



A view of a Cuban scientist in the global 21st Century scenario and opening relations with USA

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Cuba and USA: Some comparisons



Cuba and USA: General

	Cuba	USA	Cuba / US ratio
Population (a)	11,210,064	321,463,494	3 %
Area in km² (b)	109,884	9,826,675	1 %
Density of population inh./km²	102.0	32.7	312 %
GNP in Millions US\$ (c)	77,150	18,558,130	0.4 %
GNP per inhabitant in US\$	6,888	57,723	11.9 %

(a) Cuban population in 2013 (ONE) and US population in 2015 (Wikipedia)

(b) Cuba by ONE and US by Wikipedia

(c) Wikipedia, 2016

Cuba and USA: Health

Health (WHO)	Cuba	USA	Dominican Republic
Life expectancy at birth (years)	79	79	77
Aged over 60 (2013)	19 %	20 %	9 %
Under five mortality per 1000 live birth	6	7	28

Cuba and USA: Education

Education (UNESCO)	Cuba	USA	Dominican Republic
Adult literacy rate (15+ years, both sexes)	99.71 % (2015)	NR	92.47 % (2015)
Mean years of schooling	11.1 (2012)	13.6 (2014)	7.7 (2014)

Cuba and USA: Religion and Ethnics

Religion (Wikipedia, 2016)	Cuba	USA	Cuba / US ratio
Christian	59 %	71 %	0.83
Others	17 %	6 %	2.83
Non-affiliated	23 %	23 %	1.00

Cuba and USA: Religion and Ethnics

Ethnics	Cuba	USA	Cuba / US ratio
“White”	64 %	78 %	0.82
“Black”	9 %	13 %	0.69
Others	27 %	9 %	3.00

USA data from Wikipedia (2016). It uses to classify ethnics as white, African – American and others. Cuba’s census of 2012 reports by skin color as white, black and mulatto.

Cuba: Genes

Cuban population genetics was well studied for medical purposes

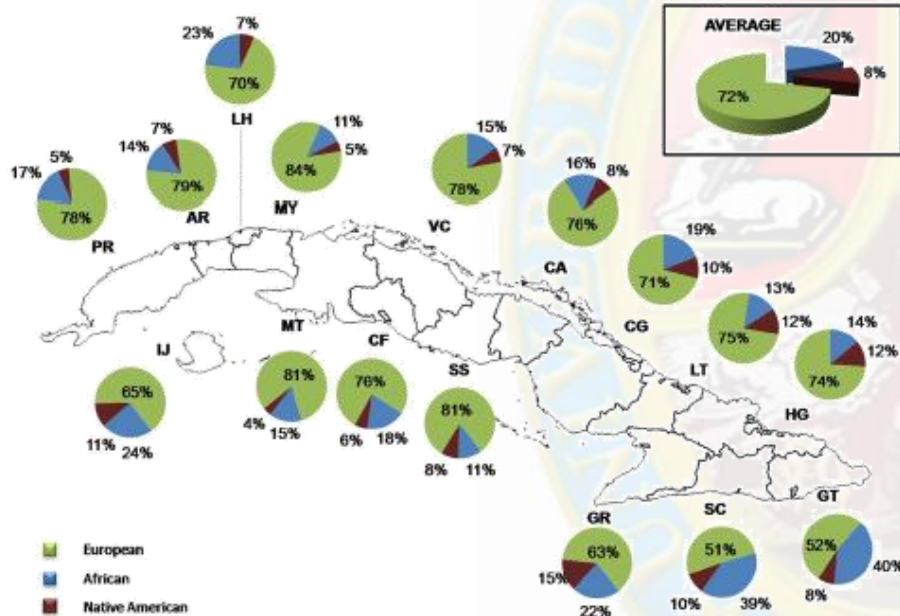


Figure 1. Distribution of ancestral contributions in the total sample and stratified by province as inferred from autosomal AIMs.
doi:10.1371/journal.pgen.1004488.g001

Marcheco-Teruel, B.; Parra, E. J.; Fuentes-Smith, E.; Salas, A.; Buttenschøn, H. N.; Demontis, D.; Torres-Español, M.; Marín-Padrón, L. C.; Gómez-Cabezas, E. J.; Álvarez-Iglesias, V.; Mosquera-Miguel, A.; Martínez-Fuentes, A.; Carracedo, Á.; Børglum, A. D.; Mors, O., Cuba: Exploring the History of Admixture and the Genetic Basis of Pigmentation Using Autosomal and Uniparental Markers. *PLoS Genetics* 2014, 10 (7), e1004488.

Cuba: Genes

Racial classification according
skin color vs. genes

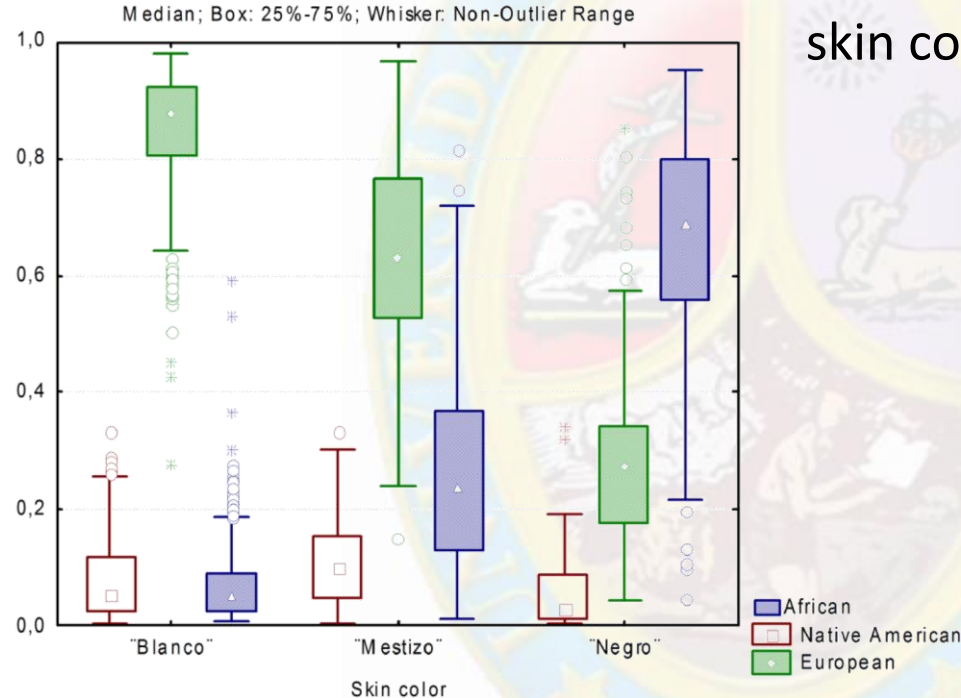


Figure 3. Distribution of individual ancestry proportions stratified by census categories.
doi:10.1371/journal.pgen.1004488.g003

Marcheco-Teruel, B.; Parra, E. J.; Fuentes-Smith, E.; Salas, A.; Buttenschøn, H. N.; Demontis, D.; Torres-Español, M.; Marín-Padrón, L. C.; Gómez-Cabezas, E. J.; Álvarez-Iglesias, V.; Mosquera-Miguel, A.; Martínez-Fuentes, A.; Carracedo, Á.; Børglum, A. D.; Mors, O., Cuba: Exploring the History of Admixture and the Genetic Basis of Pigmentation Using Autosomal and Uniparental Markers. *PLoS Genetics* 2014, 10 (7), e1004488.

Cuba in the world: Production of knowledge

Science and technology documents produced in 1996 - 2015

Rank	Country	Docs.	Citable docs.	Citations	Self-Citations	Citations per Doc.	H index
1	United States	9360233	8456050	202750565	94596521	21.66	1783
2	China	4076414	4017123	24175067	13297607	5.93	563
3	United Kingdom	2624530	2272675	50790508	11763338	19.35	1099
4	Germany	2365108	2207765	40951616	10294248	17.31	961
5	Japan	2212636	2133326	30436114	8352578	13.76	797
15	Brazil	669280	639527	5998898	2007696	8.96	412
29	Mexico	232828	221611	2305554	469296	9.9	316
37	Argentina	159172	150927	1965624	405797	12.35	300
45	Chile	101841	97250	1203308	226651	11.82	257
50	Colombia	60402	57407	468135	69810	7.75	186
59	Venezuela	33780	32445	321006	40277	9.5	166
60	Cuba	31690	30382	202503	38512	6.39	127

Scimago Journal and Country Rank, 2016

(<http://www.scimagojr.com/countryrank.php>)

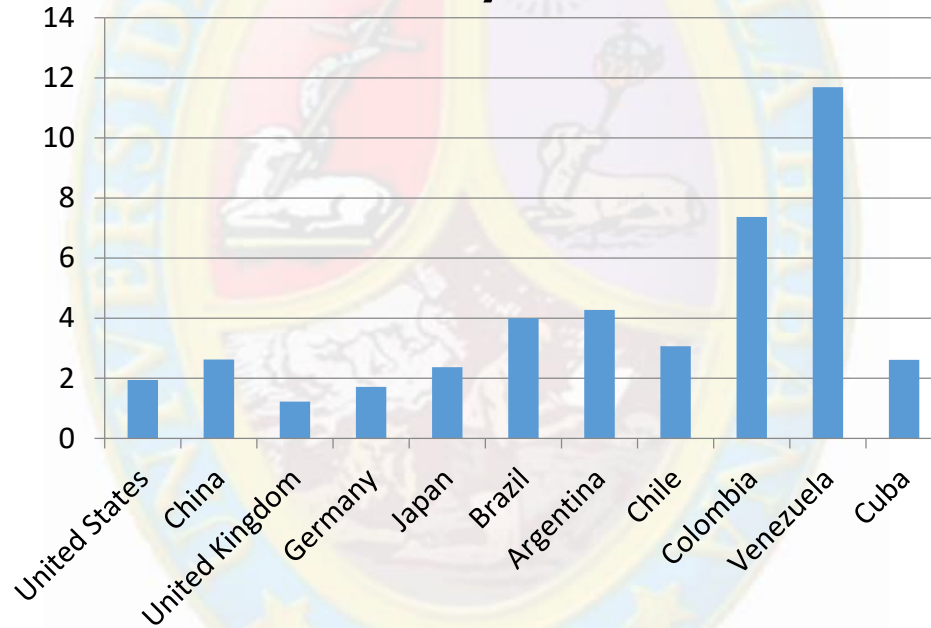
Cuba: Recent history of knowledge production in Cuba

Year	World Rank	Year	World Rank
2015	72	2008	60
2014	60	2007	58
2013	64	2006	57
2012	64	2005	58
2011	63	2004	59
2010	65	2000	52
2009	59	1996	55

Scimago Journal and Country Rank, 2016

(<http://www.scimagojr.com/countryrank.php?year=2015>)

Cuba and USA: A view of social efficiency of knowledge



Y = Millions of US\$ of 2013's GNP per Scimago's document in 1996 - 2014

Cuba and USA: Some remarks

- **Population, wealthy and surface** of Cuba and USA are overwhelmingly **different** in favor of the later, prevailing asymmetry in these factors.
- **Educational and public health** indexes are comparable.
- **Culture and ethnics** are both products of merging several roots worldwide.
- Cuba's **social efficiency of knowledge production** is similar to that of the best performing countries.

The current scenario: Pro's



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- **A tropical country: plenty of wind, sun, well preserved shallows, beaches and forests.**



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- **Well designed environmental laws and protection.**



The current scenario: Pro's

- A tropical country: plenty of wind, sun, well preserved shallows, beaches and forests.
- Well designed environmental laws and protection.
- **Well educated and healthy people. Universally free public health and education at all levels, up to PhD's.**



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- **Quiet social environment.**



The current scenario: Pro's

- A tropical country: plenty of wind, sun, well preserved shallows, beaches and forests.
- Well designed environmental laws and protection.
- Well educated and healthy people. Universally free public health and education at all levels, up to PhD's.
- Quiet social environment.
- **Economics: High potential for recovering and optimizing sugar cane production, well provided natural ores of nickel, zeolites and other minerals, expectations for oil and gas production (nowadays covering half of necessities), express government will for foreign investment and diversifying the economy.**

The current scenario: Con's



The current scenario: Con's

- Economic hardship: US embargo meaning ~126 billion dollar losses in 54 years.
- Economic hardship: obsolete local economic management.
- Aged population. Important emigration of qualified manpower. Small immigration numbers.
- Underexploited agriculture.
- Obsolete infrastructure and quality, in general, for most industrial and service activities.
- Poor and aged transportation and communication facilities: services are not covering social and economic needs.
- Low penetration of newest communication technologies in society.
- Very underdeveloped internal market.

Cuban Researchers Abroad

	Tertiary Educated Migrants	Scientists & Engineers	Occupation in S&T
U.S.	307 541 (2)	64 000 (2) 20.8 %	~8900 (2) 2.9 %
Europe	17 535 (1)	3 500 (e) 20.0 %	490 (e) 2.8 %

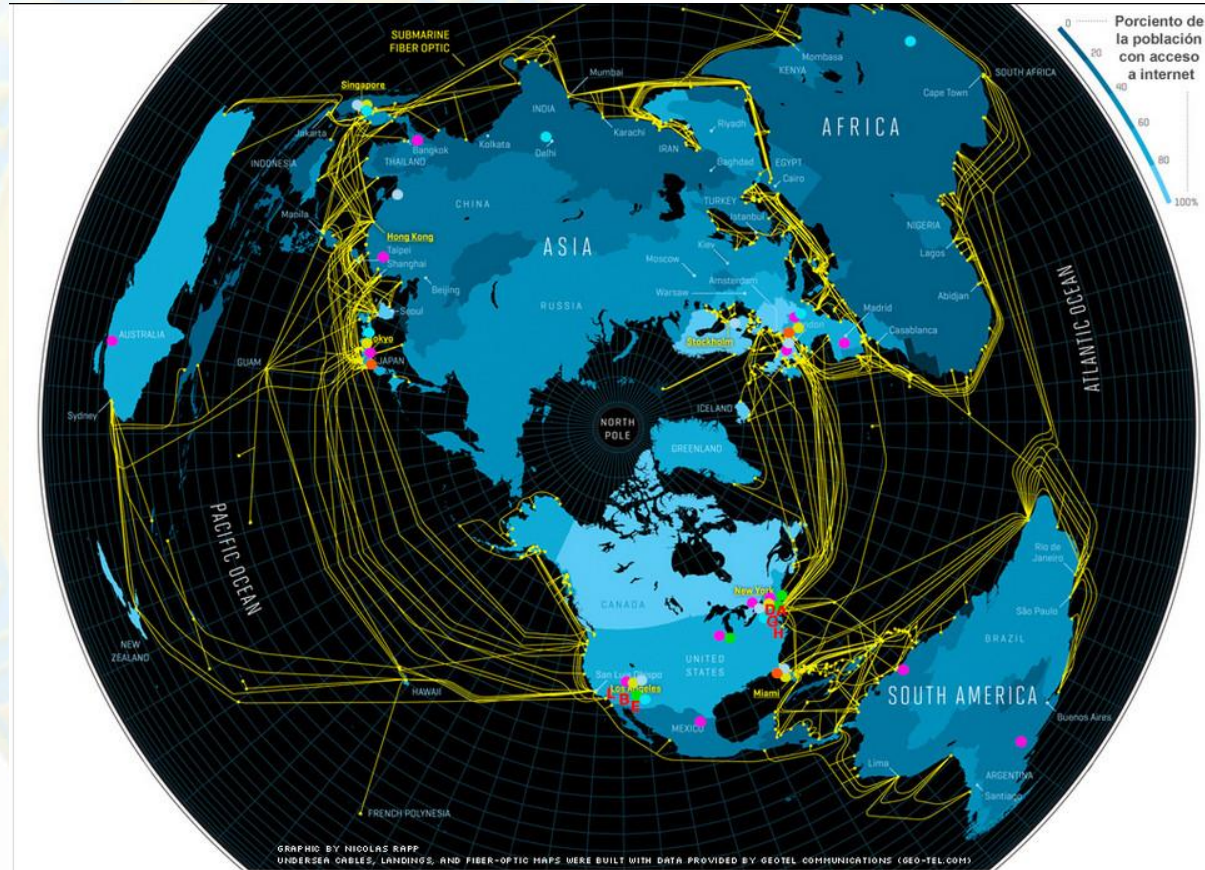
(1) Docquier et al (2009) International migration by educational attainment [OECD database]

(2) Kannankutty and Burrelli (2007) US National Science Foundation [SESTAT 2003]

(e) Estimated value

~2.9 % of Cuban population is abroad with tertiary education as got in Cuba. It is about 30 % of all Cuban people with college education

What Cuba has and what Cuba needs for science, technology and innovation to evolve for well and benefit of everyone?



Internet es una telaraña de redes, un sistema global que conecta cientos de miles de equipos diferentes permitiendo el intercambio de información

A glimpse on opportunities and themes for science, technology and innovation

- “Clean” energy recovering and sources
- Agroecology
- Air conditioning and refrigeration from renewable energy sources
- All kind of transportation systems and management
- Biotechnology and pharmaceutical products
- Comfort housing produces adapted for demographics
- Education and basic research
- Elder caring products
- Entrepreneurship on new technologies
- Environmental control and natural wildlife and landscape preservation
- Fertilizers and pesticides
- Heavy oil and gas production. Derivatives
- High throughput agricultural production and soil control in tropics
- High throughput information storage and processing and efficient communication systems
- Job creation for highly qualified manpower
- Mining and derivatives
- Packaging and manufacture of consumer goods
- Preservation of historic legacy and information
- Public health and welfare. Tropical disease cure and prevention
- Sugar and sugar cane derivatives
- Tourism development and infrastructure

What Cuba can provide for cooperation, nowadays?



- Well educated and motivated people for knowledge and science.
- A countrywide system of higher education insitutions where scientific research and innovation is part of the intrinsinc policy patterns.
- A real idiosyncratic culture of initiative.
- A certain network of research institutions.
- Advisory on supporting public health and education services for impoverished populations across the world.
- Good will and traditional affinity.



What Cuba needs for science, technology and innovation from external partners?

- Partnership and advisory.
- Cooperation on Cuban PhD's promotions.
- Investment and maintenance on infrastructure and equipment for common benefit.
- Potential markets for products of knowledge.
- New ideas.
- Opportunities.

Some contact institutions

Government:

- Ministerio de Comercio Exterior e Inversión Extranjera
- Ministerio de Ciencias, Tecnología y Medio Ambiente
- Ministerio de Educación Superior
- Academia de Ciencias de Cuba

Other organizations:

- Azcuba (<http://www.azcuba.cu/>)
- BioCubaFarma (<http://www.biocubafarma.cu/>)
- Sociedad Cubana de Química (<http://www.scq.uh.cu/>) and other scientific and professional's

Thank you!

