

Editorial

The Robot Seamstress

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Editorial

It's interesting when a new journal launches to reflect on what might be its future contents. I have, somewhere on my shelves, back collections of journals and magazines that in various ways marked out an era in artistic, scientific or technological development. Textiles have been through various stages – the focus on new yarns, adding properties through coatings or by combinations or structural engineering [1]. So too has fabric. What history seems to tell us is that at any time, we tend to think we have reached a limit in our knowledge or our ability to make an advance and then something comes along and a new book is opened? So the big question for a new journal is what is coming along and what books are going to be opened? I think, as in the past, the evolution of textiles and fabrics will have a lot to do with contextualizing evolutions in other spheres. Each of us can imagine what will affect the future but it is reasonably easy to see that some things like robotics and big data are receiving the big push and a lot of attention. Things less easy to see or predict are future changes in consumer behavior. As we think about how these might affect the future of textiles, suddenly a whole new set of possibilities open up. The last couple of year's two things have attracted my attention, one is the advances in robotics and AI [2], and another is changing attitudes toward the ownership of clothes [3]. Both open up new books about the future of fashion production and fashion consumption and each of these areas in turn will develop momentum related to textile and fabric innovation.

The kind of work that takes place at somewhere like *Boston Dynamics* (www.bostondynamics.com) certainly catches public attention. We have dreamed about robots and androids for a long time now and the Promethean urge to create life is part of our popular heritage in works of fiction and movies [4,5]. The truth is of course that anthropomorphic robots will only be pursued where a cash return on investment is likely to be guaranteed, so the military and service sectors it will be. There are obviously many other kinds of robots but one type in particular interests me – the material handling robot – commonly used in automated production lines. From the late 19th Century, and through the 20th Century, manufacturing made successive innovations relating to the processing of goods and materials. However in all this time, the kinds of advances we have seen in the production of, for instance, cars have not happened in the arena of garment production. For mass produced clothing the result is an ongoing, contentious and ethical sore, the garment sweatshop [6]. The usual reasons why are fairly obvious, the socio-economic

factors relating to costs of production and employment laws. The technical reasons why relate to the nature of fabric itself, it is floppy, it stretches, it tangles, it slips. Up until now only humans have the capacity to cope with manipulating varieties of fabric and assembling garments. Now the indications are that this *could* change [7]. The solutions come from disparate fields but they all in some way relate to attempts to mimic the human body and mind, everything from medical prosthetics, to visual and other sensory recognition systems to decision making engines.

In essence the distance between our physical and cognitive abilities and that of machines is rapidly being eroded; soon we may be outstripped almost entirely, as we already are in so many aspects of our lives [8]. Also the more we make machines like humans, the more the work of humans will be replaced. Up until now the seamstress has moved around the world to wherever it's financially viable, most recently in say Bangladesh, Vietnam or China. We can imagine the issues that will arise when garment production can be fully automated – the return of industries to post industrial societies, the loss of a traditional industrial phase in developing countries. The big question is will it happen and if so how? The development and introduction of a robot seamstress looks more viable than it was a decade or so ago. Algorithms relating to fabric performance are utilized for everything from CAD visualizations to film animation [9], sensor technology and the processing of sensory feedback are highly advanced [10], the development of robotic hands and arms moves apace [11]. So too the ability to process highly complex data very quickly [12]. The cognitive processes of proposition, rhetoric and speculation seem within the grasp of new models of AI [13]. All the parts and faculties of a robot seamstress seem present or coming very soon. However the history of technology tells us that just because all the elements are there doesn't mean it will happen, after all the Romans could have had but missed having an Industrial Revolution. If the robot seamstress happens it will be because of the trajectory of technology overall coupled with demand and motives.

One of the interesting differences between the textile industry and the fashion industry is how the textile industry has invested in scientific research and technological development and broadly in comparison the fashion industry has not. Perhaps it's obvious that the two sectors are structured differently and have different objectives but the distance of the fashion community from the kind of R&D required to create a robot seamstress is probably substantial. Similarly the incentive for garment manufacturers to pursue such developments is also lacking when the world is full of cheap labor. Finally what of the makers of manufacturing plant and equipment themselves? Their motivation would also be limited based on supplying what would be an alternative to manufacturing that required expensive investment on the part of their customers. In summary resistance to a new model of garment manufacturing is inherently present in all existing players. I think however the creation of the robot seamstress (which presumably becomes genderless at some point) will have little to do with existing industry; it will come almost as a by-product from the

rapidly developing robotics and AI industries. The key element is the robot that mimics the human not the art of assembling clothes. The robotics industry will develop a robot that almost incidentally can do the work of a seamstress.

It may be fifty to one-hundred years before a robot that can do the work of a seamstress appears but it seems inevitable and may come to pass sooner than we think. The ability of a machine to handle fabric in a complex way, to manipulate it, make assemblies, has far reaching consequences. There is no reason to doubt that such a machine could also extend its abilities to the realms of what we consider as

Traditional craft or embroideries. Also such a machine could have available to it via the internet or in its memory banks an encyclopedic knowledge of designs, techniques and processes. The main impact of the robot (seamstress) is that it might be in factories but it may be more distributed, in homes or small tailoring shops. Garment production might once again become local. Also the desire of developed economies to reboot industry through initiatives such as flexible manufacturing [14], may become redirected as a result of distributed robot manufacturing. For some perhaps the home tailor or dressmaker will become a reality. Such changes will alter the future of that part of the textiles industry that deals with the garment manufacturing sector. Distribution channels, vertical integration of companies, consumer demand, all could change. Undoubtedly the prospect of a robot seamstress will present challenges for many in industry and business, at the same time it heralds the prospect of an end to one of the worst and most exploitative aspects of the fashion industry – the sweatshop.

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