

# Theorising technogenarians: a sociological approach to ageing, technology and health

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Science and technology are central to the lived experiences and normative definitions of health and illness for ageing people. From pharmaceuticals, to walking aids, to cell phones, old people interact with technologies and science on a daily basis. Everyday technologies as well as biomedical interventions can be part of the way older adults pursue, maintain, and negotiate life. In this way, old people are cyborgs in contemporary life, blending machine and biology in both their personal identities and their relations to the external world.

This monograph builds on sociology of health and illness scholarship and expands the analytical lens to include the myriad ways old people interact with science and technology to negotiate health and illness. For elders, perceptions of health and illness may not be limited to acute illness experiences, but may include an everyday understanding of a changing state of health and wellbeing that is managed and made more tenable through the use of multiple, assistive technologies and environmental design modifications. Old individuals may rely on a range of everyday technologies such as stairway railings, phones, adjusted toilet seats, and walking aids to create safer spaces and maintain health and mobility. Elders may also manage an array of drugs and supplements to treat chronic conditions such as high cholesterol, hypertension, diabetes, and vitamin deficiencies. But, old people are not passive consumers of technologies such as walking aids and drugs. Elders creatively utilise technological artifacts to make them more suitable for their needs even in the face of technological design and availability constraints. In this way they are technogenarians; individuals who create, use, and adapt technologies to negotiate health and illness in daily life. Combining science and technology studies and medical sociology frameworks together provides a framework to examine technogenarians in action.

Science and technology studies<sup>1</sup> (also called STS, science studies and science, medicine and technology studies) puts science and technology in the centre of analyses. It is a multi-disciplinary approach that draws from fields such as history, sociology, political science, and anthropology. Genealogies of STS scholarship highlight works by Thomas Kuhn (1962), Ludwik Fleck (1972 [1935]), and Robert Merton (1973) as early exemplars of the field, but a sustained effort to study the relations between society, science, and technology took off in the 1970s in North America and Europe. International professional societies such as the Society for Social Studies of Science (4S) were formed in 1975. The European Association for the Study of Science and Technology (EASST) was officially created shortly after in 1981.

This is the first publication to highlight ageing, health and technology and to bring science and technology studies and sociology of health and ageing approaches together in a sustained manner. Although there is overlap between sociologists of health and illness and science and technology studies scholars, we make the connections explicit in this collection.

As sociologists of medicine, technology, and ageing, we track some of the stakeholders (e.g. physicians, assisted living homes, elders, and caregivers) involved in the ageing, health, and technology matrix as well as use qualitative methods to explore how elders actively use (or do not use) technologies to maintain health. This move simultaneously puts health technologies and medical science under the analytical lens and theorises elders as actors who creatively negotiate health and illness in particular contexts. Studies often evaluate the effectiveness of old people's use of technologies (e.g. Cutler *et al.* 2003, Dickerson *et al.* 2007, Selwyn 2004), but few put elders' meaning making, creativity, and bodies at the centre of analysis of technology, science, and health.<sup>2</sup>

### **Ageing populations, health, and ageism**

Current debates about changes in retirement age, the increasing cost of medical care, and demographic changes regarding the aged population in the United States, Canada, United Kingdom, Japan, and many other countries make studying the ageing, health, technology, and science junction necessary and timely. Referred to as the 'graying' of America, the US Census Bureau predicts that the percentage of people over the age of 65 in the US will grow from 13 per cent of the total population in 2008 to 20 per cent shortly after the year 2030 (Kinsella and He 2009). Canada is also predicted to 'gray', moving from having 13.7 per cent of its population over 65 in 2006 to approximately 20 per cent of its population being over 65 by 2024 (Martel and Caron Malenfant 2007). Some countries (e.g. Italy, Germany, and Japan) already report that approximately 20 per cent of their populations are over 65 and many European countries are close behind with percentages ranging from 15 per cent to 19 per cent. In 2008, with the exception of Japan and Georgia, the top 25 countries with the largest percentage of people over 65 were all in Europe (Kinsella and He 2009). Within these nations, the number of the oldest old (people over 80 years) are increasing as well.

The rise of an ageing population takes place in a broader context of ageism and age relations. US gerontologist Robert Butler (1969) created the term ageism to describe discrimination against older people and the changes associated with ageing. Building on the language of the social movements of the 1960s and 1970s that challenged discrimination against people of colour (racism) and women (sexism), Butler offered the term ageism to describe the dimensions of US society that are biased against old people and ageing. Ageism can be present, for example, in the realms of ideas and beliefs, interpersonal interactions, and institutional practices and policies. How ageism takes place varies by local and national contexts. There is no one way ageism takes place; its prevalence, forms, and intensity can differ by class, profession, gender, sexuality, and ethnicity and by local and national contexts (Bergling 2004, Cruikshank 2003, Gullette 2004).

An age relations approach (Calasanti 2003) builds on the concept of structural ageism, exposing a system of inequality based on age that privileges the not-old at the expense of the old. Such an approach makes explicit how ageist policies and institutional practices as well as ageist attitudes can be insidious, pervading everything from an individual's sense of self and others, to biomedical practices. Thus, this collection not only exposes macro-level age-based stratification, but also micro-level ageism including that which may be internalised by the old themselves.

To challenge ageism, we intentionally use language in this book that positions people as both agentic *and* old. We use 'old' to defy social stigma, to naturalise and neutralise ageing, and to emphasise social stratification related to age. We also use the terms elders, technogenarians, and 'graying the cyborg'. Language emphasising 'elderhood' comes from

gerontologist Bill Thomas's (2004) influential research emphasising three key developmental stages in life: childhood, adulthood, and elderhood. The phrase 'graying the cyborg' comes from a call for scholarship by sociologists Joyce and Mamo (2006) that reclaims old men and women as knowledgeable technoscientific users, rather than as victims of technology and design. Science writer Cynthia Fox (2001) initially used the term technogenarians to describe the economically privileged baby boomers for whom technologies are in development. We expand this term to include any old person who uses technologies in daily life to create or maintain health. Tools can be simple, established ones such as can openers or slow cookers, or complex new technologies such as surveillance tags or companion robots. In using technogenarians and other terms listed above, we join advocacy groups and academics situated internationally who aim to reposition ageing individuals as experienced and active instead of doddering and feeble. This framing calls attention to the way old people approach technology, science, and health in creative ways.

Finally, we remain cautious about buzzwords such as 'productive ageing' and 'successful ageing' that respectively emphasise activity and busyness, and youthful looks and able-bodiedness, as well as individual responsibility and control. Such ideologies are unevenly present in various regions and nations and are not necessarily shared in all cultures. Nonetheless, as we point out, these cultural ideals remain central to the biomedicalisation of ageing, an increasingly global project (Calasanti and Slevin 2001, Katzko *et al.* 1998).

### **Theorising science, technology, ageing, and health**

Putting science, technology, and ageing at the centre of analysis opens up discussion of two trends that mark the contemporary health and illness landscape. In the first trend, ageing bodies, minds, and emotions are increasingly classified and understood as illnesses through biomedicalisation processes. Biomedicalisation refers to the tendency to define any emotional, mental, and physical processes as medical problems (Clarke *et al.* 2004, Conrad 2007). Irving Zola (1972), Eliot Friedson (1970), and Jesse Pitts (1968) initially described this phenomenon, which has remained a focus of sociological analysis ever since.<sup>3</sup> In his ground-breaking essay 'Medicine as an Institution of Social Control', Zola noted how sleeplessness, alcoholism, pregnancy, and other behaviours and bodily processes once defined as socially unacceptable or normal became redefined as illnesses by the 1970s. As additional aspects of being were redefined as medical problems, physicians and other healthcare professionals gained more control over the management and treatment of life.

Medicalisation affects all ages, but it has particular implications in an ageist society. In societies that position youthful bodies as the norm, the changes associated with ageing are ripe for being labelled pathological. Sociologists, anthropologists, and gerontologists have carefully documented the transformation of the emotional, mental, and physical changes associated with ageing into 'illnesses' (Cruikshank 2002, Estes and Binney 1989, Gubrium 1986, Kaufman 1994, and Lock 1993). For example, the biomedical construction of Alzheimer's disease redefined memory loss as an illness category during the 1960s and 1970s (Gubrium 1986). What had been a normal component of ageing was reconfigured into disease through the creation and delineation of medical diagnostic categories.

Although the desire for the fountain of youth has a long history, anti-ageing medicine grew significantly in the 1990s. The mix of private and public health insurance in combination with consumer-driven healthcare in the United States provided fertile ground for its expansion. The American Academy of Anti-Aging Medicine (A4M) was founded in 1993, and reports approximately 20,000 members worldwide in 2009. Although the American

Board of Medical Specialties, the American Osteopathic Association Bureau of Osteopathic Specialists, and the American Medical Association do not recognise the field of anti-ageing medicine, anti-ageing physicians tap into cultural concerns about ageing and are establishing a foothold in clinical practice. Anti-ageing medicine represents one possible extension of biomedicalisation processes. Instead of *particular* mental, physical, or emotional processes being turned into a disease, now the ageing process itself is understood as pathology.

At the same time that the claim is made that the ageing body can and should be restored into a youthful one, there are a growing number of companies, professionals, and institutions that recognise the varied physical, mental, and emotional changes that can be associated with ageing. In this second trend, individuals, academic centres, and businesses aim to create assisted living technologies and inclusive design projects so that older people can age at home. The focus in this market-based framework is on transforming technologies and architectural design to accommodate potential changes in hearing, memory, balance, sight, or other physical and cognitive abilities as well as creating technologies (*e.g.* robots, phones for the hearing impaired) to help meet emotional needs. The ageing body is still enabled and constrained, but it is not targeted for transformation from the inside out as it is in anti-ageing medicine.

Academic research centres were formed throughout the 1990s to focus on innovation for ageing populations. For example, Cornell University's Environmental Geriatrics program emphasises how modifications to homes can help older people prevent bone fractures and other injuries that can have a severe impact on their health. Increasing technology use (*e.g.* of motorised stair lifts, handheld showerheads, and cognitive enhancement technologies in automobiles) is believed to help ageing individuals experience a wider range of mobility. The MIT AgeLab aims to invent new technologies that help people stay active and mobile across the lifespan. Other universities have also created programmes that evaluate and develop assisted living and inclusive design projects (*e.g.* University of Rochester Center for Future Health, Georgia Institute of Technology's Center for Research and Education on Aging and Technology Enhancement). Such centres get financial support from universities, businesses, and government agencies.

Beyond centres located at universities, private companies are designing and creating living spaces with the varied abilities of old people in mind. Oatfield Estates, a retirement community in Oregon, United States, is a high-end example of this residence type. In Oatfield Estates, residents wear badges that signal to the dozens of infrared and radio-frequency sensors inside the facility and outside on the grounds. Healthcare and administrative workers as well as family members use the badges to keep track of residents' location. Monitors in beds and chairs track residents' sleep patterns, weight, and movement (Kornblum 2006, Scharnberg 2006).<sup>4</sup> Similarly, the National Green House Project across the US has transformed elder health, housing, and care, by replacing high-rise nursing homes with small-houses featuring private rooms and shared common space and kitchen (Kane *et al.* 2007).

Both university and private industry responses to ageing raise issues of race, class, sexuality, and gender inequalities and access. Unequal economic, social, and political relations will have an impact on how individuals use or do not use biomedical and environmental applications. Environmental geriatric or gerontechnological innovations and assisted living communities also require us to grapple with concerns about surveillance, privacy, and freedom. For example, projects in development include a smart floor designed to send an emergency help alert when it senses a person has fallen, a driving sensor that switches off distractions like the radio if the driver's blood pressure suddenly rises, as well as an

electronic pill dispenser that is programmed to give readouts to clinicians on how many pills an individual has taken and at what time. These innovations raise important questions about power, inequality and elder-focused surveillance technologies.

## Collection overview

This collection of chapters adds theoretical and empirical depth to our understanding of two concurrent trends: (1) the biomedicalisation of ageing bodies, minds, and emotions – a process exemplified by the rise of anti-ageing or longevity medicine, and (2) the rise of gerontechnology industries and professions – fields that largely take ageing processes as a given. These trends might be considered contemporary manifestations of what Carol Estes (1979) dubbed ‘the ageing enterprise’; that is, both highlight individual consumption as a solution to changes associated with ageing. A growing body of social science scholarship examines the historical emergence, practice of, and perceptions of anti-ageing medicine, and we include several innovative contributions in this collection. However, despite the growing investment by universities, governments, and companies in elder-based technology, critical and empirical analysis of the networks, values, and inequalities embedded in gerontechnology is still needed.

This book sociologically investigates how and where biomedicalisation, anti-ageing medicine practices, and the design and use of gerontechnologies overlap and diverge in relation to ageism, health, and illness.

The first part of the book examines the biomedicalisation of ageing – an approach to health and illness that includes anti-ageing medicine or longevity medicine with its emphasis on ‘optimal health’ or the prevention of any aspect of ageing (mental, physical, or emotional). Courtney Mykytyn draws on ethnographic methods and discourse analysis to provide a socio-historical explanation of the transformation and expansion of anti-ageing medicine from the 1990s to today. Mykytyn exposes the complex knowledge production and contestation surrounding anti-ageing, as it shifted in perception from a ‘backwater science’, to a fully-fledged arena of inquiry and practice. This emergence and solidification was aided by the internet, scientific claims, public and private funding, and legitimising institutions. Jennifer Fishman, Richard Settersten Jr. and Michael Flatt explore how anti-ageing physicians in the US make sense of what they do. Building on data gathered from in-depth interviews with practitioners, the authors analyse how anti-ageing doctors’ rhetoric emphasises a return to ‘the art of medicine’, which includes more time with patients, off-label use of pharmaceuticals, repeated laboratory tests, and the use of nutrition and other low-tech techniques in treatment plans. Despite the commitment to delivering personalised and holistic care, Fishman and colleagues demonstrate how these same physicians also embrace a form of surveillance medicine that involves both patient and practitioner in the medical management of ageing avoidance.

The next four chapters consider how (changing) views about ageing shape the practice of medicine more broadly. Barbara Marshall examines how contemporary sexual medicine and biogerontology have joined forces at the present time. The social ramifications of this include virility surveillance and medical attention to late-life sexuality in the name of healthy ageing. Marshall pays particular attention to what she calls the pharmaceutical imagination, and how, through direct-to-consumer advertisements, ideas about elder sexualities (which are simultaneously gendered and racialised) are created and circulated. Sharon Kaufman takes us into an American medical clinic to analyse physicians’ and patients’ approaches to longevity and end of life technologies. Kaufman’s research shows how the

imagined appropriate age for surgeries such as heart surgery has expanded to include people in their nineties in the United States. Using ethnographic methods, she introduces the theoretical concept ‘time left’ to show how patients and their intimate circle make decisions about whether to pursue a particular treatment option over others.

Abigail Brooks and Taina Kinnunen explore perceptions of cosmetic surgery in the US and Finland, respectively. Brooks’ chapter explores how American women’s attitudes about femininity and ageing are shaped in the context of deciding whether to use anti-ageing medicine and technology. Drawing from in-depth interviews with women between the ages of 47 and 76, Brooks shows how a successful ageing paradigm (which allows for some signs of ageing) is being replaced by what she calls ‘the ideal of a feminised agelessness’. Within this ideal, women are expected to continually work to reverse, minimise, and prevent signs of ageing and maintain appearances (*e.g.* perky breasts, flat stomachs) associated with a particular version of femininity. Even women who choose *not* to use anti-ageing techniques are well aware of this new standard and evaluate themselves in relation to it. Turning the analytical lens to Finland, Kinnunen’s chapter demonstrates how arguments for cosmetic surgery and anxieties about one’s appearance are shaped by ageist discrimination, national contexts, and globalisation. Kinnunen utilises in-depth interview data to show how ageism and pressure to be more like Americans (who are understood as happy and outgoing) create a context in which Finnish people ‘choose’ cosmetic surgery to alter both their appearance and emotional selves. By transforming physical characteristics understood as Finnish (*e.g.* heavy foreheads, sagging eyelids and potato noses), Kinnunen’s respondents also aim to make themselves more ‘white’ and thus higher up a perceived racial hierarchy within Europe.

The second part of the collection explores the rise of gerontechnology. Two pieces analyse gerontechnology use in the context of dementia and wandering. Katie Brittain, Lynne Corner, John Bond and Louise Robinson utilise interviews and focus groups conducted in the UK with people with dementia, to analyse how outside places and landscapes can be viewed as both ‘therapeutic’ and frightening in the context of memory loss. Specifically, Brittain and colleagues argue that technologies of place can be used for support and assistance, to maximise the independence of people living with dementia. Johanna Wigg uses ethnographic methods to examine health and wellbeing outcomes in the context of two different technological approaches for controlling wandering at dementia care facilities in the US: locked doors and motion detectors. Wigg argues that important distinctions exist between surveillance technologies that chiefly engage in social control, and surveillance technologies that encourage greater independence in wandering.

Three chapters analyse elder technology users and put sociology of health and illness into dialogue with STS work on studies of users of science and technology. In analysing technology use as well as non-use, each chapter offers important critiques of gerontechnology in terms of design, use, and definition. Denise Copelton draws on participant observation and interviews with members of a hospital-sponsored walking club in the US to explore the social construction of pedometers by fitness researchers, group leaders, and walkers themselves. Copelton demonstrates that while pedometers may be praised by health experts as tools for assisting in the achievement of fitness goals, walkers may value sociability over technologies that create distinctions and hierarchies when it comes to health motivation and maintenance. Meika Loe examines everyday technology use among women nonagenarians ageing at home in the US. Her chapter draws on in-depth interviews to expose how lifelong care work repertoires are utilised by the oldest old to identify, adjust, use and reject familiar and new technologies such as computers, slow cookers, and automobiles for their everyday mobility, communication, and physiological health. Louis Neven examines elder test users and their approaches to robots in the Netherlands. Taking up a new trend in healthcare,



Neven documents the rise of robot companions worldwide, and tracks ‘iRo’, a robot in the making. This work contributes to theories of users and innovation by illuminating when and how elder test users and ageism contribute to health robot design and adoption.

### **Moving from medical to elder-centred definitions of health**

While biomedicine seeks to promote an ideal of healthy ageing in our contemporary life, scholarship in this collection suggests that such an equation may be overly simplistic and not representative of elders’ lives. A focus on elders makes it clear that (a) doctors and medicine are not at the centre of people’s own definitions of health and wellbeing, and (b) health includes mental, physical and emotional wellbeing in combination with social capital. This is true regardless of whether elders embrace anti-ageing medicine, biomedicine more generally, gerontechnologies, or aspects of all three as they negotiate daily life and wellness in North America and Europe.

Elders who pursue cosmetic surgery, anti-ageing medicine, and/or gerontechnologies embrace an idea of health that includes emotional, intellectual, and physical wellbeing. Part of the appeal of anti-ageing medicine is that it promises health in mental, emotional, and physical dimensions of life. A key insight of the contributors to this volume is that old people use medical techniques to achieve physical, mental, and emotional transformations. As the chapters by Brooks, Kinnunen, and Fishman *et al.* demonstrate, ageing people pursue cosmetic surgery and anti-ageing therapies to feel better, cultivate better treatment by others, and (ideally) achieve happiness.

But, medicine is just one strategy elders use to cultivate wellbeing in mind, emotion, and body. Exercise, robots, communication technologies, and mobility devices are all part of the toolkit old people assemble to stay healthy and connected to their communities. Copelton’s analysis of pedometers (an innovation that failed to be adopted), for example, illustrates how people desired companionship over measurements that fostered competition and hierarchies. Neven’s analysis of robot innovation further demonstrates how both designers and test users understand health to be a function of emotional, cognitive, and physical dimensions of one’s life. Loe’s discussion of nonagenarians illuminates how women rely on communication technologies, transportation technologies, domestic technologies, *and* medical treatments to maintain wellness and independence. In these examples, the aim of technology use is not ‘optimal health’ with its implied anti-ageing, cultivation of youth definition of optimal, but rather support for the body and mind as each changes across the lifespan. This work reveals how technologies can be used to support elders’ lives and wellbeing, including participation in communities, mobility, intellectual growth, emotional connections, and physical care.

Elders featured in this volume actively confront and complicate the biomedicalisation of ageing, pushing us to look beyond medicine to understand how health and wellbeing can be maintained and achieved. Contributors to this volume posit that biomedicine, technologies, and policies aimed at old people can enable as well as constrain and hinder elders in their own self-care. When elders rely on medical expertise and technological tools, it is the combination of these tools and associated social, emotional, and psychological contexts surrounding this use that can offer value, meaning, and enhanced health. When successful, gerontechnology can enable elders to create social safety nets, ‘link lives’, and manage self-care routines, all of which can empower elders to age at home comfortably. Whether striving to look forever youthful with products and surgeries, creatively utilising mobility devices and medications, or critiquing robot companions and pedometers, elders

are technogenarians – creatively negotiating technology and science to maintain independence and health across the lifecourse.

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## Notes

- 1 For overviews of science and technology studies, see Hess (1997), Hackett *et al.* (2007), Harding (2008), or Sismondo (2010).
- 2 Exceptions to this include but are not limited to Loe (2004) and Twigg (1997).
- 3 Conrad (1992) and Rosenfeld and Faircloth (2006) provide thorough overviews of the medicalisation thesis.
- 4 In 2008 Oatfield Estates residents were charged \$4,300 per month; Oatfield Estates did not accept Medicaid because the organisation thought that reimbursement rates were too low.

## References

- Bergling, T. (2004) *Reeling in the Years: Gay Men's Perspectives on Age and Ageism*. New York, NY: Southern Tier Editions, Harrington Park Press.
- Butler, R. (1969) Age-ism: another form of bigotry, *The Gerontologist*, 9, 243–46.
- Butler, R. (1975) *Why Survive? Being Old in America*. New York: Harper and Row.
- Calasanti, T. (2003) Theorising age relations. In Biggs, S, Lowenstein, A. and Hendricks, J. (eds) *The Need for Theory: Critical Approaches to Social Gerontology*. Amityville, New York: Baywood Publishing Company.
- Calasanti, T. and Slevin, K. (2001) *Gender, Social Inequalities, and Aging*. New York: AltaMira Press.
- Calasanti, T.M. and Slevin, K.F. (2006) *Age Matters: Realigning Feminist Thinking*. New York, NY: Routledge.
- Clarke, A., Shim, J., Mamo, L., Fosket, J. and Fishman, J. (2004) Biomedicalization: technoscientific transformations of health, illness, and U.S. biomedicine, *American Sociological Review*, 68, 161–94.
- Conrad, P. (1992) Medicalisation and social control, *Annual Review of Sociology*, 18, 209–32.
- Conrad, P. (2007) *The Medicalization of Society: On the Transformation of Human Conditions into Treatable Conditions*. Baltimore, MD: Johns Hopkins University Press.
- Cruikshank, M. (2002) *Learning to be Old: Gender, Culture, and Aging*. Lanham, MD: Rowman and Littlefield Publishers.
- Cutler, S., Hendricks, J. and Guyer, A. (2003) Age differences in home computer availability and use, *Journal of Gerontology*, 58B, 5, S271–S280.
- Dickerson, A., Molnar, L., Eby, D., Adler, G., Bedard, M., Berg-Weger, M., Classen, S., Foley, D., Horowitz, A., Kerschner, H., Page, O., Silverstein, N., Staplin, L. and Trujillo, L. (2007) Transportation and aging: a research agenda for advancing safe mobility, *The Gerontologist*, 47, 5, 578–90.
- Estes, C. (1979) *Aging Enterprise: a Critical Examination of Social Policies and Services for the Aged*. Chichester, UK: Wiley, John and Sons, Inc.
- Estes, C. and Binney, E. (1989) The biomedicalization of aging, *Gerontologist*, 29, 5, 587–96.
- Fleck, L. (1972 [1935]) *Development and Genesis of a Scientific Fact*. Chicago, IL: University of Chicago Press. Translated by Fred Bradley and Thaddeus Trenn.



- Fox, C. (2001) Technogenarians: the pioneers of pervasive computing aren't getting any younger, *Wired*, (Issue 9.11, November). Retrieved 5 October, 2009 [http://www.wired.com/wired/archive/9.11/aging\\_pr.html](http://www.wired.com/wired/archive/9.11/aging_pr.html).
- Gubrium, J. (1986) *Old-timers and Alzheimers: the Descriptive Organization of Senility*. Greenwich, CT, Jai Press Inc.
- Gullette, M.M. (2004) *Aged by Culture*. Chicago, IL: University of Chicago Press.
- Hackett, E., Amsterdamska, O., Lynch, M. and Wajcman, J. (eds) (2007) *The Handbook of Science and Technology Studies*, 3rd Edition. Cambridge, MA: MIT Press.
- Harding, S. (2008) *Sciences from Below: Feminisms, Postcolonialities, and Modernities*. Durham, NC: Duke University Press.
- Hess, D. (1997) *Science Studies: an Advanced Introduction*. New York: New York University Press.
- Joyce, K. and Mamo, L. (2006) Graying the cyborg: new directions of feminist analyses of aging, science, and technology. In Calasanti, T. and Slevin, K. (eds), *Age Matters: Realigning Feminist Thinking*. New York: Routledge.
- Kane, R., Lum, T., Cutler, L., Degenholtz, H. and Tzy-Chyi, Y. (2007) Resident outcomes in small-house nursing homes: a longitudinal evaluation of the initial Green House Program. *Journal of the American Geriatrics Society*, 55, 6, 832–9.
- Katzko, M.W., Steverink, N., Dittmann-Kohli, F. and Herrera, F. (1998) The self-concept of the elderly: a cross-cultural comparison, *Availa International Journal of Aging and Human Development*, 46, 3, 171.
- Kinsella, K. and He, W. (2009) *U.S. Census Bureau, International Population Reports, P95/09-1, An Ageing World: 2008*. Washington, DC: US Government Printing Office.
- Kornblum, J. (2006) Assisted living facility gets technology assist, *USA Today*. Retrieved 16 October, 2009: [http://www.usatoday.com/tech/news/technovations/2006-07-05-elder-tech\\_x.htm](http://www.usatoday.com/tech/news/technovations/2006-07-05-elder-tech_x.htm)
- Kuhn, T. (1962) *The Structure of Scientific Revolutions*. Chicago, IL: University of Chicago Press.
- Lock, M. (1993) *Encounters with aging: Mythologies of menopause in Japan and North America*. Berkeley, CA: University of California Press.
- Loe, M. (2004) *The Rise of Viagra: How the Little Blue Pill Changed Sex in America*. New York: New York University Press.
- Martel, L. and Caron Malenfant É. (2007) *Portrait of the Canadian Population in 2006, by Age and Sex*. Census Analysis Series, Census 2006. Ottawa, Ontario: Statistics Canada Catalogue No. 97-551-XWE2006-001.
- Merton, R. (1973) *The Sociology of Science: Theoretical and Empirical Investigations*. Chicago, IL: University of Chicago Press.
- Nelson, T.D. (2002) *Ageism: Stereotyping and Prejudice against Older Persons*. Cambridge, MA: MIT Press.
- Pitts, J. (1968) Social control; the concept. In Sills, D. (ed.) *International Encyclopedia of the Social Sciences*, Volume 14. New York: Macmillan.
- Quadagno, J. (2008) The field of social gerontology. In Barrosse, E. (ed.) *Aging and the Life Course: an Introduction to Social Gerontology*. New York: McGraw-Hill.
- Rosenfeld, D. and Faircloth, M. (2006) Medicalized masculinities: the missing link? In Rosenfeld, D. and Faircloth, C. (eds) *Medicalized Masculinities*. Philadelphia, PA: Temple University Press.
- Scharnberg, K. (2006) Keeping track of Dad: technology allows aging Americans to enjoy more independence while families monitor them from miles away, *Chicago Tribune*. Retrieved 18 October, 2009: [http://www.elitecare.com/keeping\\_track\\_dad](http://www.elitecare.com/keeping_track_dad).
- Sismondo, S. (2010) *An Introduction to Science and Technology Studies*, Second Edition. Malden, MA: Wiley-Blackwell.
- Selwyn, N. (2004) The information aged: a qualitative study of older adults' use of information and communications technology, *Journal of Aging Studies*, 18, 4, 369–84.
- Thomas, W.H. (2004) *What are Old People For?* MA: VanderWyck and Burnham.
- Twigg, J. (1997) Deconstructing the social bath: help with bathing at home for older and disabled people, *Journal of Social Policy*, 26, 2, 211–32.
- Zola, I. (1972) Medicine as an institution of social control, *American Sociological Review*, 20, 487–504.