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The 2002 Gaston Planté Medal Acceptance Speech

I wish to thank the International Planté Medal Committee for nominating and selecting me to receive the 2002 Gaston Planté Medal. I wish particularly to thank Dr. Detchko Pavlov and Prof. N. Yakimov, the Bulgarian Academy of Science, and the organizers of the LABAT Conference who provide a venue for the award. I am very honored to be included in the company of the distinguished scientists who have received the Planté Medal in past years. Dr. Paul Ruetschi, Dr. Detchko Pavlov, and John Devitt, former recipients, are here today. Let us also honor them for their contributions—not only to the advancement of battery technology—but also for their contributions to the fostering of interaction at conferences between scientists from all regions of the world such as LABAT.

I am well known for my work with alloys for battery grids and straps. I am particularly known for my photomicrographs. When I was 14 years old I was invited to participate in a science seminar. The first plant that we visited was Pittsburgh Steel Company. A metallurgist there explained the relationship between mechanical properties and microstructure of steel. We were offered the opportunity to look into the microscope. When I looked into the microscope it seemed that I had done it all my life and from that moment I knew what I wanted my career to be. But I certainly did not expect to be here today accepting the Gaston Planté Medal.

When I was at the university, I played on the golf team. The team played its matches on Thursday afternoons—at the same time as Metallography Laboratory. Dr. Phil Robinson was extremely upset when I missed his classes just to play golf. As a result, he gave me the most difficult samples to prepare—such as brass with small lead inclusions, lead, and various lead alloys. I now wish to thank Dr. Robinson. If he had not made my life so miserable at the university, I might not have been able to create the structures in the lead alloys today.

When I was at the university my thesis work was the texture and structure of rolled 20% nickel alloys. I intended to work for companies using high temperature materials such as Boeing for jet engines or Ford for advanced automotive engine components. My thesis advisor, Dr. Harry Paxton, was extremely disappointed when I left to join St. Joe Lead Company to pursue a career in lead research and development. He felt that I was wasting my talent on a material such as lead and would soon be back working in real metals. That was 35 years ago and not one day have I regretted my decision. The honor which I have received today makes that decision more satisfying.

I wish to thank several of my colleagues at St. Joe Lead Company. First, Dr. Carlton Long, Director of Research, for convincing me that the elevated temperature creep and corrosion problems of aerospace alloys at 1500–1800 °C

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were the same problems faced by lead at room temperature and challenged me to develop lead alloys for batteries. The second is to Mr. Michael V. Rose, my first supervisor. He felt that my writing and communication skills were so poor that he sent me to special classes to learn to write and communicate. This discipline has enabled me to communicate my ideas in a simple, understandable manner.

I am fortunate to work with lead acid batteries during the most dramatic changes the batteries have undergone since the development by Gaston Planté.

When I went to work in the lead industry the battery grid alloys consisted of 5–6% Sb. Attempts to reduce the antimony content caused such cracking problems that battery companies considered alternative grid materials. I worked on the development of Dispersion Strengthened Lead and, finally, Pb–Ca and Pb–Ca–Sn alloys. I wish to thank my colleagues at the time, Robert Balliett, who is now my brother-in-law, Charles J. McCrea, who still works with me today, and John Davie, for their assistance in development of the continuous casting and rolling process for Pb–Ca–Sn alloys. The casting and rolling process and subsequent expansion into grids is used today at many companies throughout the world. The materials and rolling processes are much as we developed them in the late 1960s. Delphi, Exide, Fiamm, TAB, Unica, Japan Storage Battery, Banner, Yuasa, and others use these processes.

Since most battery companies had conventional grid casting equipment I developed a series of alloys for positive and negative grids as well as a Pb–Ca–Sn Phase Diagram. This along with mechanical property, microstructure, and corrosion data served as a guide for the use of lead calcium alloys by the battery industry.

In 1975 I joined RSR Corporation to develop a research and development department. My first development was R275 which was the first commercial low-antimony alloy. It enabled battery manufacturers to produce maintenance-free batteries from low antimony alloys without cracking. I wish to thank John Wirtz for his assistance in providing the grid casting machines to permit me to fully develop the manufacturing techniques for R275 and other lead antimony alloys.

I wish to offer a special thank you to Michael Mayer and the LDA for organizing one-day seminars at various locations throughout Europe to permit me to introduce my work on low-antimony and lead–calcium grid materials.

The major problem facing the use of lead–calcium–tin alloys for positive grids was the dramatic loss of calcium which occurred during melting and casting these lead alloys. This resulted in continuous additions of 1% Ca master alloy as well as the production of very weak or very corrosion-prone grids. Protection of lead calcium by addition of aluminum was developed by another Planté award winner, Dr. Norman Bagshaw. In the early 1980s I developed a quick and easy method to permit the smelters to simultaneously alloy calcium and aluminum into lead at relatively low temperatures. The introduction of Pb–Ca–Al alloys by RSR overnight changed the battery industry's ability to consistently hold the desired calcium content of the battery grids, and changed the mode of corrosion of the grid alloys.

In the late 1980s valve-regulated batteries began to fail via negative lug and strap corrosion. Giuseppe Baudo and I explained the phenomena as recombination of gases to form water on the surface of the negative lugs and straps. Impurities in the straps and alkaline conditions on the negative lugs due to the calcium content contributed to the problem.

In the late 1980s and early 1990s automobiles became significantly more aerodynamic. The temperatures in the engine compartment increased dramatically causing severe corrosion and growth of the positive grids. Research culminated in the development of new corrosion ion resistant Pb–Ca–Sn–Ag alloys which have dramatically extended the life of SLI batteries in high temperature service.

Battery recycling has become much more important to the battery industry. In the mid-1980s recycled lead was thought to be too impure to be used as grid materials or active materials of VRLA batteries. I developed novel refining procedures to remove the gas causing impurities to low levels, as well as analytical procedures to determine the presence of impurities at levels 10 times lower than normal levels.

In 1992 the lead and battery industry came together to fund precompetitive research and development for improved electric vehicle batteries. The consortium was called the "Advanced Lead Acid Battery Consortium" and is administered by ILZRO. I have been fortunate to be named the Technical Director of ALABC and have remained in that position for the past 10 years. I would like to recognize all the companies who have given the ALABC both their monetary as well as intellectual support. I would like to thank my colleagues at RSR in the US and Eco-Bat in Europe and South Africa for their unwavering monetary and moral support, and also my administrative assistant, Ida Betancourt for creating my papers and keeping up with my activities.

I would like to thank Dr. Robert Nelson, the first director of ALABC, for all the late night discussions about VRLA batteries, PCL, charging, and the future of ALABC. I would also like to thank Dr. David Rand, a former winner of the Gaston Planté Medal, and Dr. Patrick Moseley for their insight into VRLA batteries and for teaching me more about the electrochemistry than I ever wanted to know.

Finally, there are two special people I wish to also honor. The first is Mr. Howard M. Meyers, the Chairman of Quexco, for his complete support of my research over the past 27 years and for his willingness to contribute the fruits of that research to the battery industry through my publications. Mr. Meyers also continues to support my efforts by permitting me to spend a significant amount of my time over the years on ALABC activities.

Last and certainly not least, I would like to recognize my wife, Marilyn. She has been the stable rock on which I have been able to lean for support for many years. She has endured many weeks of my absence to attend conferences, visit plants, and attend to ALABC business each year. Without her support I would never have been successful enough to be even considered for the Gaston Planté Medal. With her support over the years I have been honored with this award.

I wish to thank everyone who has contributed to my success. That success could be short lived, however, because the race is not over. As Dr. Patrick Moseley aptly stated, ''the barbarians (the other battery chemistries) are at the gate.'' We must defend the chemistry which was developed by Gaston Planté 150 years ago. We must continue the research and development efforts to fully understand the chemistry developed by Gaston Planté and create novel lead-acid batteries to compete with the alternative chemistries. We must make Gaston Planté and ourselves proud.

Thank you for this honor.

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