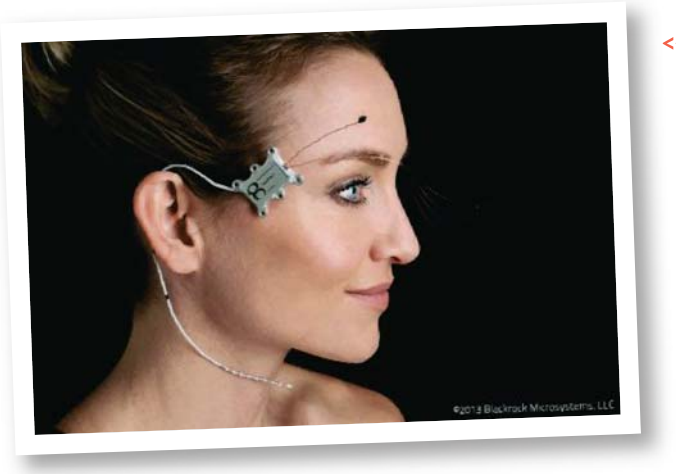

<< Figure 1: CerePlex I. >>

A View Towards Personalised Medicine

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One of the drivers of the pharmaceutical industry growth is the movement toward personalised medicine. The movement from mass production to mass customisation in the medical field is being embraced by giants like Glaxo Smith Kline as well as small and medium sized firms such as Blackrock Microsystems and Blackrock Neuromed. The mass customisation of medical care is driving both cost, and potentially huge savings that will lead to personal and societal abundance. Many understand the increased cost portion of this effort. However, where the savings come from might seem more obscure. Just where might these savings emerge? Potentially savings to society would be in terms of drug development effort that once had to be halted or withdrawn from the market due to serious side effects to segments of the population even though they were effective for many patient segments. If these side effects can be predetermined by test and computational analysis, then drug therapies need not be eliminated from use, saving the pharmaceutical industry hundreds of millions to billions of dollars per therapeutic drug that has to be withdrawn.

Yet how do we reach the potential that individualised medicine can bring to our community? Many immediately seek an understanding of the human genome and genomic discoveries can help tailor medicine to meet unique patient needs. These efforts seek to understand the genomic sequence of patients with uterine cancer, heart disease, or any other medical issues and how these differ from the unaffected population. Even more elemental are the efforts that can identify drug therapies that will work exceptionally for a subset of an affected group but might create more harm than good for other segments of an affected group. Conceptually this is great but how can we get there? How might we initiate the effort to gain the information required to provide reliable data acquisition? As a start, many are now focusing on the elemental tools, sensors and systems that can provide the robust data and trends required to make individual patient solution choices. Dr. Solzbacher and others have initiated the multichannel, multi dimensional systems and sensors. They utilise Internet of Things (IoT) based wireless noise-free links between data acquisition systems by digitising analogue neural signals at the recording site.

The latest development from Blackrock Microsystems Engineering lab along this line is the CerePex I (see figure 1). It is the first implantable ePhys System for human applications. CerePlex I records up to 96 channels of high-resolution data from the longest human implantable electrode, Utah Electrode Array and transmits signal through one external pigtail. It is easy to use, personalised, eliminates cables and generates exceptional information.

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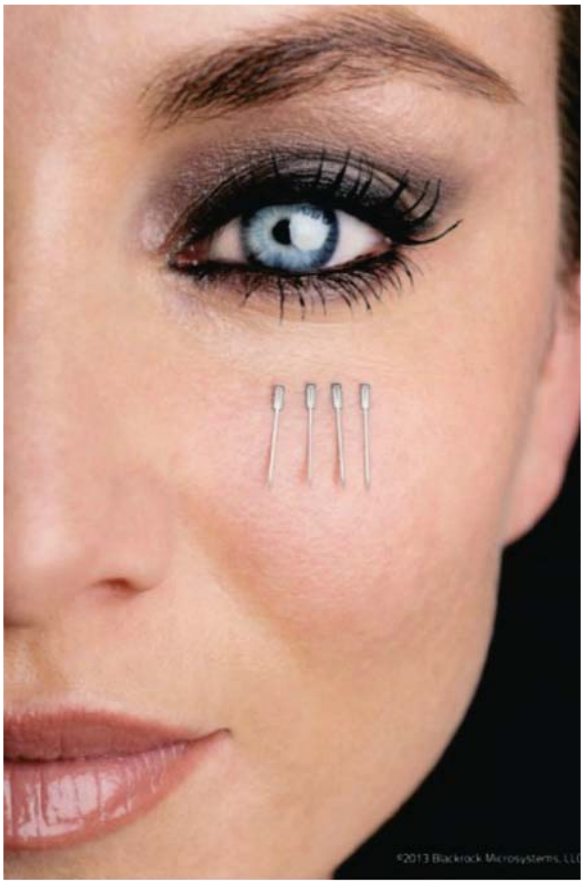
Here Blackrock Microsystems and Brown University are in the process of developing a wireless headstage amplifier, CerePlex W that will pick up, digitise and convey wirelessly neural signal to a nearby receiver. This opens new study opportunities for researchers who wish to include, for example, sleep patterns or further analyse natural behavioural patterns.

These and other technology product platforms allow for the inclusion of many technologies. For example Blackrock Microsystems is currently testing the BRMMA probe (see figure 2). BRMMA is a fully customisable depth electrode with capabilities of measuring neural activity at different dendrite locations in hopes to further advance researcher knowledge on neural signal processing. The true product freedom is allowing researchers full customisable options (i.e. length, activity site distance (micron spacing), quantity, diameter of active site) to build a depth electrode precise to their research specifications.

The trend toward personalised medicine needs these baseline activities. These and other technologies and products from other firms are advancing the knowledge in the medical field. However, and perhaps even more importantly, they are helping us to understand how my neurological disorder, cancer or any other malady differs from yours. Thereby assisting the medical field to more effectively treat or cure diseases at the individual level.

Prof. Florian Solzbacher *is Director of the Center for Engineering Innovation, Co-Director of the Utah Nanotechnology Institute, President and Executive Chairman of Blackrock Microsystems and of Blackrock Neuromed, and is a Professor in Electrical and Computer Engineering with adjunct appointments in Materials Science and Bioengineering at the University of Utah. His research focuses on harsh environment micro systems and materials, including implantable, wireless micro systems for biomedical and healthcare applications, and on high temperature and harsh environment compatible micro sensors. Prof. Solzbacher received his M.Sc. EE (Dipl.-Ing.) from the Technical University Berlin in 1997 and his Ph.D. (Dr.-Ing.) from the Technical University Ilmenau in 2003. He is co-founder of several companies including Blackrock Microsystems, Blackrock Neuromed and First Sensor Technology. He was a board member and Chairman of the German Association for Sensor Technology AMA and of Sensor + Test trade show and conference from 2001 until 2009, and serves on a number of company and public private partnership advisory boards in Europe and the US and on international conference steering committees such as the NIH/NINDS Neural Interfaces Conference. He was Co-Chair of the 2012 NIH Neural Interfaces Conference. He is author of over 190 journal and conference publications, five book chapters and 16 pending patents.*



<< Figure 2: KBRMMA probes. >>

Dr. Steven Walsh *is a Distinguished professor at UNM where also holds the Regents professor at UNM's Anderson School of Management. He also is the institute professor for entrepreneurial renewal of industry at the University of Twente. He has received many business service awards including the lifetime achievement award for commercialisation of micro and nano technology firms from MANCEF. He has also been named as a Tech All Star from the State of New Mexico Economic Development Department and has been recognised by Albuquerque the magazine as a leader in service to the economic community. He is a serial entrepreneur that has helped attract millions of dollars in venture capital to many companies.*