

evidence in many eggs of the accomplishment of these earlier stages, and this has been a major difficulty over the past years. Later stages of fertilization are attachment of spermatozoa to the egg surface, activation of the egg and pronuclear formation and growth. These stages are usually considered as achieved if pronuclei and sperm tails are seen in the cytoplasm of the eggs. We provided and evaluated some evidence of pronuclear formation and growth; our data on these stages are obviously preliminary until sperm tails can be positively identified in human pronucleate eggs *in vitro*. Fusion of pronuclei (syngame) is the final stage of fertilization.

If Rothschild had asked "Was fertilization completed?" we would certainly have agreed that it was not. We made no attempt to culture the eggs to syngame and beyond, since it is critical to control the earlier stages first. To demand that syngame is concluded and cleavage advanced before evidence of fertilization can be accepted is far too stringent. It could also be misleading since, as is well known, cleavage (parthogenesis) can proceed without fertilization. It should also be noted that conclusions in many papers reporting fertilization in progress have been based on the evidence of pronuclear stages (for example, 2 and 3). Indeed, Rothschild is hoist with his own petard, for the frontispiece to his book on fertilization⁴ shows a mouse egg with a spermatozoan in the perivitelline space and labelled "A live fertilized mouse egg showing the whole spermatozoan in the cytoplasm". This illustration shows fertilization in the same early stage as that in our figure 4B¹ which presents a human egg with a perivitelline spermatozoan.

Hamilton and Glenister mentioned Menkin and Rock⁵ and Shettles⁶. In fairness to others they should have quoted Petrucci⁷ and especially Hayashi⁸. We gave these four references and discussed them in an earlier communication⁹ quoted in our *Nature* paper. When work on the fertilization of human ova is debated, major consideration must be given to the maturation of these ova. Follicular ova are in the dietyate stage; it is unrealistic to use them for fertilization unless they are freshly at metaphase-II and possess a first polar body. The detection of bodies extruded from eggs alone is insufficient evidence of maturation, for many artefacts resemble polar bodies. It is vital to identify diakinesis, metaphase-I or anaphase-I in some maturing oocytes, since these are transitional stages providing the clue that maturation is in progress. We have furnished critical data on the identification and timing of these stages^{10,11}; earlier work has failed to do so adequately. Some previous workers made attempts to recover human eggs shortly before or after ovulation from the ovary or oviduct, but the difficulties in timing, identification of ovulatory follicles and recovery of eggs are considerable.

Yours faithfully,

R. G. EDWARDS
B. D. BAVISTER

Physiological Laboratory,
The University,
Cambridge.

P. C. STEPTOE

Oldham General Hospital,
Oldham

¹ Edwards, R. G., Bavister, B. D., and Steptoe, P. C., *Nature*, **221**, 632 (1969).

² Yanagimachi, R., and Chang, M. C., *J. Exp. Zool.*, **156**, 361 (1964).

³ Barros, C., and Austin, C. R., *J. Exp. Zool.*, **166**, 317 (1967).

⁴ Rothschild, Lord, in *Fertilisation* (Methuen and Co., 1956).

⁵ Menkin, M. F., and Rock, J., *Amer. J. Obstet. Gynec.*, **55**, 440 (1948).

⁶ Shettles, L. B., *Amer. J. Obstet. Gynec.*, **66**, 235 (1953).

⁷ Petrucci, D., *Discovery*, **22**, 278 (1961).

⁸ Hayashi, M., *Proc. Seventh Intern. Conf. IPPF, Singapore 1963*, p. 505.

⁹ Edwards, R. G., Donahue, R. P., Baranki, T. A., and Jones, H. W., *Amer. J. Obstet. Gynec.*, **96**, 192 (1966).

¹⁰ Edwards, R. G., *Nature*, **196**, 446 (1962) and **208**, 349 (1965). *Lancet*, **2**, 926 (1965). *Proc. Sixth World Cong. Fert. Ster., Tel. Aviv, 1969* (in the press).

¹¹ Henderson, S. A., and Edwards, R. G., *Nature*, **218**, 22 (1968).

University News

Professor H. F. Downton has been given the personal title of professor of statistics at the **University of Birmingham**.

Professor N. N. Das Gupta has been appointed Palit professor of physics at the **University of Calcutta**.

Professor E. W. Horton, University of London, has been appointed to the chair of pharmacology at the **University of Edinburgh**.

Appointments

Sir Frank Schon has been appointed chairman of the National Research Development Corporation in succession to Lord Black.

Announcements

Unesco International Cell Research Organization is organizing an international training course on **Energy-transducing Systems at the Subcellular Level** to be held jointly by the Wenner-Gren Institute and the Institute of Biochemistry, University of Stockholm, August 11-30, 1969. The course will comprise experiments, demonstrations, seminars and lectures. The experimental programme will include isolation and sub-fractionation of mitochondria, electron microscopy, experiments involving oxidative phosphorylation and related reactions. Dr G. F. Azzone, Padova, Italy, Dr J. Bremer, Oslo, Norway, Dr B. Chance, Philadelphia, USA, and Dr M. Klingenberg, München, Germany, have been invited to join the teaching staff of the two institutes for the course, which will be in English. Information regarding the selection of participants can be obtained from Professor O. Lindberg, Wenner-Gren Institute, Norrtullsgatan 16, S-113 45, Stockholm, Sweden.

ERRATUM. In the article "Rotating Neutron Stars and Pulsar Emission" by B. Bertotti, A. Cavaliero and F. Pacini (*Nature*, **221**, 624; 1969) the following corrections are necessary: formula (2) should not contain the factor π ; formulae (3) and (4) should read

$$P_{rr} = \frac{H_0^2 \sin^2 i}{4 c^4} \frac{a^6}{r^2} \omega^4 \left\{ I - \sin^2 \theta \cos^2 \left[\omega \left(\frac{r}{c} - t \right) + \varphi \right] \right\}$$

$$P_{r\varphi} = \frac{H_0 \sin^2 i}{2 c^3} \frac{a^6}{r^3} \omega^3 \sin \theta \sin^2 \left[\omega \left(\frac{r}{c} - t \right) + \varphi \right]$$

Instead of "radiation pressure" always read "electromagnetic stress"; page 625, column 2, lines 24 and 29, m_e should be replaced by m_c ; page 626, column I, line 3 from the bottom, ref. 13 should read "ref. 14, Richards, D. *IAU Circ. No. 2114* (1968)".

ERRATUM. In the review of the book *Functions of the Adrenal Cortex* (*Nature*, **221**, 782; 1969) the word "d-cxy-corticosterone" in line 7 of the third paragraph should read "deoxycorticosterone"; in line 8 of paragraph 4 "C21" should read simply "21".

ERRATUM. The first sentence in the article "Respiratory Activity of Mitochondria from Legume Root Nodules" by P. S. Muecke and J. T. Wiskich (*Nature*, **221**, 674; 1969) should have read "Work on subcellular elements of legume root nodules has concentrated exclusively on the symbiotic bacterial components which form the bulk of these elements and are responsible for nitrogen fixation, but no work has been published on the mitochondrial components."