

## Recipient of the 2009 IETS Pioneer Award: Stanley Paul Leibo, PhD

In 2006, almost 1 million cattle embryos were transferred in a thriving worldwide industry and a little more than half of them had been frozen and thawed.<sup>1</sup> In human medicine, in the USA alone, some 38 000 babies were born following the insertion of frozen–thawed embryos in the decade 1996–2005.<sup>2</sup> Until 1972, not a single mammalian embryo had ever survived freezing, the ET industry barely existed, and human IVF had yet to begin. Embryo cryopreservation has been central to the extraordinary changes underlying these contrasts and today we honour a man who, besides producing the very first mice from frozen embryos,<sup>3</sup> has spent his working life selflessly promulgating the science and practical application of cryobiology in reproduction.

Stanley Leibo earned his AB degree from Brown University in 1959, his MSc from the University of Vermont in 1961, and an MA from Princeton in 1962. While still a graduate student, he joined Dr Peter Mazur at the Oak Ridge National Laboratory in Tennessee to study the effects of freezing on unicellular algae, research that resulted in his PhD from Princeton in 1963 and his re-engagement at Oak Ridge to study the freezing of aqueous solutions and the consequences of solution changes on bacteriophages.<sup>4</sup> He and Mazur proved that osmotic shock resulting from freezing and thawing was responsible for inactivation of wild-type bacteriophages, whereas shock-resistant mutant phages were unaffected.<sup>5</sup> They also showed that mammalian cells respond to freezing just as microorganisms do, and incur freezing damage similarly.<sup>6</sup>

It was at Oak Ridge, during a working visit from David Whittingham from the UK, that a ‘false start’ in embryo cryopreservation was remedied to result in those first mice from frozen embryos<sup>3</sup> – an accomplishment that has profoundly influenced every member of the IETS. The accomplishment also kindled Leibo’s interest in fundamental studies of embryo cryobiology and led to his important findings on intracellular ice formation in oocytes and on the permeability of oocytes and embryos.<sup>7–9</sup>

With the development of commercial embryo transfer in the 1980s, Dr Leibo became Vice President, Research and Development, for Rio Vista International in San Antonio, Texas, in 1981. His work at Rio Vista led to a one-step dilution method that permitted direct transcervical transfer of frozen–thawed bovine embryos,<sup>10</sup> the basis of direct transfer methods in use today. Less heralded, but very important, was Dr Leibo’s demonstration (with Dr William Rall) of the practicality of embryo bisecting and sexing on a scale only possible in such a commercial environment.<sup>11,12</sup> Rio Vista closed its ET facility in 1988, and Leibo became Research Associate Professor at Baylor College of Medicine, Houston, Texas, until he returned to an agricultural and veterinary milieu in 1991 by moving to the University

of Guelph in Canada for 8 years. His work there included descriptions of the effects of temperature on oocytes of cattle and humans, differences between *in vitro*- and *in vivo*-derived embryos, a method to cryopreserve mouse spermatozoa (a problem that had been very intractable),<sup>13</sup> and the improvement of oocyte cryopreservation by ultra-rapid cooling.<sup>14</sup> In 1998, Leibo was named to the Doris Zemurray Stone Chair in Reproductive Biology at the University of New Orleans, and the Audubon Institute Center for Research of Endangered Species from where he, with his colleagues, students and postdoctoral fellows, has published research on the cryobiology of dog, boar and monkey gametes. Recently, they substantiated Leibo’s long-held belief in significant differences among individuals with respect to their gametes’ tolerance of cryopreservation.<sup>15,16</sup>

Dr Leibo has brought credit and recognition to each of the institutions in which he has worked. To say that he has done so by hard work would be an understatement; Dr Leibo has published (so far) 21 book chapters, more than 75 peer-reviewed journal articles, 13 peer-reviewed conference proceedings, over 66 refereed abstracts, and more than 100 other abstracts and papers in conference proceedings. Especially impressive, and symptomatic of Dr Leibo’s dedication to education and instruction, are his reviews (e.g. References 17 and 18) and the list of well over 160 invited lectures and 17 training courses that he has presented throughout the world and for both medical and animal applications. Among these, his repeated role in the Jackson Laboratory courses on mouse embryo cryopreservation, now approaching 50 sessions in Bar Harbor and Italy, deserves special mention because of their enormous influence.

Since re-entering academia in 1991, Dr Leibo has supervised 12 graduate students and 16 postdoctoral fellows and visiting investigators, and has served on 24 other graduate students’ committees. His fame attracts students and his success in teaching is linked to their recognising and appreciating his infectious devotion to science. Dr Leibo’s teaching has extended well beyond the classroom and laboratory: the way in which he and his late wife Bette opened their home to students, visiting scientists and their families has been truly remarkable and has cemented ties that endure around the world.

Dr Leibo is unstinting in his service to science in general and to our Society in particular; he has served as president of this society and also of the Society for Cryobiology. The call for his expert opinion is extraordinary: he serves on six editorial boards, has reviewed papers submitted to some 30 different journals over the past 12 years (more than 80 papers over the past 3 years), and has been a member of almost 40 grant review panels.

In summary, Stanley Leibo is indisputably one of the world’s best, and best known, cryobiologists – his name inextricably

associated with embryo and gamete freezing. Such reputations are not given, they are earned; earned through hard work, imaginative thought, scrupulous attention to detail, and regard for others. Not surprisingly, Dr Leibo has already been honoured by two of our sister societies: the American Embryo Transfer Association awarded him honorary life membership in 1996, and in 2005 he was made a Fellow of the Society for Cryobiology. Also, he recently delivered the Spallanzani Lecture at the 10th International Spermatology Symposium in Spain. It is with gratitude and admiration that we now ask him to accept the IETS Pioneer Award for 2009.

## References

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