TABLE VIII.—*University College, London: 2nd M.B. Survey, 1957*
Hours of Private Study Reported (per Week)

	October Term (N=61)	Current Term (N=66)
Mean	19 (18)	30 (31)
Range	3-60	10-60
S.D.	13	10.3
Thoday's survey mean	19.5	28.0

Failed students' averages in parentheses.

TABLE IX.—*University College, London: 2nd M.B. Survey, 1957*
Hours of private study reported immediately before the examinations (papers on Monday, Tuesday, and Wednesday)

	Previous Week (N=74)	Sunday (N=76)	Monday (N=78)	Tuesday (N=78)
Mean	54 (54)	5 (5)	3 (3)	2 (2)
Range	12-90	0-18	0-9	0-6
S.D.	14.3	3.7	1.8	5.4

Failed students' averages in parentheses.

different days of the week and had them detail what they had done the previous day. Table VIII shows the closeness of agreement.

I found it surprising enough that there were no consistent differences in the hours of study between good and bad students; I found it more surprising that there was such an enormous range of difference between individuals. This is shown in Tables VIII and IX. Both the best and the worst students were scattered indiscriminately over this range. It is indeed interesting to question why this should be. How is it that one young man, selected on much the same criteria as another, does five times as much study and yet gets considerably lower marks? One can hardly feel convinced that he is five times less intelligent; he passed the same examinations before acceptance. I suspect that the answer lies in differences of study technique. The truth is that after primary school or prep school we never teach how to learn; certainly at university techniques of study are not taught. They are not taught because we do not know them. How many hours of reading represent the optimum? What is the most efficient way of reading—continued attempts at recall or to read straight through? Are detailed notes, kept and recopied, essential, or are they time-wasters? If there are variations between students, what determines them? Is the ectomorphic introvert different in his optimal study requirements from the mesomorphic extrovert? We do not know these things; what hours of wasted study time might be saved and put to better use, academically or extra-curricularly, if we did.

Conclusion

If I have succeeded in interesting any reader in operational research, here is a ready field in which to begin. And I hope I have interested someone, for he will find the work fascinating. Of course, he will draw many blanks; he will also find many delightful irrelevancies—that the students who sit in the front two rows at lectures get better degrees than those who sit at the back—that those who take first honours are more often married than those who take thirds. But amid the negatives he will, if he is lucky, draw out material of real value to medical education.

REFERENCES

- Bull, G. M. (1956). *Lancet*, 2, 368.
Dale, R. R. (1954). *From School to University*. Routledge and Kegan Paul, London.
Davy, B. W. (1957). *Brit. med. J.*, 2, 547.

- Hopkins, J. (1959). *Educ. Rev.* In press.
— Malleon, N., and Sarnoff, I. (1958). *Brit. J. educ. Psychol.*, 28, 25.
Joyce, C. R. B., and Weatherall, M. (1957). *Lancet*, 2, 402.
Kelsall, R. K. (1957). "Applications for Admissions to Universities Assoc. of Univs. of the British Commonwealth."
Lennox, B., Anderson, J. R., and Moorhouse, P. (1957). *Lancet*, 2, 396.
Malleon, N. (1958a). In *The Matrix of Medicine*, p. 52. Pitman, London.
— (1958b). *Univ. Quart.*, 12, 288.
Merton, R. K., Reader, G. G., and Kendall, P. L. (1957). *The Student-Physician*. Harvard Univ. Press.
Mountford, Sir James (1956). *How They Fared*. Univ. of Liverpool Press.
P.E.P. (1950). "University Students. A Pilot Survey." P.E.P., London.
— (1954). "Background of the University Student." P.E.P., London.
— (1955). "Colonial Students in Britain." P.E.P., London.
— (1956). "Graduate Employment: A Sample Survey." P.E.P., London.
— (1957). "Graduates in Industry." P.E.P., London.
Parnell, R. W. (1954). *Brit. med. J.*, 2, 491.
Thoday, Doris (1955). *Univ. Quart.*, 9, 284.
— (1957a). *Ibid.*, 11, 172.
— (1957b). *Ibid.*, 12, 45.
Warburton, F. W. (1956). *Brit. J. Psychol.*, 47, 146.
Wedge, B. (1958). *Psychosocial Problems of College Men*. Yale Univ. Press.

VERITAS*

EXAMINATIONS AT HARVARD MEDICAL SCHOOL IN 1958

BY

W. MILO KEYNES, M.D., F.R.C.S.

*Senior Surgical Registrar, St. Bartholomew's Hospital ;
formerly Nuffield Fellow, and Research Fellow
in Surgery at the Harvard Medical School
and Massachusetts General Hospital*

Much has been said about the need for integration between the preclinical and clinical courses for medical students and the need to clear away the cobwebs in both courses. Much has been said about the need to teach students not only from a basis of fact rather than impression, but also so that they may understand and later more readily apply advances when they have become doctors. With each year more science enters the curriculum, and the trend with increasing knowledge is, as for many years, away from "art," though art must remain where science cannot be exactly applied, such as in bedside manner and individual management.

In the United States more efforts than in this country have been made in some medical schools towards integration and the emphasis on science. Perhaps the medical school where the greatest change has been made is still the Western Reserve Medical School in Cleveland, Ohio, but Harvard Medical School is fast working in the same direction. The student has spent four years at a university before entering Harvard Medical School. During the first two of these four years the education for most has been general, and only in the second two years do the courses contain basic science; in this latter period some may have taken more advanced courses in, say, biochemistry or biophysics, though it might equally be in sociology or anthropology. The course of study at the Medical School is also for four years, and the time spent on some subjects may seem shockingly short compared with that traditionally spent in this country. Thus

*This word appears on the Harvard University coat-of-arms.

topographical anatomy (not including neuro-anatomy) is covered in a four-months course.

The first two years of the four years at the Medical School are integrated, but with the emphasis on the preclinical subjects, the last two years being entirely clinical. Various tests and examinations have to be passed during the years, most of those who do not complete the four years and become doctors being eliminated during the first year. There is less emphasis on the *final* examination than in this country. At the end of the third and fourth years "comprehensive examinations" are given; in 1958 these included two essay papers, which later appeared in the *Harvard Medical Alumni Bulletin* for July, 1958, and are here reprinted by the kindness of its Editor. It may interest readers to see them and to guess how well *they* might have fared.

Harvard Medical School has given a very great deal of thought to medical education and is perhaps more interested in turning out future research workers and specialists than most schools. It has the advantage of being able to select medical students more rigorously than other schools (from an academic point of view), owing to its fame and pre-eminence. The ability of the Harvard medical students is certainly impressive, and, whatever else may be said about their education, they gain a zest and stimulation from it which it would be hard to equal. Their education would seem to leave gaps in the broad spectrum of medical learning which our system attempts, but in terms of their ability and interest, associated with peaks of knowledge which few of our students attain, this may not matter. Not all subjects in medical education are equally of interest, and to be able to ignore some of the drudgery, with the resultant time to explore more interesting topics, has its own reward in increased stimulation. The gaps soon seem to close as the need arises. The Harvard system tries to avoid the spirit that medical education often gives—the spirit that medical education is there to enable the student to pass examinations rather than to be a sound guide to his future medical practice. It attempts to educate rather than to train students of medicine.

The essay papers which follow show the trend in examinations at the Harvard Medical School and thus in the education there. They imply the emphasis on science in the curriculum. The papers are essay papers, and as such only part of the examinations in the third and final years of Medical School. They show how difficult question-spotting must be, but they do not give, of course, any idea how important it is to give good answers nor how the answers are assessed.

1958 THIRD-YEAR COMPREHENSIVE EXAMINATION

Essay Questions—2½ hours—Choose four

- Obstruction leads to infection. Under what circumstances is this true? Cite specific diseases to illustrate your points.
- Discuss cardiac and pulmonary vascular shunts and their physiological consequences.
- A patient has just undergone a subtotal gastrectomy for obstructing duodenal ulcer: (a) List 6 potential complications occurring within the first 10 post-operative days. (b) Outline the effects of this operation on the patient's bodily compensation to the alkalosis of gastric acid loss.
- Discuss the difference between high small-bowel and large-bowel obstructions.
- A 48-year-old woman complains of weakness. Neurological examination is negative except for this weakness, which is symmetrical. List possible diagnoses and give the physiologic mechanisms and appropriate diagnostic studies for one.
- Contrast the causes of jaundice in the first 2 weeks of life with jaundice in a man 50 years old.

1958 FOURTH-YEAR COMPREHENSIVE EXAMINATION

Essay Questions—3 hours—Answer all questions

Questions 1 through to 12, 10 minutes each

- List the manifestations of the nephrotic syndrome and the diseases which may cause it.
- List five conditions that may be associated with hypercalciuria and indicate the mechanism involved in each instance.
- List the abnormal haemoglobins and discuss the clinical manifestations that may be associated with the presence of any two of these.
- Give a pathological classification of cancer of the thyroid and list the biological characteristics of each major category.
- (a) Define "positron emission." Describe briefly its advantage in tracer studies and give a specific example of a positron-emitting isotope with its clinical application. (b) Define in general terms: (1) curie, (2) rad., (3) rep., (4) roentgen.
- Describe the expected fate of small skin grafts exchanged between: (a) Parent and full-grown offspring; (b) dizygotic twins; (c) monozygotic twins; (d) two members of different mammalian species of the same genus.
- Describe the syndrome of alveolar-capillary block. List the clinical disorders that may cause this phenomenon.
- Outline the origin and excretion of bilirubin in the normal adult.
- Outline the clinical picture following sudden complete occlusion of the following: (a) aortic bifurcation; (b) left middle cerebral artery; (c) superior mesenteric artery; (d) right posterior inferior cerebellar artery.
- List five (5) congenital malformations involving the gastro-intestinal tract commonly manifested in infancy. Select two (2) of these, and discuss diagnosis and treatment.
- A middle-aged previously healthy man is brought to the emergency ward from the scene of an automobile crash. He is unconscious, is bleeding from scalp and face lacerations and nose, and also from a gaping puncture wound of the thigh. There is obvious deformity of this thigh at the level of the puncture wound. His blood pressure is 40/0 and his pulse is 130. Outline the management of this patient for the first 24-hour period, listing diagnostic and therapeutic measures in order of priority.
- Define, give normal blood values for, and describe how they are derived. (a) Total CO_2 ; (b) CO_2 combining power; (c) bicarbonate; (d) partial pressure of CO_2 ; (e) dissolved CO_2 ; (f) pH.
Indicate the values one might expect to find for each in a patient with (a) severe respiratory acidosis; (b) severe metabolic acidosis.

Question 13—1 hour

- Discuss the mechanisms involved in the formation of ascites and cite some of the important experimental and clinical evidence relating to this problem.