

GLOBAL CHANNELS OF SUCCESSFUL IMMIGRANT ENTREPRENEURS ILLUSTRATE THE CONSTRUCTAL LAW

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ABSTRACT

In the last decades, the unstoppable growth of global immigrant entrepreneurs (IE) due to new technology increased IE's mobility and need to create a more rapid flow of expansion. Recent interviews with Chinese entrepreneurs unveiled a network of global channels (*guanxi*) sustaining their entrepreneurial activities. Despite controversy and critique of some negative aspects of *guanxi*, scholars concluded that *guanxi* are the main factor in immigrant- entrepreneur organizations (IEO) global success. The striking resemblance between *guanxi* and the *constructal design* in the *constructal law* started this research about the *constructal theory* as scientific explanation of *guanxi*. The fact-based investigation reveals that *guanxi* extend today like branches of a tree going from immigrant entrepreneurs' country of origin (where IE were born and raised) to their adopted country (where IE now live and work). Today, *guanxi* are also morphing and expanding in new countries, where other IE -- sharing the same culture and language-- conduct business. The morphing composition of *guanxi* includes diverse people, from suppliers and distributors to bankers and partners. Past research praised this marketing system, yet there was no understanding of *guanxi* design being based on a scientific concept. This paper explores for the first time the connection between successful immigrant channels and the constructal law. World maps, recent surveys and interviews with global entrepreneurs show that the flow of *guanxi* is real, and the successful outcomes are based on science rather than ingenuity. There is no doubt that *guanxi* are a real, vivid illustration of the constructal law. In opening new doors and asking new questions, the impact of this research might prove to be substantial.

Keywords: Constructal law, Guanxi, Morphing, Migration, Immigrant entrepreneurs.

1. GLOBAL CHANNELS OF SUCCESSFUL IMMIGRANT ENTREPRENEURS ILLUSTRATE THE CONSTRUCTAL LAW

<http://www.theguanxi.net> VIDEO 30 sec. starts here (please open link).

In the last decades, small businesses of immigrant entrepreneurs (IE) are rapidly growing yet there is limited research about the new global IE and their successful organizations.

Today, immigrant entrepreneurial organizations (IEO) are important factors in global economic growth, building valuable bridges between national small businesses, global enterprises, and the homeland nation. According to recent studies, scholars agree that IEO are frontrunners in the ongoing global business Marathon ([1]). Consequently, all these changes in global economy demand a new, more competent scientific exploration in the new, exciting field of global immigrant- entrepreneurs ([2], [5], [18-21], [45]).

2. ENTREPRENEURS & MIGRATIONS

From the old times, entrepreneurs and migrations changed the history of mankind. From Leonardo da Vinci and Edison to Steve Jobs and Zuckerman, our history provided many brilliant examples of entrepreneurs who made the world a

better place. Migrations also have a long history, as they started from the dawn of humanity when people from East Africa started to move and populate our planet, until the recent period of globalization when many so- called "global citizens," cross the borders of nations or continents more than ever before in the past.

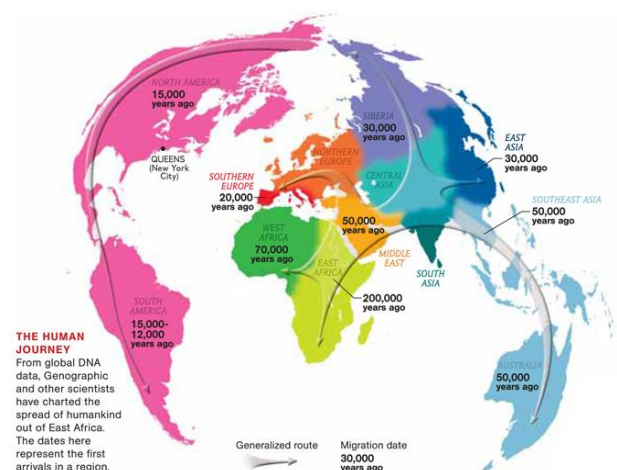


Figure 1. Humans first arrivals in a region (DNA Data).

For thousands of years, the constantly evolving flow of migrations continued to change human history: the *Silk Road* from Asia to Europe, Jewish migration from Egypt to the

promised- land, European- American migration, Jews migration to the new state of Israel, etc.



Figure 2. Human old migrations (national geographic map)

After WWI and WWII, migrations continued to disrupt life of people for political or religious reasons : Jewish migrations to escape anti-Semitism, Russian and Eastern European

migrations to escape communism, and many other economic or religion related migrations of Muslims, Irish, Italians, Jewish, Chinese, Indians, Gypsies, Africans, Christians, etc.



Figure 3. Later human migrations (national geographic map)

3. IMMIGRANT ENTREPRENEURS

In the 21st century, the advanced technology, high mobility, and increased globalization transformed the immigrant-entrepreneurs in frontrunners of the global business Marathon. According to recent studies, the entrepreneur is the sole important factor moving the global business engine of our time ([3, 4]). Yet many past articles provided limited, and many times dated information about IE, as they described the same characteristics of immigrant-entrepreneur organizations (IEO): (1) diversity, (2) unique way of doing business, (3) rapid growth ([5-7]).

4. GUANXI: GLOBAL BUSINESS CHANNELS

Multiple interviews with Chinese entrepreneurs unveiled a network of global ethnic channels (*guanxi*) sustaining their entrepreneurial activities. Recent articles confirm that today global networks “*guanxi*” are making all strategic and marketing decisions in IE organizations ([8]). Despite controversy and critique of some negative aspects of *guanxi*, many scholars concluded that *guanxi* are the main factor resulting in IEO’s phenomenal global success ([9], [10]).

The striking resemblance between *guanxi* and the *constructal design* started this research, and its first goal to demonstrate that *guanxi* are an illustration of the constructal law, later changed into another, much deeper approach of *guanxi* concept. *Guanxi*-- an old Confucian concept preserved

as a main philosophy in Chinese society-- is functioning today as a personalized network of influence based on trust, friendship, loyalty, respect, and exchange of mutual favors (Table 4).

Table 4. Guanxi (from Wikipedia, in simplified Chinese)

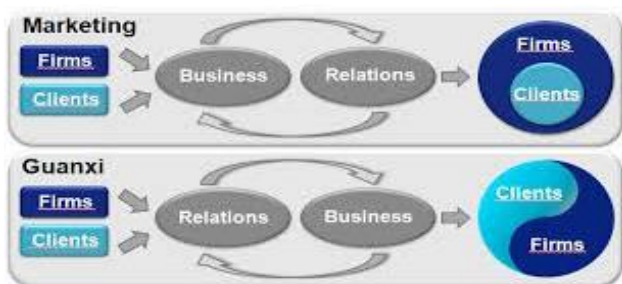
关系

Guanxi (gwan-shee): describes the basic dynamic in personalized networks of influence, and is a central idea in Chinese society.



In today's economic global market, guanxi remains an important system of social networks and influential relationships that facilitate business ([44, 45], [47]). Many Westerners realize that 'good' guanxi is the key needed to open closed doors. Major global business corporations recognize the importance of understanding guanxi philosophy versus marketing. Conducting business in China is challenging, and observers declared that "Westerners don't trust Chinese because they always *help* their friends, and Chinese don't trust Westerners because they *don't* help their friends" ([15], [45], [47]). The difference between marketing and guanxi (Table 5) consists in the emphasis either on business (marketing) or on relations (guanxi).

Table 5. Marketing vs. Guanxi (Google, www.westeastcorporation)



5. THE GUANXI NETWORK

The Guanxi Network (GN) is the top professional networking group for "foreigner/immigrant- entrepreneurs, expatriates, and local professionals" based in major cities around Asian Pacific area, including Australia, China, Hong Kong, New Zealand, Indonesia, Singapore, Shanghai, Japan, Korea, Malaysia, Philippines, Taiwan, Thailand (GN LinkedIn). Guanxi Network brings people at spectacular professional networking events, where they exchange new ideas, and also build valuable business connections ([15],

[20], [44, 45], [47]). The GN logo represents the symbol of global business collaboration (Fig. 6).



Figure 6. Logo of GN (Google GN, featured also in BBC/Goldman Sachs Video)

The path to 'good' guanxi is not an easy one to follow. There is sometimes a fine line between guanxi and bribery (called in Russia "blat" or in Israel "protektia"). After the fall of the communist regime in countries like Romania, the bribery (called "mita") became in the past decades the usual way to obtain a diploma, a position or a job, even to be accepted in a doctor's office or in a hospital ([19]). Hopefully, all this will soon be history.

6. CONSTRUCTAL LAW & GUANXI NETWORKS

"Constructal" is a word coined by professor Adrian Bejan in 1997, when he described that everything around us is a flow system, and all these "flow systems evolve over time, being connected to and shaped by other systems, in a global tapestry of flow" [30].

Dr. Bejan's (1997) constructal law of design was stated as follows: "For a finite-size system to persist in time (to live), it must evolve in such a way that provides easier access to the imposed currents that flow through it ([22-24], [28], [30]).

This revolutionary concept unites in a beautiful "oneness" animate and inanimate systems in nature, society, science, sports, design, academia, publishing, and architecture ([16], [22-26]).

The theory of constructal law demonstrates that everything that moves in nature (animate or inanimate) generates in time shapes that facilitate this movement. Examples of treelike architectural design are: plants and tree roots, leaves, river basins, our cardiovascular system, our lungs, corporate structure, global social channels, etc. ([22-25], [30-38]).

The branching design is generated in natural or social environments because it facilitates the evolutionary flow, i.e. a successful outcome ([30, 36], [40-45]).

Fig. 7 and Fig. 8 illustrate the similarity of inanimate and animate constructal designs: in river basins (Danube Delta in Romania), and in our modern society (IE Global Network). The division of Danube in three branches facilitates its flow to the Black Sea.



Figure 7. Danube delta (national geographic maps)



Figure 8. (TiE, from Wikipedia)

The global networks of IE are rapidly growing in specific areas facilitating the guanxi flow.

Before constructal law of design was discovered, the idea of “oneness” with nature, i.e. between the inanimate and animate realm, was based on a hunch, on intuition rather than on a scientific, rational, verifiable proof ([30]). The increased interest of the scientific community, and the diversity of scholars new findings demonstrate today that the constructal law “provides this missing link,” and this link is based on science, on physics ([22], [25, 26] [29], [39]).

7. CONTROVERSY & CLARIFICATION

Why it takes so long for people to accept new, disruptive theories? An extraordinary scientist born not far from Parma, the Nobel prize winner Rita Levi-Montalcini, had to wait 45 years, (from 1942 until 1987) to have her scientific discovery of nerve growth factor recognized, and finally accepted ([18]). As a novice researcher, my admiration and gratitude goes to all these brilliant and courageous scientists who believe in their new ideas, and I wish the day will come when the

constructal law design will inspire conservative people locked in their closed systems open up, and join the flow of progress rather than oppose it.

Bejan and Lorente ([36]) declared the constructal law, as well as the laws of thermodynamics, as scientific “first principles.” They also stated that first principles emerge as non-mathematical statements that do not require any proof based on statistical physics ([28], [30], [39], [42]).

For example, the thermodynamic laws were formulated as first principles by Clausius: “No process is possible whose sole result is the transfer of heat from a body of lower temperature to a body of higher temperature” and Kelvin: “Spontaneously, heat cannot flow from cold to hot regions without external work being performed” ([39], [42]).

According to Bejan and Lorente, in the very beginning a first principle or a new law does not have to be stated in mathematical terms; e.g. the “mathematization” of second law of thermodynamics came later ([29, 30], [39-42]).

The constructal law underwent the same evolution: the initial statement (1997) was followed by a complete mathematical formulation of the constructal law in 2004 ([28], [30], [41]).

8. NEW FINDINGS

As this study progressed, aspects of the resemblance between the constructal law and guanxi networks reached a deeper level of investigation. The findings demonstrated that global guanxi networks are also illustrating “hierarchy”; “the golden ratio”; “the S curve,” and other manifestations of the constructal law, such as “short and slow & long and fast; big and few & small and many” ([23], [24], [17], [30], [31]).

9. HIERARCHY

According to the Constructal Law, ‘hierarchy’ can be observed in nature or diverse areas of human activity: medicine, biology, society, psychology, business, etc. ([17], [20], [22], [25], [30], [33-40]). IEO’s corporation structure is an example, and the same constructal design is noticed in organizations like GN (Fig. 9).

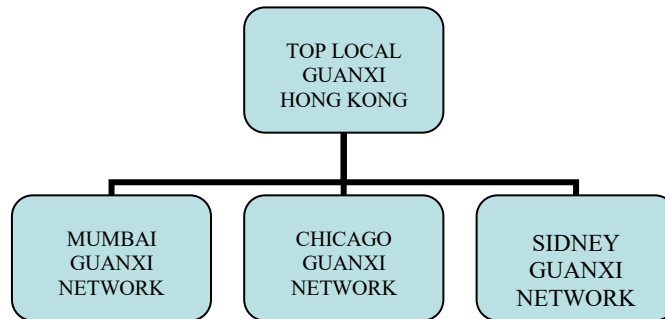


Figure 9. Hierarchy of Guanxi Network (Google/ Guanxi Network)

In the last decade, an interesting new *guanxi* aspect is that the complexity of hierarchical order in *guanxi* raised new challenges for foreign firms conducting business in China. As illustrated in Fig. 10, today the *guanxi* penetration of the market is not possible without adapting the flow of design with several layers of boundary spanners.

Guanxi boundary spanners are relating the *guanxi* insiders with foreign *guanxi* outsiders. Enabling foreign companies to connect with local *guanxi* business networks, the *guanxi* boundary spanners perform tasks that outsiders cannot: find local clients, meet top *guanxi* people or resolve conflicts between *guanxi* norms and outsiders norms ([14, 15], [44]).

Fig. 10 represents hierarchy in a concentric diagram of ‘local’ *guanxi* flow overcoming ‘foreign’ resistance ([44]).

10. GUANXI BOUNDARY SPANNERS

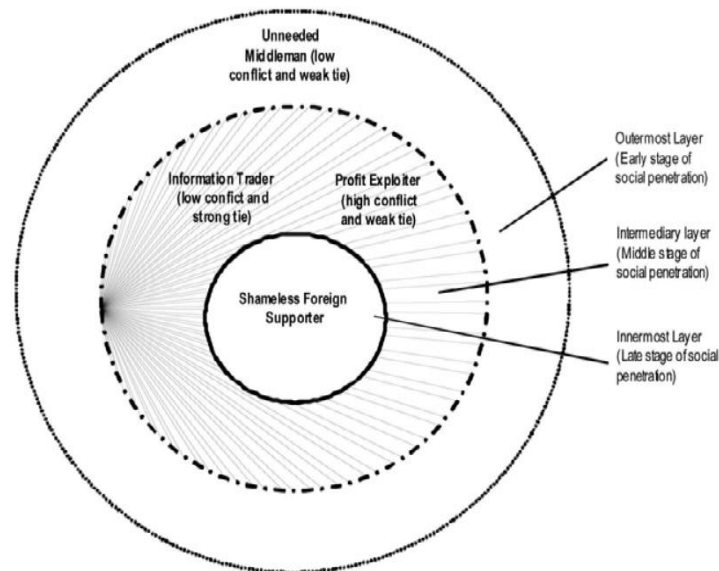


Figure 10. Guanxi Boundary Spanners (Liu & Gao, 2014, p. 279)

Fig. 10 shows the flow of three layers of *guanxi* social penetration: (1) outermost (early stage of social penetration), (2) intermediary (middle stage of social penetration), and innermost (late stage of social penetration). Each stage has different layers, each one with a specific level of conflict and

type of ties: (1) Middleman / low conflict and weak ties (2) Information Trader/low conflict and strong ties; Profit Exploiter/ high conflict and weak ties (3) Shameless Foreign Supporter ([44]).

11. THE GOLDEN RATIO

Presentations at CLC in Nanjing, China (2013) mentioned the 'golden ratio'-- an old concept that united arts and science for a long time--through aesthetic beauty norms in both science and arts. Golden ratio is a mathematical concept recognized from antiquity as an expression of perfection, and it is related to numbers, proportions, fractal geometry. The constructal law also explains *why* nature has temporal and spatial fractal geometry, and how it facilitates the evolution of the natural fractal geometry in both animate and inanimate systems.

Fractal means a repeating pattern (natural or a mathematical) coined by Mandelbrot (1975) from the Latin "broken" or "fractured." Mandelbrot (1975) extended this mathematical concept to geometric patterns in nature, and he summarized it as "beautiful, damn hard, and useful" ([19]). Fractal patterns have different degrees of self-similarity and are identified in images, structures, sounds found in nature, society, technology, art, etc.

The Constructal law explains why the geometry of nature is fractal. Based on the constructal law complementing the golden ratio, the architect and designer Nigel Anthony (2013) named his principle of geometric optimal flow "asynsis" i.e. asymptotic synthesis, and asymmetric creation ([26]). Anthony (2013) argued that both constructal law and "asynsis" concepts are dynamic, aligned with golden ratio, and can be summarized as "Form follows flow" ([26]).

12. THE S CURVE, SHORT AND SLOW & LONG AND FAST

Another manifestation of the constructal law design is the S curve shape, that can be observed in growth of yeast, spreading of populations, the rapid growth of IE organizations, the economic bubble burst, spreading of languages, growth of MNC ([43], [23], [30, 32, 34]).

The shape of S curve was clearly noticed in the evolutionary flow of all known IEO: slow and short at the beginning, then long and rapid ('invasion'), followed finally by another slow and short ending flow ('consolidation'). These short and slow, and long and fast designs mentioned by Bejan & Lorente were recognized in many areas of research, studies, and peer-reviewed articles about IEO ([1-5][17], [21, 23], [30, 32], [34-36], [43]).

13. CONSTRUCTAL LAW & IE GUANXI NETWORKS (GN)

In the beginning of presentation we mentioned that the constructal law of design shows striking similarities with the successful immigrant-entrepreneurs global channels (guanxi). These ethnic channels-- from the country of origin to the newly adopted country ([1-11], [30], [36]) -- proved that Bejan constructal law can be their conceptual foundation, as well as the cause of their global success.

Consequently, if the GN model could be extended as an innovative marketing system for all other global entrepreneurs, it might drastically change the future of mainstream global entrepreneurs, transforming their struggle and isolated efforts in a splendid dance of global collaboration.

14. SUMMARY

This paper explores for the first time the scientific connection-- based on nature's laws of physics-- between immigrant channels and the constructal law ([3- 11], [14, 15], [20], [41]).

The investigation for *guanxi* being an illustration of the constructal law revealed that *guanxi* networks extend today like branches of a tree, going from immigrant entrepreneurs' country of origin (where IE were born and raised) to their adopted country (where IE now live and work).

Today, *guanxi* is also expanding in many new, remote places, where other IE sharing the same culture and language conduct business ([44], [5-11], [14, 15], [18, 20]).

The morphing *guanxi network* is composed by suppliers and distributors, bankers and partners, investors or friends. Past research praised this marketing system, yet there was no understanding of *guanxi* being based on any scientific concept. Today, the constructal design demonstrates that *guanxi* is an evolutionary design created by the law of physics, either in nature or social relations to facilitate flow, i.e. a successful outcome. World maps, recent surveys, interviews, and statistics ([46]) show that the flow of *guanxi* is real, and successful outcomes are based on science rather than on IEO's ingenuity and innovations ([10],[22],[24], [26], [29], [44-47]).

In sum, there is no doubt that global channels of successful IE are a real, vivid illustration of the constructal law. In opening new doors and asking new questions, the impact of this study might prove to be substantial. The constructal law of design has a broad appeal ([12, 13], [19], [26]), and inspires many creative ideas in entrepreneurship, which is claimed to be 'more art than business'. The evolution of humanity will be soon in the hands of 'good' *guanxi*.

15. PREDICTING FUTURE GUANXI

The beauty of the constructal law of design relies not only in discovering phenomena, but also in the ability of predicting them. Based on the constructal design, Fig. 12 offers the frame to predict future *guanxi* by drawing them live on the world map. These 'guanxi predictions' should be, and are the result of an analysis of present situations and similar events in past history. In sum, all these predictions should be, and are based on the constructal law of design.



Figure 11. Live Drawing of predicted “good” Guanxi (World Map from Google)

And now, let’s start to draw together ‘good’ guanxi. Imagine them flowing and morphing; from Chicago to Singapore, from Hong Kong to Parma, and from Sienna to Mumbai, for an easy flow of life on this planet.

(<http://www.theguanxi.net> VIDEO last 30 sec. starts again, continues and fades away).

ACKNOWLEDGMENT

My gratitude goes to Dr. Adrian Bejan for inviting me to present this paper at the 9th CLC in Parma. The originality and simplicity of his revolutionary Constructal Law made me for years one of his fans. I am so excited, and yet so humbled by this unexpected opportunity.

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REFERENCES

1. Acs, Z., Audretsch, D., Braunerhjelm, P., & Carlsson, B., “Growth and entrepreneurship,” *Small Business Economics*, 39 (2) 289-300, 2012. DOI: [10.1007/s11187-010-9307-2](https://doi.org/10.1007/s11187-010-9307-2).
2. Assudani, R.H., “Ethnic entrepreneurship: The distinct role of ties,” *Journal of Small Business & Entrepreneurship*, 22(2), 197-205, 2009. DOI: [10.1080/08276331.2009.10593450](https://doi.org/10.1080/08276331.2009.10593450).
3. Basu, A., “From ‘break out’ to ‘breakthrough’: Successful market strategies of immigrant entrepreneurs in the UK,” *International Journal of Entrepreneurship*, 151-23, 2012.
4. Sahin, M., Todiras, A., Nijkamp, P., & Suzuki, S., “Bright stars in the urban galaxy – the efficiency of ethnic entrepreneurs,” *European Journal of Social Sciences*, 25(2), 209-227, 2012.
5. Kloosterman, R. & Rath, J., “Entrepreneurship among migrants and returnees: Creating new opportunities,” *Journal of Ethnic and Migration Studies*, 27(2), 189-202, 2001.
6. Jamal, A., “Retailing in a multicultural world: the interplay of retailing, ethnic identity and consumption,” *Journal of Retailing & Consumer Services*, 10(1), 1, 2003. DOI: [10.1016/S0969-6989\(02\)00059-0](https://doi.org/10.1016/S0969-6989(02)00059-0).
7. Achidi Ndofor, H., & Priem, R.L. “Immigrant entrepreneurs, the ethnic enclave strategy, and venture performance,” *Journal of Management*, 37(3), 790-818, 2011. DOI: [10.1108/sd.2011.05627iaa.014](https://doi.org/10.1108/sd.2011.05627iaa.014).
8. Xie, Yu Henry, Amine, Lyn S., “Social networks and the internationalization of Chinese entrepreneurs,” *Global Business & Organizational Excellence*, 29 (1) 61-78, 2009. DOI: [10.1002/joe.20299](https://doi.org/10.1002/joe.20299).
9. Ling, H., “The transnational world of Chinese entrepreneurs in Chicago, 1870s to 1940s: New sources and perspectives on southern Chinese emigration,” *Frontiers of History in China*, 6(3), 370-406, 2011. DOI: [10.1007/s11462-011-0134-z](https://doi.org/10.1007/s11462-011-0134-z).
10. Brzozowski, J., Cucculelli, M., Surdej, A. “Transnational ties and performance of immigrant entrepreneurs: the role of home-country conditions,” *Entrepreneurship & Regional Development*, 26(7/8), 546-573, 2014. DOI: [10.1080/08985626.2014.959068](https://doi.org/10.1080/08985626.2014.959068).
11. Kariv, D., Menzies, T., V., Brenner, G.A., Filion, L. “Transnational networking and business performance: Ethnic entrepreneurs in Canada,” *Entrepreneurship & Regional Development*, 21(3), 239-264, 2009. DOI: [10.1080/08985620802261641](https://doi.org/10.1080/08985620802261641).
12. Kumar, S.U., & Krueger, N.F., “Making the United States immigration policy and the startup visa act proposal effective: An exploratory study of high-growth Indian American immigrant entrepreneurs,” *Journal of Management Policy & Practice*, 14(1), 112-126, 2013. DOI: [10.2139/ssrn.2096426](https://doi.org/10.2139/ssrn.2096426).
13. Correa, E., & Girón, A., “Credit and capital formation: Lessons of Mexican migrant entrepreneurs in the U.S. financial crisis,” *Journal of Economic Issues (M.E. Sharpe Inc.)*, 47(2), 555-560, 2013. DOI: [10.2753/JEI0021-3624470229](https://doi.org/10.2753/JEI0021-3624470229).
14. Weidenbaum, M.L., *The Bamboo Network: How Expatriate Chinese Entrepreneurs Are Creating a New Economic Superpower in Asia*, Martin Kessler Books, Free Press. p. 23-28, 1996.
15. Min Chen, *Asian Management Systems: Chinese, Japanese and Korean Styles*, Cengage Learning EMEA, p. 205, 2006.
16. Bejan, A., “The constructal law origin of the wheel, size, and skeleton in animal design,” *American Journal of Physics*, 78 (7), 692–699, 2010. DOI: [10.1119/1.3431988](https://doi.org/10.1119/1.3431988).
17. Lorente, S; Bejan, A., “Few large and many small: Hierarchy in movement on earth,” *International Journal*

- of *Design & Nature and Ecodynamics*, 5 (3): 1–14, 2010. DOI: [10.2495/DNE-V5-N3-254-267](https://doi.org/10.2495/DNE-V5-N3-254-267).
18. Carey, B., “Dr. Rita Levi-Montalcini, Nobel winner, dies at 103,” *The New York Times*, Dec. 30, 2012.
 19. Mandelbrot, Benoit, “24/7 Lecture on Fractals Ig Nobel Awards,” *Improbable Research, You Tube*, 2006.
 20. Xiaohua, L., “The diaspora solution to innovation capacity development: Immigrant entrepreneurs in the contemporary world,” *Thunderbird International Business Review*, 11 (3), 47-59, 2010.
 21. Alsever, J., “Immigrants: America’s job creators,” *Fortune*, 169(8), p.56, 2014.
 22. Razavi, M.S., Shirani, E., Salimpour, M.R., & Kassab, G., “Constructal law of vascular trees for facilitation of flow,” *Plos ONE*, 9(12), 1-16, 2014. DOI: [10.1371/journal.pone.0116260](https://doi.org/10.1371/journal.pone.0116260).
 23. Bejan, A., & Lorente, S., “The constructal law origin of the logistics S curve,” *Journal of Applied Physics*, 110(2), 2011. DOI: [10.1063/1.3606555](https://doi.org/10.1063/1.3606555).
 24. Bejan, A., “The constructal law of “designedness” in nature,” *AIP Conference Proceedings*, 1033(1), 207-212, 2008.
 25. Gordon, I. D., “Design in Nature: how the constructal law governs evolution in biology, physics, technology, and social organization,” *Library Journal*, 137(3), 123-124, 2012.
 26. Nigel, A., *ASYNIS clc Conference Nanjing*, China, 2013.
 27. Bielifski, D., “In Romania bribery is a health problem,” *New York Times*, 2009.
 28. Bejan, A., *Advanced Engineering Thermodynamics* (2nd ed.), New York: Wiley, 1997.
 29. Reis, A.H., “Constructal theory: from engineering to physics, and how the flow systems develop shape and structure,” *Appl Mech Rev.*, 59, 269–282, 2006. DOI: [10.1115/1.2204075](https://doi.org/10.1115/1.2204075).
 30. Bejan, A., Zane, P., *Design in Nature: How the Constructal Law Governs Evolution in Biology, Physics, Technology, and Social Organization*, p.3, 127. New York: Doubleday, 2012.
 31. Miguel, Antonio F., “Constructal theory of pedestrian dynamics,” *Physics Letters, A* 373 (20) 1734–1738, 2009. DOI: [10.1016/j.physleta.2009.03.020](https://doi.org/10.1016/j.physleta.2009.03.020).
 32. Bejan, A., Lorente, S., “Constructal law of design and evolution: Physics, biology, technology, and society,” *Journal of Applied Physics*, 1(13) 151-301, 2013. DOI: [10.1063/1.4798429](https://doi.org/10.1063/1.4798429).
 33. Reis, A.H., “Design in nature and the laws of physics”. *Phys Life Rev.*, 8, 255–256, 2011. DOI: [10.1016/j.plrev.2011.07.001](https://doi.org/10.1016/j.plrev.2011.07.001).
 34. Bejan, A., “The constructal law origin of the wheel, size, and skeleton in animal design,” *American Journal of Physics* 78(7), 692–699, 2010. DOI: [10.1119/1.3431988](https://doi.org/10.1119/1.3431988).
 35. Bejan, A., *Advanced Engineering Thermodynamics* (2nd ed.), New York: Wiley, 1997.
 36. Bejan, A., Lorente, S., *Design with Constructal Theory*, Hoboken: Wiley, 2008. DOI: [10.1002/9780470432709](https://doi.org/10.1002/9780470432709).
 37. Quéré, S., “Constructal theory of plate tectonics,” *Int J Design & Nature Ecodyn*, 8, 242–253, 2010.
 38. Errera, M., “Constructal law of design in nature,” *Scoop.it* [web], 2015.
 39. Kleidon, A., Malhi, Y., Cox, P.M., “Maximum entropy production in environmental and ecological systems,” *Philos Trans R Soc Lond B Biol Sci.*, 365 1297–1302. DOI: [10.1098/rstb.2010.0018](https://doi.org/10.1098/rstb.2010.0018).
 40. Bejan, A., “Design in nature, thermodynamics, and the constructal law. Comment on Life, hierarchy, and the thermodynamic machinery of planet Earth,” by A. Kelidon, *Physics of Life Reviews*, 7(4), 467-470, 2010.
 41. Bejan, A., Lorente, S., “The constructal law and thermodynamics of flow systems with configuration,” *International Journal of Heat and Mass Transfer*, 47, 3203–3214, 2004.
 42. Crooper, W., “Rudolf Clausius and the road to entropy,” *Am. J. Phys.* 54, 1068-74, 1986. DOI: [10.1119/1.14740](https://doi.org/10.1119/1.14740).
 43. Chen, L., “Progress in study on constructal theory and its applications,” *Science China, Technological Sciences*, 55(3), 802-820, 2012. DOI: [10.1007/s11431-011-4701-9](https://doi.org/10.1007/s11431-011-4701-9).
 44. Liu, A.H., & Gao, H., “Examining relational risk typologies for guanxi boundary spanners: Applying social penetration theory to guanxi brokering,” *Journal of Marketing Theory & Practice*, 22(3), 271-284, 2014.
 45. Ai, J. (2006), “Guanxi networks in China: Importance and future trends,” *China & World Economy*, 14(5), 105 – 118, 2006. DOI: [10.1111/j.1749-124X.2006.00034.x](https://doi.org/10.1111/j.1749-124X.2006.00034.x).
 46. Albaum, G., Golden, L., Murphy, B., Straskov, J., *Likert Scale and Semantic Differential: Issues to Cross-Cultural Research*, Austin TX, USA: The University of Austin Press, 1987.
 47. Kiong, T.C., Yong, P.K., “Guanxi bases and Chinese business networks,” *British Journal of Sociology*, 49(1), 75-95, 1998. DOI: [10.2307/591264](https://doi.org/10.2307/591264).

ABBREVIATIONS

- IE**= Immigrant entrepreneurs
IEO= Immigrant-entrepreneurs Organizations
CL= Constructal Law
GN= Guanxi Network