“History consists of a series of accumulated imaginative inventions,” as Voltaire so astutely noted. In dairy cattle reproduction, a series of imaginative and forward-thinking inventions led to great advancements in the industry. The following timeline explores key historical events, research findings and trusted on-farm implementation, to help determine where the industry is headed as it further fine-tunes and improves reproductive performance.

**1800s**

**Rectal Palpation is first identified as a method for pregnancy diagnosis**
Beyond visual estrous detection, producers are now able to more easily identify open and pregnant cows. Also, open cows do not show signs of estrus and can now be examined closely and treated as needed.

**1905**

**Dairy Herd Improvement Association is established to provide data on individual cows in a standardized format across herds**
With individual animal information, producers are able to select the best females within the herd while also creating herd averages using the data. DHI is able to generate production information for the United States and build a benchmarking database for the industry.

**1918**

**USDA leases young bulls to farmers to develop proven sires**
Bulls continue to move genetic progress forward in the industry with greater selection intensity. Young bulls leased to producers begin an era of one bull serving as the sire for large groups of the female population. These bulls have the ability to improve the U.S. dairy population’s genetics faster than before.

Photo courtesy of USDA-ARS
1936 — THE FIRST NATIONAL SIRE EVALUATIONS ARE CALCULATED
Taking sire information one step further, the industry begins to evaluate sires and their genetics by comparing dams with their daughters. While visual appraisal is still a large part of the evaluations, a concerted national effort to individually document when bull genetic transmission to their offspring begins.

1938 — ARTIFICIAL INSEMINATION (A.I.) BECOMES AVAILABLE
The first use of A.I. begins by breeding females in estrus with fresh semen. While implementation is not substantial in the first few years due to the limitations of fresh semen, 7,500 cows are bred using A.I. in 1939.

1950 — FROZEN SEMEN MAKES A.I. MORE FEASIBLE
When advancements in technology make it feasible to freeze semen, elite sire genetics can be transported around the world. This increases implementation of the technology exponentially; by 1970 more than 7 million cows are bred using A.I. This number peaks in 1980 when 14 million units are sold.

1970s — EMBRYO TRANSFER BECOMES AVAILABLE
Veterinarians use embryo transfer as a way to multiply exceptional genetics from elite cows and use genetically inferior animals as embryo recipients. This speeds up genetic progress and allows the genes from outstanding females to be proliferated in the herd in shorter intervals.

ACTIVITY MONITORING SYSTEMS FIRST IMPLEMENTED
Activity monitoring systems were first introduced to monitor overall activity since activity has long been correlated with reproduction and animal health. Activity sensors are placed on the ankle or around the neck of each cow, and activity is tracked throughout the course of the day. Increases or decreases in activity are reported through the computer system and alert the herd manager to changes in individual animals. Based on these changes, cows can be bred, checked by the herd veterinarian or watched more closely. Since the 1970s more activity monitoring systems have been introduced around the world, allowing producers to assess individual cows beyond visual observation.
ULTRASOUND IS INTRODUCED FOR PREGNANCY DIAGNOSIS
For over 100 years producers relied on visual heat detection or palpation to determine whether cows are open or pregnant. With the introduction of ultrasound, veterinarians had a new technology to diagnose pregnancy or potential problems. Identification of the sex of the calf or if a cow is carrying twins also becomes possible. Based on the diagnosis, cows can be handled and treated appropriately.

FIRST EFFORTS TO CREATE TIMED ARTIFICIAL INSEMINATION PROTOCOLS
The first protocols were created in the late 1980s to assist in estrous detection. These initial research findings will ultimately lay the groundwork for greater uptake and research on synchronization protocols in the 1990s. Synchronization protocols will continue to grow in popularity to more efficiently get cows bred while effectively treating problem breeders.

USDA INTRODUCES HEALTH TRAITS TO IMPROVE FERTILITY
New information about an animal’s health becomes available in response to the dramatic decline in herd fertility. Traits introduced include Somatic Cell Score (1993), Productive Life (1994) and Daughter Pregnancy Rate (2003), and allow dairy producers to select bulls with greater fitness traits for their breeding programs.

CIDR IS INTRODUCED
Controlled internal releasing devices, or CIDRs, enter the dairy reproduction market as a tool to efficiently synchronize the onset of estrus in heifers. The CIDR contains progesterone and is inserted into the vagina of dairy females to keep them from coming into estrus. When the CIDR is removed blood progesterone levels fall and the female will come into estrus. This new tool provides dairy producers with greater control over timed breeding in heifer pens and will later become part of lactating synchronization protocols as well.

FIRST BLOOD PREGNANCY TEST IS COMMERCIALIZED FOR DAIRY CATTLE
A new tool becomes available to help producers diagnose cows as pregnant or open earlier. The blood pregnancy test identifies specific proteins that are present only during pregnancy. The test could originally be conducted 30 days after breeding, and today the test can be administered as early as 28 days after breeding. This allows for timely resynch following an open diagnosis.
SEXED SEMEN BECOMES COMMERCIALY AVAILABLE
Sexed semen becomes commercially available. A.I. companies begin to offer sexed semen, which has been sorted to remove sperm that carry Y chromosomes and increase the chances of a heifer calf being born. Sexed semen is implemented almost overnight on the dairy, and increases the heifer population significantly.

GENOMIC EVALUATIONS BECOME OFFICIAL
With the release of genomic evaluations in 2009, information about an animal's genetic potential that would have previously taken years to collect with progeny testing can be revealed at a young age. This means young sires have genetic information equivalent to proven bulls, and can be implemented and marketed accordingly. Today, a 3K and 6K test are available and economically feasible for commercial dairy producers, allowing for greater genetic improvement on the female side of the pedigree.

THE PAST AS A PREDICTOR OF THE FUTURE
The history behind dairy cattle reproduction is a strong indicator of where the industry is going, and promises an innovative and imaginative future using the following baseline ideas.

• Innovation starts from base understanding. For hundreds of years farmers, researchers and the dairy industry worked to solve big picture questions of the “how” and “why” behind the dairy cow. This background knowledge laid the foundation for advancements in technology, and showed that the more we know about the dairy cow, the more we can provide the ideal environment, nutrition and breeding program for reproductive success.

• New technology translates to greater reproductive efficiency. Every new technology and advancement answered a need within the dairy industry, and therefore translated to greater reproductive efficiency and performance. The development of new technological advancements continues to better serve veterinarians and producers as they strive to improve herd reproduction.

• The way forward relies on yesterday’s foundational ideas. Tomorrow’s reproductive programs may look completely different from what is considered the “norm” today. But the industry should not lose sight of its foundation, which has helped it reach today’s level of successful technological implementation.

As the future unfolds, a quick look back at historical improvements in dairy cattle reproduction confirms just how rapidly advancements can transform the dairy industry, and assist dairy producers in decision-making and on-farm improvements.