

NEWS, VIEWS AND COMMENTS

Remembering Irving I. Gottesman: Twin Research Colleague and Friend Extraordinaire/Research Studies: Face-Lift Technique Comparison in Identical Twins; Raising Preterm Twins; Fetal Behavior in Dichorionic Twin Pregnancies; Co-Bedding and Stress Reduction in Twins/Public Interest: Identical Co-Twins' Same Day Delivery; Teaching Twins in Bosnia; Twin Auctioneers; *Sister*, the Play

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Dr Irving I. Gottesman, a colleague, friend, and long-time member of the International Society of Twin Studies passed away on June 29, 2016. His contributions to twin research and some personal reflections are presented to honor both the man and the memory. This tribute is followed by short reviews of twin research concerning differences between cosmetic surgical techniques, the rearing of preterm twins, behavioral observations of dichorionic fetal twins, and the outcomes of co-bedding twins with reference to stress reduction. Interesting and informative articles in the media describe identical co-twins who delivered infants on the same day, educational policies regarding twins in Bosnia and the United Kingdom, unusual practices of twin auctioneers, and a theatrical production, *Sister*, featuring identical twins in the leading roles.

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Remembering Irving I. Gottesman: Twin Research Colleague and Friend Extraordinaire

Irving I. Gottesman retired in about 2001, but the exact date is difficult to determine. That is because several festschrifts were held in his honor, organized by different academic institutions, and chaired by various colleagues. I attended one of them, at the University of Minnesota, an event that culminated in an impressive collection of published papers edited by Gottesman's former student, DiLalla (2004), now a professor of psychology at the University of

Southern Illinois. Irv's knowledge, insight, and influence were far-reaching and continue to be – even now.

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**FIGURE 1**

(Colour online) Irving I. Gottesman outside his office in Elliott Hall, Department of Psychology, University of Minnesota, October 2009. Note the Dobzhansky Award certificate on the door behind him.

Photo credit: Dr. Nancy L. Segal

Professor Irving I. Gottesman passed away peacefully on June 29, 2016, at age 85, at his home in Minneapolis, Minnesota. The outpouring of tributes and testimonials has been staggering – newspapers and journals around the globe have published moving essays detailing Gottesman's professional accomplishments in twin research, in the areas of intelligence, personality, psychopathology, psychiatric genetics, and epigenetics. Individuals interested in learning the full scope of his research activities may examine any one of these tributes – links are provided in an appendix at the end of this article. I have, however, listed a sampling of Professor Gottesman's classic books and papers that have had a significant impact on the research activities of countless twin researchers, including my own:

1. Gottesman, I. I., & Shields, J. (1972). *Schizophrenia and genetics: A twin study vantage point*. New York: Academic Press. (This classic work was summarized in one of my previous publications in *TRHG*; see Segal, 2015).
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A Stellar Career

Irving I. Gottesman, PhD, FRCPsych Hon (London), FKC Hon, was a senior fellow in the Department of Psychology at the University of Minnesota in Minneapolis (2001–2016) at the time of his passing. He was also a visiting professor at the MRC Social, Genetic & Developmental Psychiatry Centre, Institute of Psychiatry, King's College London (2013–2016). Over the course of his career, he held faculty appointments at Harvard University in Cambridge, Massachusetts (1960–1963), the University of North Carolina in Chapel Hill, North Carolina (1963–1966), the University of Minnesota in Minneapolis, Minnesota (1966–1980), Washington University in St. Louis, Missouri (1980–1985), and the University of Virginia in Charlottesville, Virginia (1985–2001). He received his PhD degree in psychology from the University of Minnesota in 1960. His curriculum vitae lists over 50 awards, among them the prestigious Grawemeyer Award (University of Louisville), the Theodosius Dobzhansky Lifetime Achievement Award (Behavior Genetics Association), the Joseph Zubin Award (American Psychological Association), and the Gold Medal for Life Achievement in the Science of Psychology (American Psychological Foundation). His books, papers, chapters, and monographs number over 300, with more to come – he was in the process of co-authoring a chapter of personality and psychopathology with Bouchard et al. (in press). Between the years 1962 and 2003, Gottesman either supervised or directed the research of over 40 doctoral students and post-doctoral fellows. Twins were at the center of much of the research he conducted.

Reflections

I will use the remainder of this column to reflect upon the person behind the brilliance for which Gottesman was – and is – so well known. His wise counsel and constant support, offered selflessly and often with a touch of humor, form a large part of his legacy.

I first met Irv at a conference – either a Twin Congress or Behavior Genetics Association meeting – sometime after he had published a journal article describing his plans for a lifetime achievement award to be established in the name of his late British colleague, James Shields. At the time, I was

a graduate student at the University of Chicago and I had been studying Shields's work on reared-apart twins. I sent Irv a check for \$10.00 – it was all I could afford in those days. I felt a little sheepish about that over the years because Irv was certainly hoping for several hundred to a thousand dollars from potential donors. But he approached me at the conference and thanked me very graciously. From time to time, he would mention this donation to colleagues, but always in his characteristically generous spirit.

Over the years, Irv was uniquely supportive of students and colleagues because he understood the sociology of the field better than almost everyone – he knew what actions to take when and how to advise younger scholars. If there was uncertainty about pursuing an opportunity or responding to a critic, Irv was the one to contact for advice. He would gently lead colleagues toward a decision that was right in the end.

Irv was a great supporter of my recent book *Born Together-Reared Apart: The Landmark Minnesota Twin Study* (Segal, 2012). He was an internal reviewer prior to the book's going to press and arranged for a long conversation with me on a weekend morning to review his comments. In the acknowledgments, I thanked him for 'his usual penetrating insights and brilliant suggestions' (p. 138).

Several years ago, Irv reorganized his personal library and sent me several treasures from his twin research trove, among them copies of Burlingham (1952), Bulmer (1970), and Mittler (1971). Irv signed them all (I asked him to), but I was deeply touched by what he had inscribed inside of Bulmer's volume. (I recounted this story in Segal, 2015, but it is worth retelling at this time for readers who may have missed it.) The book originally belonged to James Shields and Shields had given it to Irv. Irv drew a line from Shields's name to his, and from his name to mine. I feel honored and humbled whenever I refer to that book.

I learned of Irv's passing while attending the annual meeting of the Human Behavior and Evolution Society in Vancouver, Canada. This sad news cast a terrible shadow over the five days of plenaries, papers' sessions, and social activities. I was also disheartened, disappointed, and conflicted over not being able to attend the July 9th celebration of Irv's life that his wife, Carol, and sons, Adam, and David, organized in Minneapolis – I was about to leave for a 10-day research visit to Bogotá, Colombia and faced many last-minute preparations. I knew Irv would understand but that was of little comfort at the time.

More Reflections

I had the pleasure of talking to Irv's wife, Carol, over brunch in Minneapolis in early October 2016. The couple met on a blind date when Carol was a teacher in the Minneapolis school system and Irv was a professor at the University of Minnesota. Carol recalled that Irv was a good listener, asked interesting questions, and had a gift for making people feel

comfortable. Irv has continued to be known for these qualities that are mentioned frequently by his former students, now colleagues.

Dr. Thomas J. Bouchard, Jr. was a young assistant professor at the University of Minnesota in 1969 when he encountered his fellow faculty member. Bouchard has often described how Gottesman took him under his wing, introducing him to behavior genetics, leaving significant articles in his mailbox, and engaging him in discussions over current findings. In an email message sent to me on July 1, just two days after Irv's passing, Bouchard wrote: 'He [Irv] was one of the most important influences in my intellectual life and a really good friend and colleague. Very, very sad.' In his remarks at the event celebrating Irv's life, Bouchard recalled: 'When I launched the study of twins raised apart he was right there with a ton of useful advice. He also personally interviewed many of the twin pairs.' Bouchard also thinks that he may have received the last email Irv ever sent.

More to Come

Irving I. Gottesman will continue to be a forceful presence in twin research, to the members of the International Society for Twin Studies (ISTS), to the readers of *Twin Research and Human Genetics*, and to twin researchers everywhere. I am organizing a special session for the 2017 meeting of the ISTS in Madrid that will honor his life and work. A memorial event has also been planned for the week of October 24, 2016 at the MRC SGDP (Medical Research Centre – Social, Genetic and Developmental Psychiatry) in London, organized by Irv's colleague Dr Peter McGuffin and attended by Irv's wife Carol and one of his sons. Irv established the

Gottesman Shields Prize given by this center to the doctoral student (or two doctoral students) who completed research studies at an outstanding level. The next Gottesman Shields lecture is scheduled for Fall 2017.

Interested colleagues are invited to make a contribution in his name to the 'Wall of Honor' maintained by the Federation of Associations in the Behavioral and Brain Sciences. Being on the wall requires that the person be very distinguished and that there be a commitment by colleagues to honoring the individual. This process, initiated by the University of Minnesota Psychology Professor J. Bruce Overmeier, usually takes some time, but the Board responded immediately with approval. The link to this site is: <http://www.fabbs.org/fabbs-foundation/honoring-our-scientists/make-a-donation/>. It is important that the name Irving I. Gottesman be indicated when making a donation.

Appendix

http://www.nytimes.com/2016/07/07/science/irving-gottesman-pioneering-psychologist-on-schizophrenia-dies-at-85.html?_r=0

https://www.washingtonpost.com/national/health-science/irving-gottesman-psychologist-who-upended-views-on-schizophrenia-dies-at-85/2016/07/08/9f0d2780-4489-11e6-8856-f26de2537a9d_story.html

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Research Studies

Face-Lift Technique Comparison in Identical Twins

Many cosmetic surgical techniques are currently available to plastic surgeons, so choosing among them can be challenging. Comparing the facial appearance of MZ twins who have undergone different procedures is an ideal approach to this question. Outcomes from such efforts were undertaken by New York surgeon Dr Darrick E. Antell and colleagues (2016), who performed various face-lift procedures on four sets of MZ twins (three female and one male) and one set of MZ triplets (female). The twins ranged in age from 56 to 73 years at the time of surgery.

First-born twins received a full-incision lift, whereas second-born twins received a short-scar lift. The third member of the triplet set underwent a minimal access cranial suspension face-lift as an alternative to the short-scar incision. Preoperative and postoperative photographs of

each twin (the latter taken at 1 year and at 5 years post-surgery) were evaluated by eight expert plastic surgeons who were blind to the type of procedure performed. Ratings were made of the nasolabial fold (commonly known as 'smile' or 'laugh lines'), jawline and neck, scored from (1) *no improvement* to (5) *perfect result*. Data analysis revealed no differences between techniques at 1 year following surgery. In contrast, the full-incision technique produced a more favorable result in the neck region at the 5-year follow-up. However, the small sample size and several confounds (e.g., co-twin differences in smoking histories and prior facial surgeries) limit the generalizability of the results. In addition, the method by which the zygosity of the twin pairs and triplet set was not reported, an omission that casts further question on the findings. Hopefully, this information will be forthcoming in subsequent reports from this interesting and timely medical specialty.

Raising Preterm Twins

Preterm infants tend to be less attentive and to show fewer facial expressions than full-term infants. Newborn twins, who are often premature, pose additional challenges for parents with respect to the time and resources required to care for two babies simultaneously. Most twin births occur early, but the situation of parents with very preterm twins deserves further professional attention. Beer et al. (2013) aimed to determine (1) if mothers of very preterm twins suffer greater stress than mothers of very preterm singletons, and (2) if mother-twin dyads experience poorer quality interactions. Very preterm infants were those born prior to 32 weeks' gestation.

The participants in the study were 17 mothers with very preterm twins and 17 mothers with very preterm non-twins. Mothers were matched for parity, age at birth, and educational level and evaluated in both naturalistic and structured settings. Specifically, mother-infant interaction was observed prior to hospital discharge and at home when infants were 3 months of age. Measures included the 2004 Index of Multiple Deprivation (health and living environment), the Nursing Child Assessment Teaching Scale (observation of mother teaching a new skill to her infant), the Home Observation for Measurement of the Environment (parental responsivity to the infant), and Parenting Stress Index – Short Form (stressful parenting experiences).

As anticipated, mothers of twins had lower home observation scores than mothers of singletons when twins were 3 months old. Mother of twins also tended to show higher parenting stress scores than mothers in the control group. Infant twins had lower scores on the multiple deprivation assessment than the non-twin infants, both at discharge and at 3 months, indicating reduced responsiveness while interacting with their mother. Mothers of twins tried to compensate for their infants' unclear behaviors in a structured setting, but these mothers were still less responsive than mothers of singletons in an unstructured setting. The data, though based on a small sample, underline the need for additional research in this area, as well as greater attention to the concerns of very preterm infant twins and their mothers.

Fetal Behavior in Dichorionic Twin Pregnancies

Studies conducted in the 1990s reported that fetal twins show considerable synchrony in behaviors, such as heart rate accelerations, body movements, and breathing activity. The extent to which fetal twins and singletons differ in their degree of activity is also of interest. These questions were explored in a study conducted in the Netherlands using 20 women carrying twins and comparative data gathered on over 100 non-twin fetuses from two independent studies (Mulder et al., 2012). Ultrasound techniques were used to visualize the twins.

In contrast with earlier work, the fetal twins in this study did not show coordinated movements or rest-sleep cycles. Occasional movements were displayed simultaneously and appeared to be evoked in one twin by the other but were mostly short in duration and unintentional – such behaviors represented approximately 10% of the observations. Co-twins' rest-sleep cycles also appeared to occur independently. In further support of this conclusion, the authors referred to conjoined twins whose rest-sleep cycles over the first 5 months of postnatal life failed to achieve synchrony despite their shared genes, environment, and tactile stimulation. A subsequent review of studies of fetal twins' spontaneous and evoked motor behaviors (by some members of the research team and published in *TRHG*; see Tendais et al., 2013) found that monozygotic twins were more alike than male-female twins in prenatal behaviors, but the similarities decreased during the pregnancy. It was suggested that sex effects may have heightened the differences in fetal activity.

Fetal twins were found to be less active than fetal non-twins, but the twins' breathing activity was higher during the third trimester of pregnancy. This may reflect the fact that twins show accelerated lung, placenta, and nervous system development from the middle to the end of the third trimester. The authors suggested that the twins' reduction in body movement and increase in breathing could represent an adaptation to crowding, lowered placental supply, and premature delivery.

Co-Bedding and Stress Reduction in Twins

The practice of co-bedding twins was inspired by the idea that twins' postnatal adaptation would be enhanced by continued physical contact with their co-twin. Specifically, it was suspected that close physical contact would allow recognition of familiar olfactory and auditory stimuli. Observed advantages of co-bedding twins include short-term (but not long-term) growth improvements, greater respiratory stability that affects sleep regulation (fewer pauses in breathing lasting more than 10 seconds) and fewer positive blood cultures. Singleton infants engaging in skin-to-skin contact with their mothers have shown reduced stress and reduced salivary cortisol release during heel lance. Explanations are unclear but might include sensory memories of the mother before birth or the frontal pressure, warmth, and regulation of the mother's breathing.

The first study of the possible calming effects of co-bedding on twins' stress following heel lance was conducted by Campbell-Yeo et al. (2014). Participants were 134 infant twins from 67 sets, born between 28 and 36 weeks' gestation. Twins were randomly assigned to a co-bedding (shared incubator or crib) or standard care (separate crib or incubator) group. Heel lances were performed between 24 hours and 10 days following study group assignment. Cortisol levels from salivary samples gathered prior to the

procedure and 20 minutes after the procedure were analyzed. Baseline differences in cortisol were not detected between the co-bedded and standard care twins. However, cortisol levels were significantly lower in the co-bedded twins at the 20-minute assessment. It was concluded that co-bedding twins reduced the stress associated with the heel lance procedure, an effect that might generalize to other contexts. In addition, it was speculated that co-bedding may attenuate the ‘resetting of the twins’ immature regulatory

pathways, as reported among very preterm newborns and linked to untreated exposure to pain.

An unfortunate methodological procedure urges a very cautious review of the findings from this otherwise well-conducted study. In particular, the personnel responsible for infant care were aware of which twins were co-bedded and which received standard care. Given the possibility of biased assessment in this investigation, additional efforts from independent researchers are required.

Public Interest

Identical Co-Twins’ Same Day Delivery

Identical twins Sarah Mariuz and Leah Rodgers delivered their first babies at exactly the same time in the time zones in which they lived (Murray, 2016). Sarah gave birth to a daughter at 1.18 a.m. in La Jolla, California, and Leah delivered a son at 1.18 a.m. in Denver, Colorado. The twins are 35 years of age and have always been close to one another. This is not the first time identical twins have delivered newborns on the same day, but it may be the first instance that the babies’ arrival times matched exactly.

Teaching Twins in Bosnia and the UK

Learning World, a bi-weekly television program that explores educational issues worldwide, recently looked at school policies regarding twins in Bosnia and the United Kingdom (Chappell, 2016; *Learning World*, 2016). The elementary school in the Bosnian town of Buzim includes 20 pairs of twins among the student body, whereas the greater community of 20,000 has 100. (Buzim is one of the few Bosnian areas with an increasing twinning rate.) Teachers recognize many twins’ desires to stay together in school and, in fact, most twins remain together through the high school years. The mayor of the town, Agan Bunic, hopes to promote Buzim’s reputation as a ‘Town of Twins’. A future goal is to organize national and international twin meetings, with the aim of attracting scientists and other interested individuals to the town.

The United Kingdom has also experienced a rising trend in twin births, as have many Western nations. Professor Pat Preedy, an ISTS member, was interviewed by *Learning World* to learn more about educational policies as they apply to twins. Preedy advocates no policy, allowing twins and their families the freedom to make these important decisions on a case-by-case basis. This process involves balancing the needs of twins as individuals and as a pair, factors that are likely to change across twin types. It is perplexing that most schools do not follow fixed practices when it comes to the classroom placement of non-twin

students, while refusing to be flexible when it comes to twins.

Twin Auctioneers

Fifty-nine-year-old identical twins, Leigh and Leslie Keno, are well-known American experts on Americana and vintage cars. Each twin has held prominent positions in the field – Leslie served as the director of American furniture and decorative arts at Sotheby’s, whereas Leigh was a well-regarded specialist at Christie’s. The twins have appeared in all 20 seasons of the PBS program *Antiques Roadshow*. Their impressive backgrounds make their recent behavior all the more curious (Rowley, 2016).

In the spring of 2016, a buying spree put the Keno twins in debt for \$60,000, resulting in legal action from two auction houses. In addition, the twins bid against each other during one auction, raising the price of ordinary items to unreasonable limits. For example, a rug priced at \$800 was eventually bought by Leslie for \$14,500. The twins have also made numerous purchases for which they have not paid, although they never took possession of the items. When asked, the brothers explained that their seemingly unusual bidding behavior was simply a misunderstanding. They have recently covered some of their debts and plan to make up the remainder as quickly as possible.

It is difficult to explain these twins’ uncharacteristic actions and activities. They are famous for the passion they bring to their work, their pleasant personalities on air and off, and their great expertise when it comes to American antiques. Their atypical behaviors would have attracted attention had they been singletons, but being twins assured even greater interest.

Sister, the Play

I was fascinated to read a review of the play *Sister*, starring real-life identical twins, Emily and Elizabeth Hinkler. The play is set at the end of the Weimar era in Berlin, Germany, as Adolph Hitler was coming into power. It concerns

twin sisters who struggle to survive in a one-room apartment with limited rations – but the focus is on the fact that one of the twins has cerebral palsy (CP), leaving her with impaired speech and a lack of function on the left side of her body. (CP and various other congenital anomalies have a common mechanism associated with monozygotic twinning; Pharoah & Dundar, 2009.) Despite her handicaps, this twin, named Matilde, writes brilliant political satire that her unaffected sister Magda performs. Matilde lives vicariously through Magda's experiences in the theater – and the audience views Matilde as a clever person and good writer because her sister does.

Interestingly, the play was written specifically for the Hinkler twins by Janet Schlapkohl while she took part in the Iowa Playwrights Workshop at the University of Iowa. The twins were juniors at the same school. I applaud Schlapkohl's efforts to feature real identical twin actresses in her work – I have seen several dramas that variously address issues of twinning and human cloning and only one (*Replica*) was truly convincing because it had cast identical twin actresses. I have not seen *Sister*, but am hopeful that plans to turn it into a film will be realized.

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