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EDITOR'S COMMENTARY

The making of an embryologist, then and now!

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In the not-so-distant past, embryology was a discipline practiced by a cadre of 20th century biologists fascinated with the transformation of a single egg cell into a complete organism. This fascination with morphogenesis–"morphing" as we refer to it today–constituted the very foundations of embryology because transitions in form could be observed and recorded in real time for organisms whose development could be studied ex vivo. And once empowered with the ability to elicit the onset of development by timed fertilization, the traditional discipline as we knew it was off and running towards the molecular genetic era of the 1980s when it became known as developmental biology. From its descriptive roots, encouraged by the introduction of electron microscopy and time-lapse cinematography, to the decidedly experimental character that embryology assumed into the 1980s, the field was dominated by non-mammalian subjects of study like amphibians, avians, insects, and marine invertebrates–all very visible and plentiful organisms that satisfied Krogh's principle! It was not until the mid-20th century that mammalian embryology matured as an experimental discipline and interestingly, was presaged by some 15 years by our first glimpses into the earliest stages of human development as a result of the famous "egg hunts" of Hertig and Rock.

As it happens, the change in name from embryology to developmental biology coincides temporally with the dawning of human ARTs. Human gametes and embryos were becoming the stuff of the "full-monty", and the race was on to characterize and manipulate all resulting zygotes to the benefit of patients awaiting the good news that a pregnancy followed embryo transfer. The task lines that are presently drawn between embryologist and clinician were not nearly as clear cut 20–25 years ago when some countries first realized the importance of formalized and specialized training for what would become the next generation of embryologists. As they have in many an instance, the UK paved the way for meeting this imperative when the Association of Clinical Embryologists (ACE) was formed in Birmingham, England, in May of 1993. With the momentum in place from passage of the Human Fertilization and Embryo Act, and having the staunch support from Bob Edwards and Anne McLaren, ACE brought to the UK system a formalized curriculum for post-baccalaureates that encompasses 1 year each of didactic and practical training including basic research experience. I first came to appreciate the role of ACE in training embryologists when I attended their meeting this past January and had a chance to evaluate the platform and poster presentations constituting their research projects–impressive indeed! And to see the camaraderie and *esprit de corps* enliven the closing banquet when 20 or so 20-somethings took hold of their well-earned diplomas made impressionable the substance and form that these young people would be carrying into the IVF clinic.

The road to becoming a clinical embryologist in other countries follows many different paths and fortunately has been the subject of scrutiny by major organizations such as the ASRM and ESHRE. In the US, the American College of Embryology was founded in 2009 and besides recognizing individuals as the "Embryologist-of-the-month", a number of programs are offered at cost for which a diploma is earned in specialized practices such as ICSI. While understandably rigorous for all who venture into the "now" world of embryology that is human ARTs, meeting local or national standards

Capsule The international growth of human ARTs has spawned a generation of clinical specialists whose duties include the daily management of human embryos and gametes. How ART embryologists are trained and certified varies widely between countries and generally reflects attitudes that have been historically shaped by the principles and practices of reproductive medicine adopted for a given society. Ironically, new technology in human ARTs may turn out to be old stuff in the annals of human embryology!

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will likely continue to be under the purview of organizations or governments who assume full responsibility for assuring safety and efficacy. What about clinicians in training? Should the demarcation between clinical and laboratory duties remain encrypted in daily practice or is some degree of training in embryology beneficial to the educational experience of future REIs?

This is exactly the question posed by Dr. Scott and his team in our lead article this month ("Embryology training for Reproductive Endocrine fellows in the clinical human embryology laboratory, DOI10.1007/s10815-014-0189-0"). Confronting the broad knowledge and experience base expected of RE fellows, the "experiment" implemented in this study first queried whether competency could be acquired by fellows working with staff embryologists and andrologists in many of the standard procedures undertaken in the laboratory. As you will read, this was not only achieved with high marks for the fellows engaged in this experiment, but added momentum and direction for the pursuit of original research at least for those fellows finding themselves in practices encouraging an academic identity. Lest some readers find this issue an academic exercise in the training of the next generation of clinician scientists, there is much more on the menu in this month's issue of JARG for both the seasoned and budding embryologists of today.

As promised last month, and as featured on our cover this month, JARG is keen on following the trials and tribulations of time-lapse microscopy as an emergent technology in human ARTs. No less than 3 articles are brought to the attention of our readership exemplifying the kinds of insights time-lapse imaging is bringing to our understanding of early human development. A recurrent theme through these studies recapitulates on the matter of how fast or slow events take place in the days following fertilization. In the study by Iwata and colleagues, the onset and progression of compaction are highlighted as new and inviting criteria for a given embryo's ultimate fate, and the paper by Cauffman and colleagues takes one step backward in identifying subtle components of blastomere shape that could have some predictive value. Illustrating that over and above having potential for predicting embryo quality comes an intriguing study from the Joergensen group revealing the value of time-lapse imaging as a basic research tool. Their work documents distinct and unusual behaviors during cleavage of diploid or triploid embryos in the context of whether embryos were produced by ICSI or IVF. Readers should bear in mind that each of these papers are published with online access to the original movie sequences so your own judgments can be rendered as to how significant the observations are to your own practice, or edification for that matter.

As JARG continues to grow, and its purview matures, we hope to bring our audience closer to the leading edge of advances in human ARTs. Excuse the "embryocentric" nature of this issue but as will continue to become apparent, providing a perspective on the current and future directions for reproductive medicine will at times require us to look back on processes in terms of developmental origins and history. Retreating into the annals of reproductive medicine will remind many that the Hertig and Rock collection assembled in the 1940s stands solid today as educational tools defining a generation of embryologists. It is on the shoulders of embryologists today that the future practice of ARTs will depend.