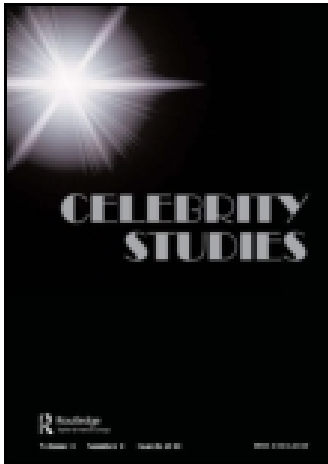


This article was downloaded by: [Ben Gurion University of the Negev]

On: 20 August 2015, At: 06:11

Publisher: Routledge

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: 5 Howick Place, London, SW1P 1WG



## Celebrity Studies

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/rcel20>

### The social structure of celebrity: an empirical network analysis of an elite population

Gilad Ravid <sup>a</sup> & Elizabeth Currid-Halkett <sup>b</sup>

<sup>a</sup> Department of Industrial Engineering and Management , Ben Gurion University of the Negev , Beer-Sheva , Israel

<sup>b</sup> Price School of Public Policy , University of Southern California , Los Angeles , CA , USA

Published online: 25 Jul 2013.

To cite this article: Gilad Ravid & Elizabeth Currid-Halkett (2013) The social structure of celebrity: an empirical network analysis of an elite population, *Celebrity Studies*, 4:2, 182-201, DOI: [10.1080/19392397.2013.791047](http://dx.doi.org/10.1080/19392397.2013.791047)

To link to this article: <http://dx.doi.org/10.1080/19392397.2013.791047>

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the "Content") contained in the publications on our platform. However, Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Any opinions and views expressed in this publication are the opinions and views of the authors, and are not the views of or endorsed by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor and Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. Terms & Conditions of access and use can be found at <http://www.tandfonline.com/page/terms-and-conditions>

## The social structure of celebrity: an empirical network analysis of an elite population

Gilad Ravid<sup>a</sup> and Elizabeth Currid-Halkett<sup>b\*</sup>

<sup>a</sup>*Department of Industrial Engineering and Management, Ben Gurion University of the Negev, Beer-Sheva, Israel;* <sup>b</sup>*Price School of Public Policy, University of Southern California, Los Angeles, CA, USA*

(Received 1 October 2011; final version received 16 March 2013)

Celebrities are anecdotally one of the most observed groups in contemporary society, but are difficult to capture in large-scale quantitative empirical analyses. In this analysis, we use a unique dataset, Getty Images photographs, to study this social group and its various network structures. Overall, our analysis demonstrates that celebrity networks are characterised by low degrees of separation and high connectivity between one another. Higher industry status ('talent') and media profile form particular, more exclusive, networks within the larger universe of celebrities. Our empirical results stack up with the theory of 'superstars' and the 'rich-get-richer' model of preferential attachment and cumulative advantage. We speculate that there may be substantial social and economic outcomes to being more connected to other celebrities that transcend the social ties observed at the documented social events.

**Keywords:** celebrity; popular culture; social networks; media

### Introduction

Over the past two decades, celebrities and their associated media have become a significant line of scholarly inquiry (Marshall 1997, 2006a, 2006b, McCracken 1989, Turner 2004, 2006). This work has evolved from historical accounts of fame (Braudy 1986) to the more recent analysis of the mediated construction of celebrity as a function of events and mass-produced commodified culture (Rindova *et al.* 2006, Turner 2006, Thrift 2008) positioning celebrities as what Thrift (2008) 'has called 'mechanisms of fascination' and Marshall (2010) 'presentational culture'. Yet whilst celebrities are anecdotally one of the most known and observed groups in contemporary society, the empirical quantitative study of celebrity fits into the larger challenge facing scholarly work on elites, whereby data on these groups are difficult to attain (Hertz and Imber 1995).

In this paper we use a unique data set, Getty Images photographs, to study the social structure of celebrities, taking into account the spatial perspective of their social networks. While scholars before us have looked at the role of celebrities in media, consumption, symbolic and aspirational capital, the study of celebrities as a product of their social networks and the milieus in which these networks form has not been undertaken. Drawing from Marshall's (2010) conception of 'presentational culture', we look at the social-network patterns that can be observed from the media presentation of celebrities, as documented by

---

\*Corresponding author. Email: [currid@usc.edu](mailto:currid@usc.edu)

their attendance of events and the associated spatial context. We ask the following questions: what might be the distinguishing characteristics that define celebrities vis-à-vis other social formations? What does the social structure upholding celebrity status look like? How might celebrity social networks differ from random networks? What role do specific geographically bound events play in the formation of stardom's social networks?

Historically celebrities are individuals who have attained renown due to talent or success within a highly visible popular-culture industry: film stars, musicians, TV personalities and so forth (Adorno 1991). The rise of reality TV and social media have created stars emerging through more democratic and simultaneously less talent-driven conduits (Turner 2004, Currid-Halkett 2010). Regardless of their endowment of talent, the most defining and consistent element of a celebrity is that such an individual is visually recorded with great frequency by the media (Boorstin 1962) and that he or she is frequently documented spending time with other highly visible individuals in what Marshall (2010) calls the 'performance' and 'extratextual dimensions' (Marshall 2006b), the latter of which he defines as being 'out of control of an industry' per se and whereby social events (such as award ceremonies and movie premieres) translate stars into cultural commodities. In other words, film stars are not simply aligned and identified by their films but also the awards, scandals and visual reportage that also help establish their public persona.

We borrow from Boorstin (1962) as our point of departure. We define celebrities as individuals who share the distinguishing trait of *being frequently visually documented by the media and popular press with other highly visible individuals at high-profile events*. We will assume this general definition throughout the discussion of our research and results. We would not be able to observe 'celebrities' without knowing the types of social structures and relationships amongst them that distinguish them from 'everyone else'. We 'know' through media reportage that tells us they were invited and we were not, which is what makes them celebrities and us not. Thus, celebrities uphold their position by maintaining their network of events and frequency of interaction with one another. In Boorstin's (1962) conception, 'Being known primarily for their well-knownness, celebrities intensify their celebrity images simply by becoming widely known for relations among themselves. By a kind of symbiosis, celebrities live off each other' (65). Media promotes both the 'extra-textual dimensions' and the events that define celebrities as a social group. Drawing from both Boorstin (1962) and Marshall (2010), we look at celebrities as those individuals who are frequently visually documented by the media with other highly visible individuals. We expand Boorstin's and Marshall's conceptions of celebrity to study how the interplay of media, networks and events plays out within a spatial context of events and industry milieus.

From the sociological literature, we also look at the duality of celebrities as persons and groups (Breiger 1974) within the larger context of their social networks. Thus in this paper, we study celebrities as both individuals (the actress Angelina Jolie, the late Princess Diana) and a highly exclusive social category that engages in high profile activities and events that are significantly documented by the media (for example the Grammys, Vanity Fair Oscar Party, Costume Institute Ball). Yet while celebrities can be documented at member-only events, not all celebrities attend the same events or engage with one another. Thus individuals can share the common characteristic of being celebrities, and yet within this category they form distinct social groups via the network of people and events they engage in frequently. Using empirical data to study the social and spatial linkages amongst individuals, we attempt to define the social category of celebrity and then seek to study the subgroups that form within the larger framework of celebrities through an analysis of their social

interaction and what characteristics might explain interaction and the events they frequent together.

In order to circumvent celebrities' inaccessibility, we use Getty Images photographs, a unique data set of high-profile events and individuals, as a proxy for defining people as being part of the celebrity social group. We studied the photographic database from March 2006–2007, collecting 616,248 photos documenting 66,100 people in these photos taken at 11,800 events at 128 locations around the world. We are interested in the way in which some individuals within the celebrity category become parts of particular networks and social milieus and what variables or characteristics might explain their formation. Employing social-network analysis, we studied the interactions between the different individuals in the photos and the types of events where the photographs were taken. We divide our analysis into three parts. We start by looking at the whole network and then deconstruct it looking at extrinsic characteristics. In Part One, we study the Getty Images database as a whole. We look at celebrities as a social group, outlining the network structure of this category vis-à-vis other types of observed and previously studied social networks (for example, families, small communities, schools). In Part Two, we study celebrities through two discrete (but not mutually exclusive) characteristics: industry prestige (using the case of the film industry) and media profile. We find that distinct network structures and social groups are associated with particular groups of celebrities as defined particularly by their perceived status within their industry and the public and media interest in them. In Part Three, we look at event networks for the entire Getty Images photographic dataset and then study events by isolating those associated with the industry prestige and media criteria. We conclude with a discussion on the implications of our analysis.

### **Celebrity theory and concepts**

Despite their omnipresence in mass media (Boorstin 1962, Turner 2006) and ubiquity in society, the quantitative study of celebrities remains an emerging line of inquiry in social-science research. While media researchers, historians, and cultural and critical theorists have long documented celebrity (Braudy 1986, Marshall 1997, Turner 2004), the limited quantity of social-science scholarship has focused primarily on four facets of celebrities: the winners-take-all quality of superstar markets (Rosen 1981, Adler 1985, MacDonald 1988, Frank and Cook 1995, Cowen 2000), the actors and gatekeepers involved in creating and promoting celebrities (Gamson 1994, Turner 2004, 2010), the relationship between celebrities and their public or fan base (Dyer 1979, Braudy 1986, Marshall 1997), and the commodification process of celebrities through advertising endorsements and consumption patterns (McCracken 1989; Argawal and Kamakura 1995; Baym 1993). From the view of the public, celebrities are the definitive reference group, one that has become increasingly significant in modern society with the advent of reality television, celebrity tabloids and social media devoted solely to the documentation of celebrities (Braudy 1986, Gamson 1994, Turner 2004, 2006, Marshall 2010).

Within social science, the economic model of superstars may be a useful starting point in defining celebrities. The superstar, similar to winner-take-all markets, is a position whereby some individuals maintain elite status by attaining most of the rewards in their respective markets. Initially put forth by Rosen (1981) and expanded by Adler (1985), the superstar model is defined by the disproportionate popularity of and economic reward appropriated to cultural producers (musicians, actors and so forth) who exhibit marginally more talent at the outset, a process similarly conceptualised in the 'Matthew effect' (Merton 1968) and later empirically tested by Salganik *et al.* (2006).

The most significant contribution to the study of celebrity lies in cultural studies and media scholarship. Cultural theorists and media scholars have pioneered the study of celebrity, positioning the phenomenon (and its associated individuals and accoutrements) as a function of media construction and the public's response to such efforts (Marshall 2010). As Rindova *et al.* (2006) argue, economic reward from celebrity appears to be more closely linked with public attention bestowed upon particular individuals and positive emotion response to them.

Within this literature, one of the critical components to celebrity culture is the interplay between fans or attentive audience and the celebrity (Jenkins 2006). The cultivation of celebrity is emblematic of the actor's connection with an audience, and therefore public attention is necessary in order to elicit response or reaction. As recent scholarship points out, the generation of this interplay is rarely organic. The media is an important mediator in this dynamic by focusing such interest and attention on an individual level. As such, the media creates 'pseudo-events' (Boorstin 1962), or what Marshall (2010) calls 'extra-textual dimensions', through which celebrities emerge in order to generate mass commodities and information to the public (McLuhan 1964, Braudy 1986, Adorno 1991). However, the production of celebrity through the media results in the speculation as to whether the actor's behaviour is authentic and conforms to the 'patterns of expectations'. Within this larger context, certain celebrities seem to have suddenly risen to fame despite not having any particular talent, and disappear from the public eye just as quickly. Rojek refers to this phenomenon as a 'celetoid', defined as a media-generated 'compressed and concentrated' form of 'attributed celebrity'. A sub-category of the celetoid is the 'celeactor', a fictional character that suddenly becomes ubiquitous in popular culture, for example, James Bond. Both forms of attributed celebrity are a result of mass media fulfilling a need from the public for a character that is fitting for the times. Within this extant literature, the context revolves around the relationship between the fans, the media and the emergence and perpetuation of the star, and the manufacturing of the celebrity. Implicitly, all such social and economic phenomena occur in particular milieus, whether virtual or spatially grounded in Hollywood or otherwise.

In the economic geography and sociology literature, an emerging line of research has begun to tease out the relationship between the rise of such elite cultural producers, their consumers and their geographical location (Crane 1989, Currid 2007; Currid and Williams 2010; Molotch and Treskon 2009, Currid-Halkett and Ravid 2012). This research allows us to understand the spatial dimensions of celebrity culture and the mechanisms of its production as it pertains to a spatial context. For example, Currid (2007) argues that the rise of elite cultural producers (such as film stars, musicians and artists) is dependent on the spatial context of the gatekeepers, consumers of culture and the media that writes about and anoints particular people as stars. Earlier work by Crane (1989) linked the rapid success of particular artists to their linkages with New York-based 'gatekeeper galleries'. More recent work on the geography of stardom notes that the success of Hollywood players can be dependent on such specifics as having a Los Angeles-based mobile-phone area code (Currid-Halkett 2010). This paper takes a spatial look at the studied elements of celebrity, seeking to understand the geographical elements to celebrity's social and economic dynamics.

### *The social dynamics of celebrities*

How, then, to understand celebrities' position in society and the geographically bound milieus from which stardom emerges and depends upon? A start is to define celebrities vis-à-vis other social groups. We attempt here to establish a few distinguishing traits of

the celebrity category. Celebrities are a clear example of the ‘elite’ (Mills 1956, Bell 1958, Bottomore 1993). But their elite status is not just of economic and social power, but is also predicated on a public to reinforce and affirm their social position. In their ability to draw fans and a collective public, celebrities exhibit qualities of ‘charismatic authority’ (Weber 1947; Dyer 1979). Celebrities’ ability to attain a public is in part due to their perceived desirable and attractive qualities (Blau 1960, Dyer 1979). As Merton and Kitt (1950) observe, we are influenced and attracted to groups of which we are not members. The relationship between the idol and his public is necessary in the establishment and persistence of celebrities (Braudy 1986). While celebrities can exist in many realms, perhaps due to their visual documentation, celebrities tend to be the most pronounced in the highest rungs of the culture industries and, more particularly, popular culture (Adorno 1991).

The exclusivity of celebrities vis-à-vis other social categories and groups hinges in part on the fact that many celebrities tend to be members of the same social network as other celebrities, which reinforces their celebrity status (Boorstin 1962). This statement does not mean that celebrities only spend time with other celebrities, but like other types of social categories and groups, celebrities conform to particular institutional constructs and access to those institutions cultivate the social group, linkages with people and resulting social networks (Levi-Strauss 1969, Granovetter 1973, Frank and Yusmoto 1998, Woolcock 1998). In ordinary life, people come together due to shared interests or attributed status (Breiger 1974). Often such interaction revolves around particular activities or events linked to individual attributes: family reunions, Gettysburg war enactments, Star Trek conventions, birthday parties and so forth. However, the unifying unique quality of celebrity as a category is that it rests on the media documenting it and affirming that such a category exists through reporting on the exclusivity of the institutions, events and social networks of which they are a part, regardless of the industry they are affiliated with or whether they are viewed as talented or talentless.

We believe we can learn a lot about celebrities as a social group and the networks that they form through studying their social interactions and the social milieus that define celebrities. We are also interested in what social and economic outcomes emerge from these networks. In particular, the exclusivity of the events and ongoing interactions occurring at those events creates the social group that defines celebrities. In other words, celebrities are not all film actresses, they don’t all have blue eyes, or all attend one annual event. We define celebrities as a group primarily through repeated attendance with each other at multiple media-recorded events that non-members are not privy to: Marshall’s extra-textual dimensions, where stars use award ceremonies and premieres to turn their image into a cultural commodity. They do not all attend the same events, but in fact a wide number of events. Through studying celebrities through the exclusivity of the people and events they all attend, we may begin to understand how we define celebrities, and differences amongst them. Only after such analysis can we draw conclusions about celebrities’ social structure and the social and economic outcomes associated with being a member of this social formation.

The spatially bound context of these networks is a crucial additional element to this analysis. Celebrity networks exist in specific places – whether online or ‘real’ places – and stars’ participation in these networks appears essential to their careers – as is the case with many winner-take-all industries and groups (Hirsch 1972, Becker 1982, Caves 2000, Currid 2007, Godart and Mears 2009). Stardom, in other words, exhibits a geographical manifestation. This article articulates the social structure of celebrity and its spatial dynamic.

### Using empirical data to study celebrity network structures

Like other elite subgroups, meaningful and robust data on celebrities is difficult if not impossible to attain (Hertz and Imber 1995). An earlier study of the French financial elite compiled media reports and rankings from various outposts, while still issuing the disclaimer that such data was limited in scope and ability to illuminate the intended behaviour of the individuals within the subgroup (Frank and Yasumoto 1998). Others have looked at superstars using theoretical models (Rosen 1981, Adler 1985). Chapin (1950) took data on small villages to isolate 'stars' within the group. We chose to use Getty Images, a large-scale, worldwide photographic dataset, to undertake an empirical study of the network structure and social dynamics within the celebrity social group. We chose this market-driven photographic data because it captures the defining quality of celebrities as individuals who are highly documented by the media at highly profiled events with other well-documented individuals. As celebrity relies extensively on a mass audience and highly visible events, Getty is used as a proxy for measuring the individuals and events associated with the celebrity category. Photos are an important currency in creating visibility and celebrity status (Boorstin 1962, Marshall 2010, Turner 2010), creating what King (2011) calls 'traces of presence'. Thus those individuals and events photographed tend to be those that the media and the mass public are interested in.

Additionally, images can be a good proxy for understanding rough network structure, as they record interactions between people and associations of people with events (Naaman 2005). Recently, the use of photos and social media to study social phenomena has been conducted in fields from geography to computer science (Zook *et al.* 2004, Currid and Williams 2010; Nov *et al.* 2009). While there are other photo catalogues that could have been used, Getty Images is the most comprehensive and largest of such photographic databases and its photos tend to be used in a diverse collection of media outlets ranging from the tabloid press to mainstream newspapers. Getty captures several of the identified attributes of celebrity: highly visible and documented through the media, affiliated with high-profile entertainment events and industries and generating a product (the photograph) which is distributed to a large audience. Additionally, because Getty is a market-driven dataset, it can loosely be thought of as a kind of cultural stock market, whereby only the most market-valued individuals, events and groups will be photographed. These individuals and events are the most documented in celebrity journalism, posted on celebrity and popular-culture websites and featured in popular television. That Getty photographers choose to show up at events and take pictures of particular people is a fairly accurate gauge of whom the media and the mass public would characterise as celebrities.

In order to study whether the celebrity category consisted of subgroups, we further narrowed the dataset by industry (Hollywood film) and status within the industry as measured by industry gatekeepers. We used the 2009 Forbes Star Currency index to study possible social-group formation through industry status. Forbes undertook a comprehensive survey of 157 Hollywood studio executives and their preferences for particular actors and actresses. Preferences were based on whether or not an actor was perceived as 'bankable' and their ability to generate box-office receipts, attain production financing and increase theatrical distribution.<sup>1</sup> The Forbes list is a compilation of the survey results, ranking 1410 actresses and actors. We then created three distinct categories of Hollywood stars based on ranking: top 20, middle 20 and bottom 20. We then looked at these individuals within the larger Getty network to study if ranking played a role in defining a group and what characteristics and network structures emerged.

Undoubtedly, while celebrity can emerge from 'talent', celebrity status is also a function of being acutely publicised through various media outlets; that is, a celebrity is

‘well-known for his well-knownness’ (Boorstin 1962). We were interested in how media profile might form subgroups. We used Google Blog search results from March 2006 to February 2007 to study the media volume of stars and to analyse the most mentioned celebrities in the Getty database. We studied the network structure and group formation of these individuals.

### **Quantifying celebrity social networks: methodological approach**

We attempt to study celebrities through looking at the networks of people in photographs and the way in which these networks of people form social networks (Breiger 1974). Co-attendance at events with other high-profile individuals is a proxy for membership and social capital within the celebrity social category (Putnam 2000). Our method consists of several steps. In step one we developed a proprietary web bot that harvested meta information on the pictures in Getty database.<sup>2</sup> In step two, our target was to identify the photographed people in each picture. The data that we have is not in the form of actual photos, but instead is an aggregate catalogue of the accompanying photo ‘caption’ information that we collected. Implementing natural language processing (NLP) methods, we were able to identify the photographed individuals in the photos. Our cataloguing process included the individuals in each picture, the event where the photo was taken, the date of the photo and the individual’s occupation (for example: Actress Angelina Jolie at the Oscars, 22 February 2007). In step three, using the information in the database, we built a list of events and celebrities photographed at them. From this list we built a two-mode network which essentially connects people to events. The nodes are people and events they connect with through an ‘undirected edge’, meaning that there is no causal direction to the connection. Thus, a person is connected to an event simply if that individual is photographed at the event. In step four, we converted the two-mode network to one-mode network of co-attendance, looking at linkages between individuals by studying which events they both attended. In this newly formed network, the nodes are people and two nodes are connected by an undirected edge if they are photographed at the same event. The edge value equals the number of events they are co-photographed at. We were interested in observing individuals who both regularly attend and are regularly photographed at events, thus indicating potential for group formation within the celebrity category. This, in order to remove noise, we analysed the network of people who were photographed at more than three events. This criterion is a good proxy for level of media interest in particular individuals, frequency of event attendance and frequency of interaction amongst nodes.

We also built a one-mode network of events. In this case the nodes are events, two events are connected with an undirected edge if a least one person attends both events. The edge value equals number of people who attend two events together. The following results are based on these networks.<sup>3</sup> Finally, we used the criteria rankings established in Forbes Star Currency and Google media mentions to study the network structure of particular groups within the Getty dataset. Below we discuss our findings.

## **Results**

### ***Part 1: Getty Images celebrity network***

Do people photographed by Getty Images exhibit different network structures than random networks? The entire Getty network consists of 66,100 nodes (people) and 2,705,937 connections (between unique people). The network’s density is 0.0006 with average degree of



75.74. Due to the nature of our dataset this network contains noise, recognising some places and objects as subject names, along with people who appear to only have attended one event. As such, we also looked at the network of nodes that are in at least three photographs. This smaller network consists of 6754 nodes and 798,636 connections, and average degrees (number of connections to other people) of 236.49. Returning to the entire Getty network, we examined two network models, scale-free and small-world networks, to see if the people documented in the Getty Images dataset exhibited qualities of these types of special network structures.

*The scale-free network: celebrities and cumulative advantage*

A network is a scale-free network if the nodes' (that is, people) degree frequency distributes according to the power distribution (Barabasi and Albert 1999, Ravid and Rafaeli 2004). The defining characteristic of scale-free networks is that participants attain disproportionate benefits, a phenomenon that could be called in common parlance 'the rich get richer'. Examples of the scale-free network are observed in the World Wide Web, whereby certain websites get a disproportionate amount of traffic, in academic citation networks (for example Merton's (1968) 'Matthew effect') and in unique social networks, and is indicative of cumulative advantage properties (Barabasi and Albert 1999). We find that the celebrity network demonstrates scale-free network properties (See Appendix A for graphical representation of the scale-free network).<sup>4</sup>

*Celebrities and the 'small-world' phenomenon*

Small-world networks are networks where most nodes are not neighbours of one another, but most nodes can be reached from every other by a small number of hops or steps (Watts and Strogatz, 1998). In the case of people, small-world networks indicate that individuals within a social network tend to be highly connected to everyone within the group and that their degrees of separation, even between those they are not directly connected to each other, are very small.<sup>5</sup> Small-worlds exhibit two properties: low degrees of separation between people – measured by the Characteristic Path Length (CPL) – and high Clustering Coefficients (CC), which indicates the extent to which all of the individuals in one person's network are also highly connected (see Appendix B for detailed results). In more prosaic terms, if my social network can be characterised as a small-world network, all of my friends all know each other and even those who don't can connect easily through a few contacts. While networks tend to exhibit six degrees of separation (Milgram 1967, Watts and Strogatz 1998), those within our celebrity network are connected by 2.55 degrees of separation.<sup>6</sup>

The celebrity network, as defined by Getty Images, is a small-world network, which means that despite the large number of unconnected individuals, these individuals can reach each other through a few steps and for the most part they are already all immediately connected to one another.

***Part 2: Extrinsic decomposition: industry status and network structure: Forbes Star Currency and Google media mentions***

Social networks are formed through interaction over time, identity with other members and establishing norms that non-members do not possess. How might celebrities as a broader social group begin to form smaller cliques through particular characteristics and socialisation patterns of the individuals? How might these characteristics reflect network

structure? In order to study this process of group formation, we isolated a particular type of celebrity and assigned status based on industry expert opinions. Using the Forbes Star Currency index, we isolated the most valued Hollywood film stars as rated by top movie executives.<sup>7</sup> We then categorised film stars by their industry ranking, using three different categories: top 20 (rank 1–20), middle 20 (rank 705–725) and bottom 20 (rank 1376–1410). Below are the graphic depictions of these categories' respective network structures (See Figures 1–3).

This section of our analysis demonstrates some of the most interesting results. We find that within the larger listing of 1410 actors and actresses, there is a wide discrepancy within the three clusters. In particular, the top-20 network exhibits homophily, which means that the group tends to spend only time with each other (see for example Lazarsfeld and Merton 1954, Watts and Kossinets 2009), along with being the densest and most connected network (see Figure 1), suggesting that the top-ranking film stars truly represent a particularly closed and highly connected network structure within the larger network. Their exclusivity can be defined by the events they go to and the relatively small number of people that they are connected to. (see Table 1, Figure 1). The bottom 20 produces no meaningful network or connections amongst the film stars (Figure 3). In other words, it is no more socially advantageous to be ranked in the bottom of Star Currency than to be in the larger celebrity network. Only the top 20 attain social-networking benefits from their grouping. On one level, these results correspond to the common phrases 'A-list', 'B-list' and so forth. However we were surprised at the diversity of results based on industry status. We expected one of two outcomes from our analysis: either there would be no notable linkages within each ranking or we would observe film stars within their rankings exhibit similar network properties but within their respective ranking. Instead, we find that being ranked highly by the industry gatekeepers is strongly correlated with being invited to the same events, thus having a dense network structure with other highly ranked film stars, but no connections amongst the stars with lower ascribed status. We also observe that network density and degree increases from the bottom- to middle- to top-ranked clusters (See Table 1).

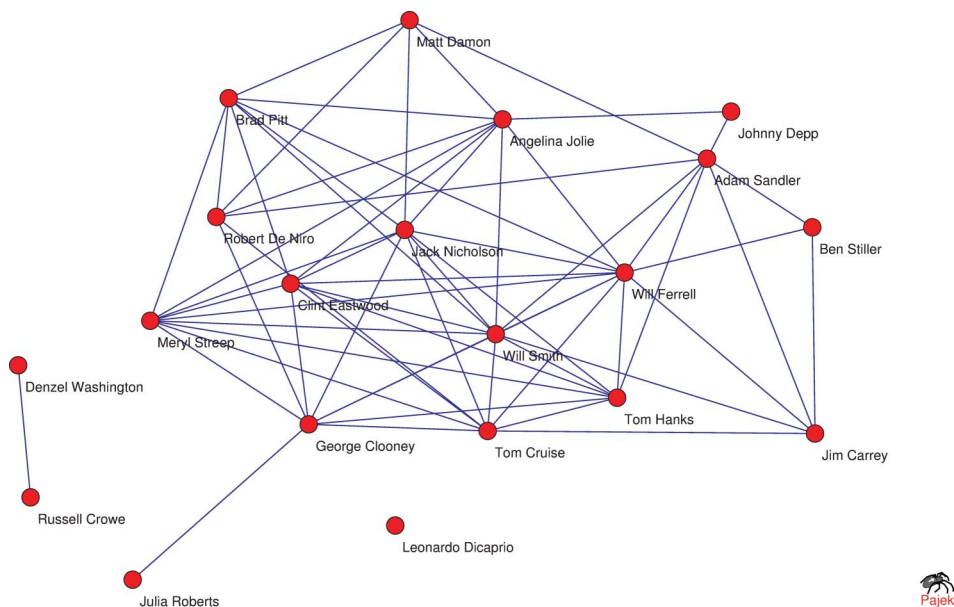


Figure 1. Social network of the top 20 Forbes ranked stars.

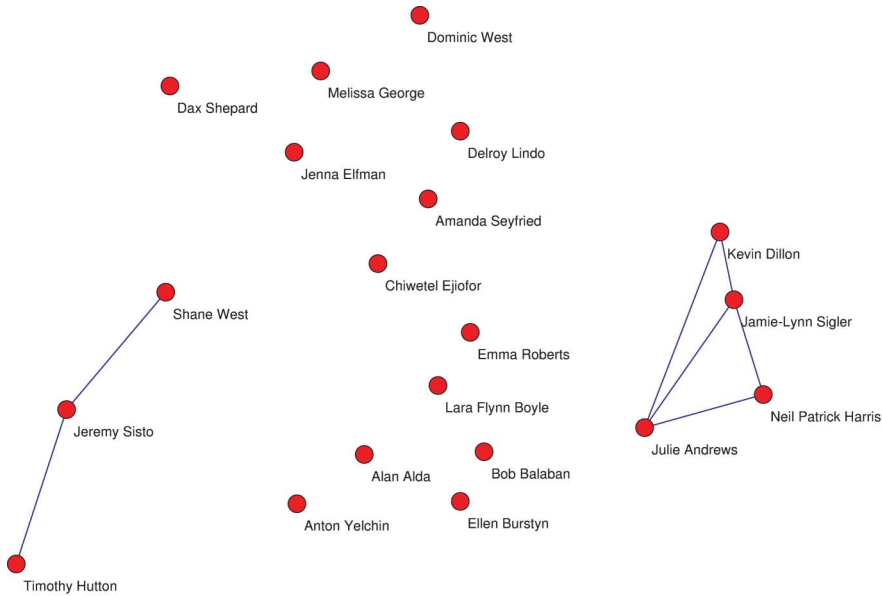


Figure 2. Social network for middle 20 stars.

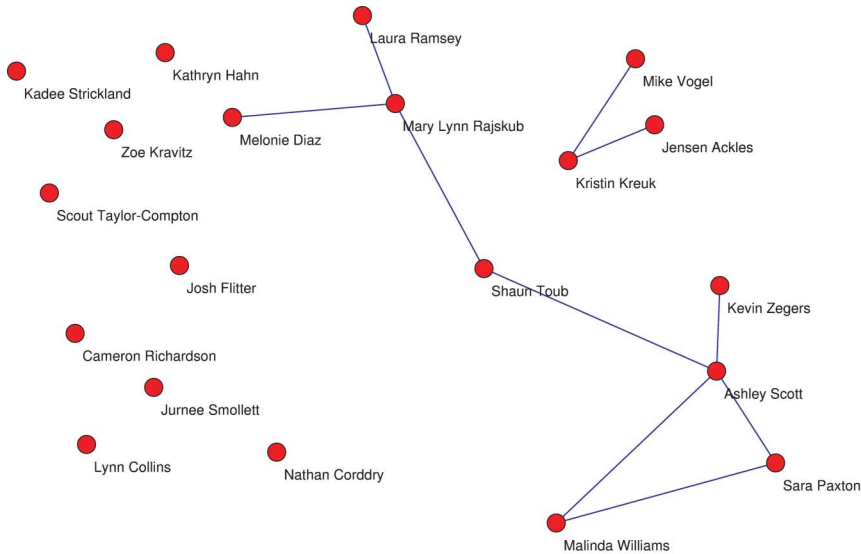


Figure 3. Social network for bottom 20 ranked stars.

***Famous for being famous: network structure of greatest Google media volume celebrities***

Celebrities are fundamentally defined by their well-knownness, which is a function of frequent media reportage. Do those disproportionately well-known celebrities tend to have



Table 1. Comparison of network structure characteristics between top, middle and bottom Forbes Star Currency-ranked film stars.

	Top 20	Mid 20	Low 20
Minimum Star Currency rank	1	705	1376
Maximum Star Currency rank	20	725	1410
Number of stars (tried to select)	20	21	35
Number of stars in the group	20	20	20
Number of links	63	13	10
Density	0.332	0.068	0.053
Average degrees	3.15	0.65	0.5
Clustering coefficient	0.612	0.542	0.361
Connectedness	0.721	0.289	0.163

Table 2. Top 20 individuals by Google media volume.

Rank	Name	Volume of blog media mentions	Star Currency rank
1	Michael Jackson	952,568	—
2	Britney Spears	125,704	—
3	Madonna	81,507	—
4	Paris Hilton	77,913	645
5	Beyonce	64,557	210
6	Lindsay Lohan	62,513	153
7	Angelina Jolie	52,161	2
8	Brad Pitt	44,591	2
9	Jessica Simpson	44,259	462
10	Tom Cruise	42,770	13
11	Justin Timberlake	42,427	180
12	Anna Nicole Smith	38,027	—
13	Jennifer Aniston	37,577	55
14	Johnny Depp	37,550	2
15	Mariah Carey	36,195	—
16	Kanye West	35,786	—
17	Jessica Alba	34,689	108
18	Christina Aguilera	33,760	—
19	Miley Cyrus	33,064	177
20	Kim Kardashian	32,609	—

unique network characteristics and are these qualities different from those who are most regarded by their industry? Do they have unique properties vis-à-vis the Getty Images celebrity network as a whole? To analyse media stars, we analysed the top 20 people ranked by their blog coverage during the study period as reflected by Google Blog search results (Table 2). We programmed a web bot to search for each person in the Getty Images celebrity network for their blog coverage in Google Blog search. Not all people who are mentioned frequently on blogs are also film stars (examples include Michael Jackson and Britney Spears), thus not all celebrities studied have a Forbes Star Currency ranking. Some of the 'bottom 20' celebrities on the Forbes Star Currency list did not show up in the Getty photographs and thus we had to take a larger sample from the rankings to attain 20 individuals.

The comparison between the top 20 Star Currency film actors and top 20 according to Google media coverage (Table 3) shows that the top 20 media stars have fewer connections

Table 3. Network comparison between Star Currency and Google media coverage.

	Top 20	Blogs Top20
Minimum Star Currency rank	1	2
Maximum Star Currency rank	20	645
Number of stars (tried to select)	20	12
Number of stars in the group	20	20
Density	0.33	0.32
Average degree	3.15	3
Clustering coefficient	0.61	0.71

within their network than the highly ranked film stars, and their network is derived from a much larger number of events. This finding did not come about because they go to smaller events. These individuals go to events of the same size as those celebrities ranked highly in Forbes' Star Currency but they attain fewer social benefits from their interactions. Despite their frequency of interaction, those ranked highly in Google media mentions have smaller cluster coefficients (less connectivity amongst their social circle) and a smaller number of degrees (or number of people with whom they interact). We speculate the implications of these findings in the final section of this paper.

#### ***Part 4: 'Presentational culture': the events perspective***

Drawing from Marshall's (2010) conception of 'presentational culture' as a means to promote self and celebrity status, we look at the geographically situated places and events in which these social networks are formed. We convert the above two-mode network into a one-mode event network. In this case, each node represents an event and two events are connected if and only if at least one person is photographed at both events. We can find similar or connected events by looking at the components. Looking at nodes with degree > 1000, we identify three types of events that appear to have frequent attendance by the same people. These clusters of events appear industry-specific with strong co-attendance of events associated with film, music and fashion, respectively. The upper-right corner depicts the film-related events, the lower-left corner the fashion-related events, and the lower-right corner are the music-related events (Figure 4). Some events appear to act as 'bridges' between these industry event groups: the MTV Video Music Awards, Grammy Awards and the Metropolitan Museum of Art's Costume Institute Ball, Anglomania, are events that tend to be attended by diverse people from different groups within the Getty network.

We are interested in whether most highly ranked film stars were strongly correlated with specific events. In this stage of our analysis, we looked at the place-specific events and milieus associated with each status category of film star. We find that the top 20 film stars are most affiliated with the most prestigious industry events (the Oscars, Golden Globes and Vanity Fair Oscar Party, for example) (Table 4), which are also the most photographed events as measured by volume of photos taken (also a proxy for value to media and public). The bottom 20- (Table 5) ranked film stars have no strong affiliation with any event; even the top event as ranked by frequency of bottom 20 in attendance has only three of the stars in attendance. There are no other events that tie the bottom 20 together, while there are several that seem to link the middle 20 to each other and increasingly more that link the

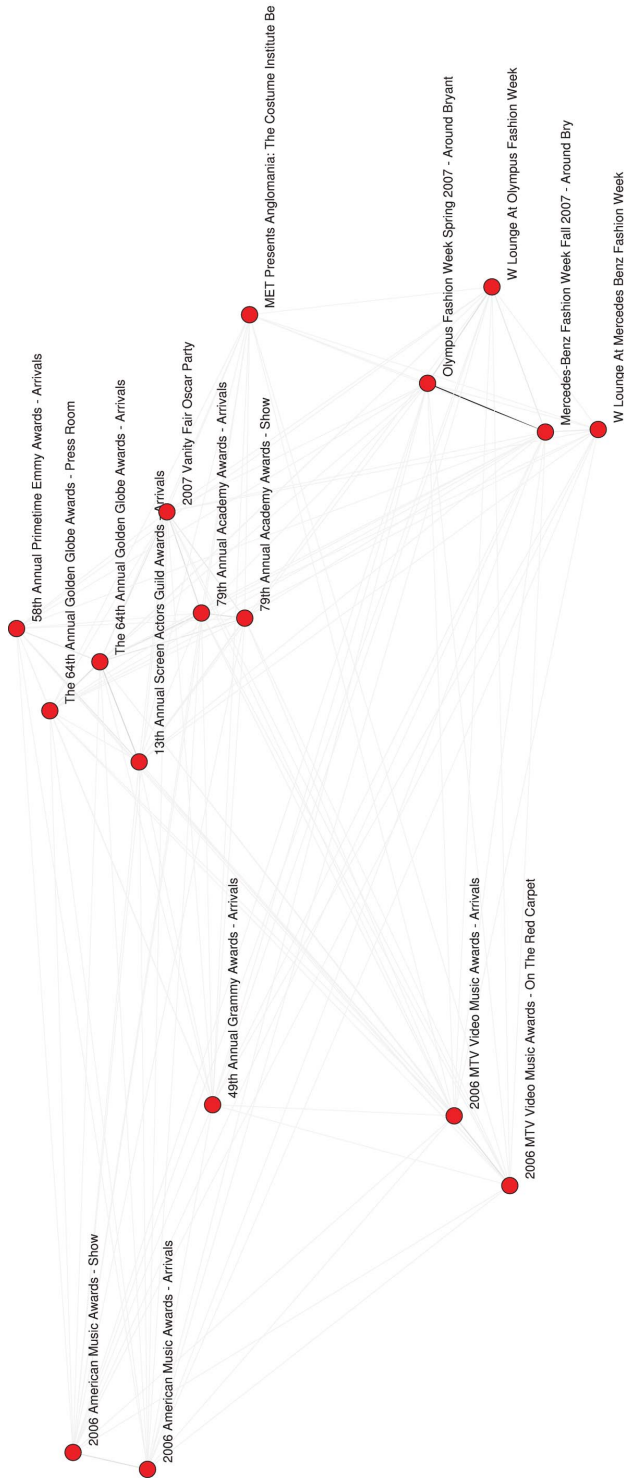


Figure 4. Celebrity event network structure.

Table 4. Top 10 events most frequented by Star Currency top-ranked film stars.

Number of top-20 film stars photographed	Event
7	79th Annual Academy Awards – Show
5	The 64th Annual Golden Globe Awards – Arrivals
4	Universal Presents the World Premiere of <i>The Good</i>
4	Celebrity Dads
3	Newmarket Films Premiere of <i>God Grew Tired Of Us</i>
3	B.E.D. Turns Into Celebrities Hot-Spot
3	19th Annual Kid’s Choice Awards – Show
3	79th Annual Academy Awards – Arrivals
3	The 64th Annual Golden Globe Awards – Show
3	Tom Cruise and Katie Holmes – Wedding Day

Table 5. Top ten events frequented by bottom 20-ranked film stars.

Number of bottom-20 film stars photographed	Event
3	58th Annual Primetime Emmy Awards – Arrivals
2	20th Century Fox Television 2006 Emmy Party – Arrivals
2	Premiere Of <i>Standing Still</i> – Arrivals
2	Disney-ABC TCA A1- Star Party
2	New Line Cinema’s Premiere of <i>Snakes On A Plane</i>
2	Warner Bros. Pictures Premiere of <i>The Departed</i>
1	Warner Bros. Television Emmy Party
1	Opening Night of <i>Three Days Of Rain</i> At Bernard
1	Pre-gala party For <i>Rock The Kasbah</i>
1	Premiere of <i>I Think I Love My Wife</i> – Arrivals

top 20. These results affirm our previous results studying the network structure of these groups: the highly ranked film stars exhibit homophily through a very tightly connected network upheld by attending the same high-profile events with each other. The bottom 20-ranked film stars do not form notable network connections or attend particular events with frequency, thus are not distinguishable as a social network from the larger universe of studied celebrities.

**Implications**

In this article, we seek to study celebrities through their relationships and connections to each other and the spatially bound events and social milieus that enable these networks to form. Getty Images photographic data was used as an empirical tool to study an otherwise highly elite and inaccessible population. Overall, the Getty Images photographic dataset demonstrates that celebrities documented by Getty Images form a small-world network (Watts and Strogatz 1998) which exhibits cumulative advantage and rich-get-richer attributes as found in other scale-free networks (Barabasi and Albert 1999). More generally, the celebrity network exhibits the same traits as those observed by Stanley Milgram (1967) in small community structures. We find this result noteworthy. Despite there being

Downloaded by [Ben Gurion University of the Negev] at 06:11 20 August 2015

no real reason for these people to be at events together (other than say musicians at the Grammys or actors at the Oscars), and lack of necessary connections amongst the various celebrities, the small world found amongst celebrities exhibits high connectivity amongst even the friends of particular stars. Getty Images documents many culture-industry events, and yet we found that an individual's connections with other people could not be fully explained by just industry affiliation (for example two Hollywood stars), thus celebrities form their social networks through events and people they associate with unrelated to any obvious connections, other than their shared characteristic of being recorded by the media with frequency; that is, they are celebrities.

Much aforementioned empirical and theoretical work has been undertaken to understand how social groups are formed within larger network structures. We found that within the larger celebrity network, groups formed in three ways: through similar network characteristics, industry status and media profile. Status and media profile appear to be cultivated through number of events attended and significance of event (approximated through number of photos taken). Through these criteria, subgroups of more or less exclusivity and unique network properties emerged.

Sociological theories on how groups and networks are established inform our findings (Simmel 1955, Blau 1977). A few observations are worth noting here. First, celebrities are a diverse group of individuals who are primarily defined by their media visibility and interactions with each other. Networks within the larger group of celebrities are not simply formed due to industry affiliation but instead through status within the industry, media mentions and through their networking characteristics. These findings corroborate other observations of elites (Frank and Yasumoto 1998), citations and co-authorships in the scientific and social science academic communities (Moody 2004, Newman 2004), and Hollywood movie and TV actors (Watts 1999). The scale-free quality demonstrates the disproportionate benefits to those who are members of the network attain vis-à-vis non-members. In real life, such findings have tangible outcomes for those who are members or non-members of the Getty Images network in attaining greater social capital. If media profile (for example 'celebrity') is important to one's career success, particularly within the cultural industries, then having access to events and individuals who are highly documented by the media may be an important part of one's social and economic behaviour (Currid-Halkett 2010). The preferential attachment quality of the Getty network indicates that those who are more connected are disproportionately more likely to attain this profile, while those who are not members will be significantly less likely to be documented by the media.

Second, we speculate that film-star status may indicate the possibility that success begets success, but that network structure may partially explain this result. We found that those film stars most highly regarded as possessing star currency exhibit the densest network structures and attend the most prestigious events, whilst those film stars who are ranked on lower rungs do not appear to capture any network benefits from their status. We speculate that being ranked as an A-list star may in fact reinforce that status because one is invited to the most important and high-profile events for the industry, which begets more of the same. Our results suggest that benefits do not distribute down from top-ranked to bottom-ranked. In fact, being a poorly ranked film star may also mean that individual is not attending the most profiled events within the film industry. It is well documented that the capacity to form weak ties with more people and more events could be significant in career advancement (Granovetter 1973). Qualitative work on social networks has indicated that these industry events are important milieus for interacting with gatekeepers and other individuals important for career mobilisation (Becker 1982, Saxenian 1994, Currid 2007). Thus being highly valued by studio executives may get one invited to A-list



events but the network structure of A-list events may further affirm such status even more so than demonstrated or perceived talent. This finding corroborates the theory that social interactions produce social structure and that individuals within these networks may create mechanisms for reinforcing the benefits to belonging and reinforcing the drawbacks to being a non-member (Castells 2000). In real life, those members of the Getty network or the A-list film stars may have every reason to reaffirm its exclusivity to optimise benefits to members.

The cause-and-effect nature of the Getty network is ambiguous: does a celebrity get photographed because she is one or does Getty photograph someone and then she becomes a celebrity? Media theorists, most notably Adorno (1991), Boorstin (1962), Katz (1957), Katz and Lazerfeld (1955) and McLuhan (1964, 1967), postulate that the media exerts great control on information flow and dictates much of popular culture. By extension, celebrities are as such because photographers choose to make them so. There are a few points we would like to address. Undoubtedly, being photographed more by Getty photographers is likely to increase a celebrity's profile. There is a chain of events we can play out whereby an individual (for various reasons) is photographed more and thus attains a profile that propels her celebrity status and all of the benefits to this status (for example, more connections to other individuals influential in their career; invitations to even more high-profile events and so forth). But it is unlikely that Getty creates celebrities out of nothing. Because Getty Images is a market-driven company, the photographers take pictures of individuals that are sellable to media outlets and by extension are interesting to a larger public. It is unlikely that an unknown individual would suddenly be of collective interest to photographers interested in selling photos. Celebrities are likely to do things (star in films, release records, attend events) that create their initial membership into the celebrity network. Thereafter, Getty photographers may play a hand in reinforcing celebrity and the promotion of particular people. Those individuals that attain such status also gain the future benefits of being a participant at these events. Or, as one reviewer of this article astutely remarked, the description of celebrity is circular because the facts are as well.

There are undoubtedly several limitations to this dataset. First, even if photographers make choices to photograph the most profiled people, thus accurately reflecting society's (or the market's) interest in particular individuals, they will still exclude some individuals who are also at the event, thus impacting the network analysis. They may exclude interactions amongst people, connections not captured in the photos and so forth. Thus, the Getty dataset of celebrities will reflect the biases towards some individuals and cumulative advantage that some individuals attain, both of which are driven by photographers' desire to take pictures that are sellable and publishable. The preferential attachment observed in the network structure is part and parcel of the nature of the dataset. Those most connected are also those most profiled by the media, and these two qualities are likely symbiotic and recursive. There may of course be other people at the party or event or awards ceremony but they are not of enough media and social interest to record their attendance. Thus, Getty Images by virtue of it being a good measure of celebrity is simultaneously limited in capturing the entire network.

We have a final, more general, point with regard to the use of Getty Images to study celebrity. Developments in technological tools to study social and economic behaviour and the rise of social media outlets have given social scientists vast new tools to understand social groups that were previously largely inaccessible for study (Zook et al. 2004, Kossinets and Watts 2006, 2009, Becker *et al.* 2009). In just the last decade, social scientists have been able to track email (Watts and Kossinets 2009), cell-phone usage (Eagle

*et al.* 2009; Raento *et al.* 2009), Facebook interactions (Burke *et al.* 2009, Sun *et al.* 2009) and geo-tag photographs (Currid and Williams 2010; Rattenbury and Naaman 2009) to study social behaviour on a large scale. These datasets have become increasingly available through online data and new technologies that transfer these large datasets into meaningful economic and social information. In particular, these new datasets enable us to access populations and sheer numbers of information and people that were previously out of reach. We hope our initial steps are of use in studying the social behaviours of both celebrities and other social groups through innovative and unconventional ways.

## Notes

1. 2009 is the first year this data is available. Please see a more comprehensive description of Forbes' methodology: [http://www.forbes.com/2009/02/06/forbes-star-currency-methodology-business-media-star-currency-09\\_0210\\_methodology.html](http://www.forbes.com/2009/02/06/forbes-star-currency-methodology-business-media-star-currency-09_0210_methodology.html) While there are a number of measures of 'talent' (awards won, number of film credits and so on), the perceived ability to draw audiences, other top stars and resources to the film's production is as good a measure as any in Hollywood show business.
2. The bot is written in the programming language Perl and uses software agents to gather the web pages and parser to break the web page into structured information. The meta information is stored in a relational database (MS-SQL server).
3. We constructed and analysed these networks using a number of different tools and programs. For example, using the data-mining tool SPSS Clementine we were able to identify groups in the network. The social-network analysis (SNA) tools Pajek and Netminer were utilised for the analysis.
4. Figure 1 shows the degree distribution of the whole network on a log-log axis. Plotting power distribution on a log-log axis yields a straight line. Statistically the network conforms with the power distribution (R-square 0.867 with significance 0.00) with  $\text{Frequency} = 91883.2 \cdot \text{Degree}^{-1.586}$ . ANOVA testing indicates that the fit is significant. An eye examination of the log-log graph (Figure 2) indicates that the frequency of the lower part of degrees is not high enough. It means that our results would be strengthened if we had more low-degree participations. Those with low degree are people that attend only small private events which usually are not photographed.
5. Small-world networks are characterised by measuring the Clustering Coefficient (CC) and the Characteristic Path Length (CPL) and comparing these results to a random network (Bornholdt and Schuster 2003, Wasserman and Faust 1994). The CPL measures how many liaisons (or other nodes, that is, degrees of separation) there are between any two nodes within a network. The CC measures how many of a node's contacts are connected to each other (see Uzzi *et al.* 2007 for a terrific and thorough review of small-world network literature). While most random networks have a short CPL (Watts and Strogatz 1998) the CC of random networks is quite low. Small-worlds, however, have both short CPL and very high CC compared to a random network. In our network  $n$ , number of nodes, equals 6754,  $k$ , average degree equals 0.1605. The requirement stated by the hypothesis is therefore that  $Q > 1$ , where  $Q$  is the ratio between CPL ratio and CC ratio (Uzzi *et al.* 2007). In our network  $Q = 3.71$  (Watts and Strogatz, 1998, Grossman, 2002).
6. For the mathematically inclined, please see the Appendices for social-network analysis corresponding to our general results.
7. We cross-referenced our results using another similar ranking of industry status, Neilson Media Star Power index. Our results were almost identical to the Forbes Star Currency ranking.

## References

- Adler, M., 1985. Stardom and talent. *The American economic review*, 74 (1), 208–212.
- Adorno, T., 1991. *The culture industry*. New York, London: Routledge.
- Agarwal, J. and Kamakura, W.A., 1995. The economic worth of celebrity endorsers: an event study analysis. *The journal of marketing*, 59 (3), 56–62.
- Barabasi, A., 2003. *Linked: how everything is connected to everything else*. New York: Plume.
- Barabasi, A. and Albert, R., 1999. Emergence of scaling in random networks. *Science*, 286, 509–512.

- Baym, N., 1993. Interpreting soap operas and creating community: inside a computer mediated fan culture. *Journal of folklore research*, 30 (2–3), 143–176.
- Becker, H., 1982. *Art worlds*. Berkeley, CA: University of California Press.
- Bell, D., 1958. The power elite-reconsidered. *The American journal of sociology*, 64 (3), 238–250.
- Blau, P.M., 1960. A theory of social integration. *American journal of sociology*, 65 (6), 545–556.
- Blau, P.M., 1977. A macrosociological theory of social structure. *American journal of sociology*, 83 (1), pp 26–54.
- Boorstin, D., 1962. *The image*. New York: Atheneum.
- Bornholdt, S. and Schuster, H.G., 2003. *Handbook of graphs and networks*. Berlin: Wiley-VCH.
- Bottomore, T., 1993. *Elites and society*. London: Routledge.
- Bourdieu, P., 1993. *The field of cultural production*. New York: Columbia University Press.
- Braudy, L., 1986. *Frenzy of renown: fame and its history*. Oxford: Oxford University Press.
- Breiger, R.L., 1974. The duality of persons and groups. *Social forces*, 53 (2), 181–190.
- Burke, M., Marlow, C., and Lento, T., 2009. Feed me: motivating newcomer contribution in social network sites. In: *Proceedings of the 27th International conference on Human factors in computing systems*. Boston, MA: ACM Press, 945–954.
- Castells, M., 2000. Materials for an exploratory theory of the network society. *British journal of sociology*, 51 (1), 5–24.
- Caves, R., 2000. *Creative industries: contracts between art and commerce*. Cambridge: Harvard.
- Chapin, F.S., 1950. Sociometric stars as isolates. *American journal of sociology*, 56 (3), 263–267.
- Cowen, T., 2000. *What price fame?* Cambridge, MA: Harvard University Press.
- Crane, D., 1989. The transformation of the Avant-Garde. *The New York Art World 1940–1985*. Chicago: University of Chicago Press.
- Currid, E., 2007. *The Warhol economy: how fashion, art and music drive New York City*. Princeton, NJ: Princeton University Press.
- Currid-Halkett, E., 2010. *Starstruck: the business of celebrity*. New York: Faber & Faber.
- Currid, E. and Williams, S., 2010. The geography of buzz: art, culture and the social milieu in New York and Los Angeles. *Oxford: Journal of economic geography*, 10 (3), 423–451.
- Currid-Halkett, E. and Ravid, G., 2012. Stars and the connectivity of cultural industry world cities: an empirical social network analysis of human capital mobility and its implications for economic development. *Environment and planning A*, 44 (11), 2646–2663.
- Dyer, R., 1979. *Stars*. London: British Film Institute.
- Eagle, N., Pentland, A., and Lazer, D., 2009. Inferring social network structure using mobile phone data. *Proceedings of the national academy of sciences PNAS*, September 8, 106 (36), 15274–15278.
- Frank, R.H. and Cook, P.J., 1995. *The winner-take-all society: why the few at the top get so much more than the rest of us*. New York: Penguin Books.
- Frank, K.A. and Yasumoto, J.Y., 1998. Linking action to social structure within a system: social capital within and between subgroups. *American journal of sociology*, 104 (3), 642–686.
- Gamson, J., 1994. *Claims to fame: celebrity in contemporary America*. Berkeley, CA: University of California Press.
- Godart, F. and Mears, A., 2009. How do cultural producers make creative decisions? Lessons from the catwalk. *Social forces*, 88 (2), 671–692.
- Granovetter, M., 1973. The strength of weak ties. *American journal of sociology*, 78 (6), 1360–1380.
- Grossman, J.W., 2002. The evolution of the mathematical research collaboration graph. Available from: <http://www.oakland.edu/~grossman/eddie.pdf>.
- Hertz, R.H. and Imber, J., 1995. *Studying elites using qualitative research*. New York: SagePublications.
- Hirsch, P.M., 1972. Processing fads and fashions: an organization-set analysis of cultural industry systems. *The American journal of sociology*, 77 (4), 639–659.
- Jenkins, H., 2006. *Fans, bloggers and gamers*. New York: New York University Press.
- Katz, E., 1957. The two-step flow of communication: an up-to-date report on a hypothesis. *Public opinion quarterly*, 21, 61–78.
- Katz, E. and Lazarsfeld, P.F., 1955. *Personal influence*. New York: Free Press.
- King, B., 2011. Articulating digital stardom. *Celebrity studies*, 23, 247–262.
- Kossinets, G. and Watts, D.J., 2006. Empirical analysis of evolving social networks. *Science*, 311, 88–90.
- Kossinets, G. and Watts, D.J., 2009. The Origins of Homophily in an evolving social network. *American journal of sociology*, 115, 405–450.

- Lazarsfeld, P.F. and Merton, R.K., 1954. Friendship as a social process: a substantive and methodological analysis. *Freedom and control in modern society*, 1954, 18–66.
- Levi-Strauss, C., 1969. *The elementary structures of kinship*. Boston, MA: Beacon Press.
- MacDonald, G.M., 1988. The economics of rising stars. *American economic review*, 78 (1), 155–166.
- Marshall, D.P., 1997. *Celebrity and power: fame in contemporary culture*. Minneapolis, MN and London: University of Minneapolis Press.
- Marshall, D.P., 2006a. Intimately intertwined in the most public way: celebrity and journalism. In: P. David Marshall, ed. *The celebrity culture reader*. New York: Routledge.
- Marshall, D.P., 2006b. New media- new self: the changing power of celebrity. In: P. David Marshall, ed. *The celebrity culture reader*. New York: Routledge.
- Marshall, D.P., 2010. The promotion and presentation of the self: celebrity as marker of presentation media. *Celebrity studies*, 11, 35–48.
- McCracken, G., 1989. Who is the celebrity endorser? Foundations of the endorsement process. *Journal of consumer research*, 16 (3), 310–321.
- McLuhan, M., 1964. ‘The media is message’ Taken from *Understanding media: extensions of man*. New York: Signet.
- McLuhan, M., 1967. *The medium is the massage: an inventory of effects*. New York: Ginko Press.
- Merton, R.K., 1968. The Matthew effect in science. *Science*, 159 (3810), 56–63.
- Merton, R.K. and Kitt, A.S., 1950. Contributions to the Theory of Reference Group behavior. In: K. Robert and P.F. Lazarsfeld, eds. *Continuities in social research*. Glencoe, IL: Free Press, 47–51.
- Milgram, S., 1967. The small world problem. *Psychology today*, 1, 61–67.
- Mills, C.W., 1956. *The power elite*. Oxford: Oxford University Press.
- Molotch, H. and Treskon, M., 2009. Changing art: SoHo, Chelsea and the dynamic geography of galleries in New York City. *International journal of urban and regional research*, 33, 517–541. doi: 10.1111/j.1468-2427.2009.00866.x
- Moody, J., 2004. The structure of a social science collaboration network: disciplinary cohesion from 1963-1999. *American journal of sociology*, 69, 213–238.
- Naaman, M., 2005. *Leveraging geo-referenced digital photographs*. Thesis (PhD). Stanford University, California.
- Newman, M.E.J., 2004. Who is the best connected scientist? A study of scientific coauthorship networks. In: E. Ben-Naim, H. Frauenfelder and Z. Toroczkai, eds. *Complex networks*. Berlin: Springer, 337–370.
- Nov, O., Naaman, Mand Ye, C 2009 ‘Motivational, Structural and Tenure Factors that Impact Online Community Photo Sharing’, In: *Proceedings, Third International Conference on Weblogs and Social Media*, ICWSM 2009.
- Putnam, R.D., 2000. *Bowling alone: the collapse and revival of American community*. New York: Simon and Schuster.
- Raento, M., Oulasvirta, A., and Eagle, N., 2009. Smartphones: an emerging tool for social scientists. *Sociological methods and research*, 37 (3), 426–454.
- Rattenbury, T. and Naaman, M., 2009. Methods for extracting place semantics from Flickr tags. *ACM transactions, web*, 3 (1), Article 1.
- Ravid, G. and Rafaeli, S., 2004. Asynchronous discussion groups as small world and scale free networks, *First Monday*, 9, (9).
- Rindova, V.P., Pollock, T.G., and Haayward, M.L., 2006. Celebrity firms: the social construction of market popularity. *Academy of management review*, 31 (1), 50–71.
- Rosen, S., 1981. The economics of superstars. *American economic review*, 71 (5), 845–858.
- Salganik, M., Dodds, P., and Watts, D.J., 2006. Experimental study of inequality and unpredictability in an artificial cultural market. *Science*, 311, 854–856.
- Saxenian, A., 1994. *Regional advantage: culture and competition in Silicon Valley and Route 128*. Cambridge, MA: Harvard University Press.
- Simmel, G., 1955. *Conflict and the web of group affiliations*. Glencoe, IL: Free Press.
- Sun, E., et al. 2009 ‘Gesundheit! modeling contagion through facebook news feed. In: *Proceedings of the third international conference on weblogs and social media*. San Jose, CA: AAAI Press.
- Thrift, N., 2008. The material practices of glamour. *Journal of cultural economy*, 1 (1), 9–23.
- Turner, G., 2004. *Understanding celebrity*. London: Sage Publications.
- Turner, G., 2006. The mass production of celebrity. *International journal of cultural studies*, 9 (2), 153–165.

Turner, G., 2010. Approaching celebrity studies. *Celebrity studies*, Vol 1 (1), 11–20.

Uzzi, B., Amaral, L., and Reed-Tsochas, F., 2007. Small-world networks and management science research: a review. *European management review*, 4, 77–91.

Wasserman, S. and Faust, K., 1994. *Social network analysis*. Cambridge: Cambridge University Press.

Watts, D.J., 1999. Networks, dynamics and the small world phenomenon. *American journal of sociology*, 105 (2), 493–527.

Watts, D.J. and Kossinets, G., 2009, ‘Origins of Homophily in an Evolving Social Network’, Working Paper: Columbia University and Yahoo! Research.

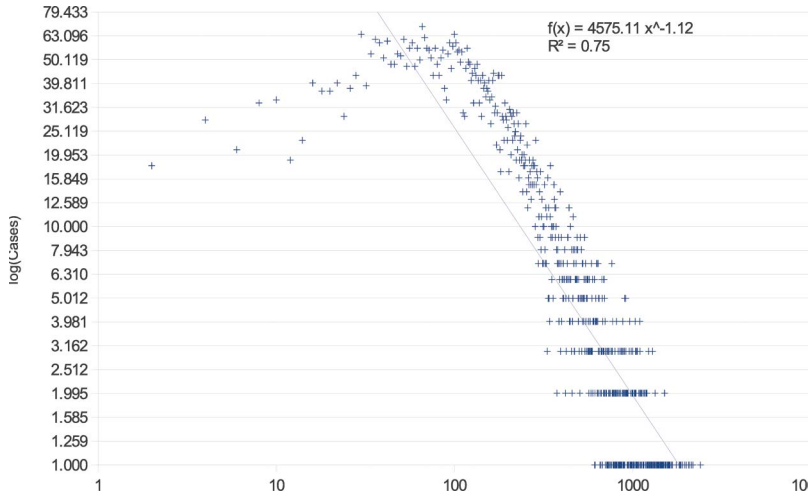
Watts, D.J. and Strogatz, S., 1998. Collective dynamics of small world networks. *Nature*, 393, pp. 404.

Weber, M., 1947. The nature of charismatic authority and its routinization. In: A.R. Anderson and T. Parsons, trans. *Theory of social and economic organization*. London: Oxford University Press.

Woolcock, M., 1998. Social capital and economic development: towards a theoretical synthesis and policy framework. *Theory and society*, 27 (2), 151–208.

Zook, M., et al. 2004. New digital geographies: information, communication, and place. In: S. Brunn, S. Cutter, and J. Harrington, eds. *Geography and technology*. New York: Kluwer Academic Publishers, 155–176.

**Appendix A. Degree distribution on log-log axis**



**Appendix B**

Characteristic Path Length (CPL) and Clustering Coefficient(CC) for celebrity network and random network	CPL	CC
Getty Image celebrity network	2.55	0.45
Random network (average encompassing three computer simulation generated networks)	2.1	0.02
Theoretical random network		0
Theoretical random bipartite network (Newman 2004)		0.1
Ratio between celebrities and theoretical random bipartite network	1.21	4.5