M. Theiler and S. Gard, *Jour. Exp. Med.*, 72: 49, 1940.

[3] C. W. Jungeblut, *Am. Jour. Publ. Health*, 33: 1227, 1943.