

EDGE > EVOLUTION | DISRUPTION | GROWTH | EMERGING THEMES

Case Study: CRISPR

ACTIVE FUNDAMENTAL EQUITY | COUNTERPOINT GLOBAL TEAM | INVESTMENT INSIGHT | 2017

WELCOME TO THE EDGE.

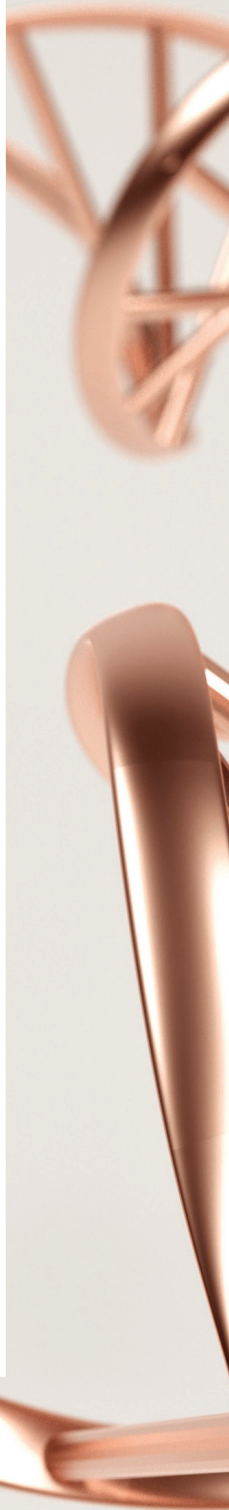
Morgan Stanley Investment Management's Counterpoint Global Team publishes its proprietary views on a big idea that has the potential to trigger far-reaching consequences—ideas such as autonomous vehicles, artificial intelligence, robotics and bioengineering.

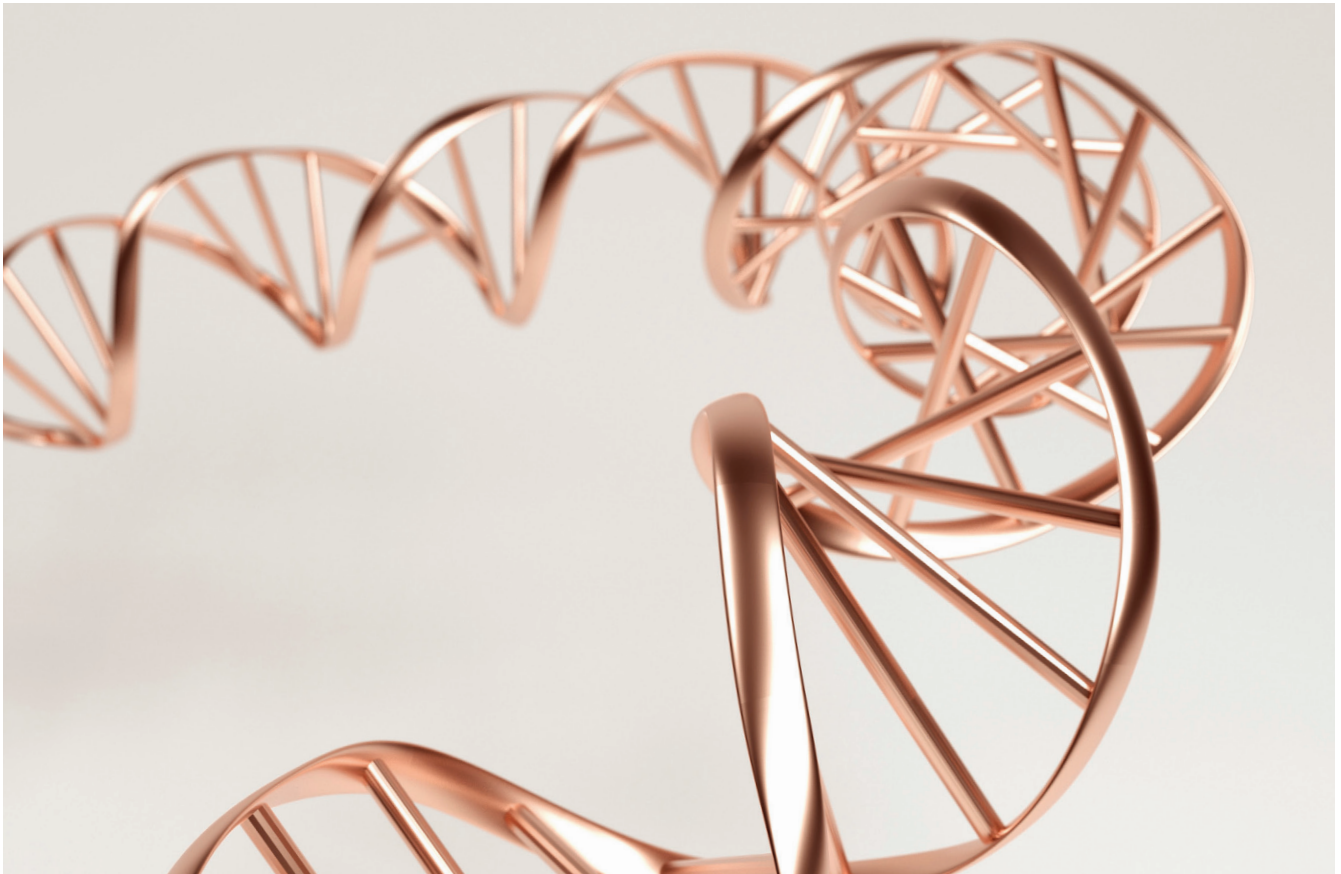
The Counterpoint Global Team's long-term ownership mindset emphasizes perspective, insight and thinking across categories, while our investment process focuses on identifying unique companies with sustainable competitive advantages. Through The EDGE, we share our framework for thinking about change and our process for recognizing patterns that may drastically alter the investment landscape over the longer term.

This work complements our team's more traditional, fundamental research to create a framework for long-term investing that is grounded in intellectual curiosity and flexibility, perspective, self-awareness and partnership.

Clustered regularly interspaced short palindromic repeats (CRISPR) is a new tool for genetic research that allows scientists to locate specific segments of DNA and then replace or delete those segments. It enables scientists to alter organisms for either therapeutic or research purposes, both before and after they have developed. For investors, it has the potential to birth new industries and disrupt existing medical treatments.

CRISPR is a string of DNA that was originally discovered as part of a bacterium's immune system. Using this simple string of DNA, bioengineers figured out how to repurpose the immune system to have it target select strands of human, animal or plant DNA instead of the natural threats to bacteria. They can thus locate specific portions of a human genome—the blueprint of the human body. Cells use DNA, which is the language of the blueprint, to construct organs and enable the various functions of the body. CRISPR allows scientists to read, write and edit this blueprint. ▶





► This breakthrough creates an opportunity for innovations to flourish. Some of the first applications of CRISPR have been in agriculture, where genetic modifications are being made to crops. Imagine an apple that doesn't brown or crops that are mildew resistant. For diseases caused by known faulty mutations—"typos" in the three-billion letter sequence of the human genome—such as cystic fibrosis, hemophilia and Tay-Sachs disease, CRISPR offers therapeutic opportunities. Once the "typos" are located, they can either be excised or altered. This treatment could radically disrupt existing therapeutics, many of which treat symptoms rather than underlying causes. The technology can even be used to target viruses, such as HIV. Such disruption would be a detriment to the annuity streams of many pharmaceutical companies. More utopian or dystopian is the possibility of "designer babies"—allowing parents to choose the traits and qualities they want in their children.

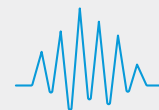
To be sure, there are a number of causes for doubt. Ethical questions could bring on regulatory scrutiny. There is also legal uncertainty over

We will continue to monitor the scientific and clinical research that is being conducted and are mindful of the tremendous potential here.

This breakthrough creates an opportunity for innovations to flourish.

the intellectual property; the Supreme Court and Congress may have to clarify the patentability of CRISPR. Finally, science is generally incremental, and there are few paradigm shifts that change things overnight.

CRISPR is still in its early stages, with the first clinical trial receiving approval in June 2016. Short of some miracle breakthrough, it could be years before treatments are approved. Other segments, like agriculture, may move faster.



OTHER DISRUPTORS

Other themes the team is currently researching include

- Blockchain
- Machine Learning
- Autonomous Vehicles

Risk Considerations

There is no assurance that a Portfolio will achieve its investment objective. Portfolios are subject to **market risk**, which is the possibility that the market values of securities owned by the Portfolio will decline and that the value of Portfolio shares may therefore be less than what you paid for them. Accordingly, you can lose money investing in this Portfolio. Please be aware that this Portfolio may be subject to certain additional risks. In general, **equities securities**' values also fluctuate in response to activities specific to a company. Investments in **foreign markets** entail special risks such as currency, political, economic, market and liquidity risks. The risks of investing in **emerging market countries** are greater than risks associated with investments in foreign developed countries. **Privately placed and restricted securities** may be subject to resale restrictions as well as a lack of publicly available information, which will increase their illiquidity and could adversely affect the ability to value and sell them (liquidity risk). **Derivative instruments** may disproportionately increase losses and have a significant impact on performance. They also may be subject to counterparty, liquidity, valuation, correlation and market risks. **Illiquid securities** may be more difficult to sell and value than public traded securities (liquidity risk). The **healthcare industry** can be affected by various political, economic, regulatory, and supply-and-demand factors. Furthermore, it can be subject to government approval of products and services, which could have an effect on price and availability, and can be affected by rapid obsolescence and patent expirations.

MSIM Counterpoint Global Team

Counterpoint Global Team

DENNIS LYNCH, Head of the Counterpoint Global Team

New York

INVESTORS	RESEARCH RESPONSIBILITIES	YEARS OF EXPERIENCE	YEARS WITH FIRM	YEARS WITH TEAM
DENNIS LYNCH	Lead Investor	24	20	20
SAM CHAINANI	Communication Services, Financials, Internet	22	22	18
JASON YEUNG	Health Care	21	16	14
ARMISTEAD NASH	Business Services, Software	18	16	14
DAVID COHEN	Consumer	30	25	19
ALEX NORTON	Consumer, Industrials, Technology (ex Software)	23	18	18
THOMAS KAMEI	Internet, ESG	9	6	6
MANAS GAUTAM	Generalist	6	3	3
DISRUPTIVE CHANGE RESEARCH				
STAN DELANEY	Big Ideas, Emerging Themes	17	17	14
SASHA COHEN	Big Ideas, Emerging Themes	<1	<1	<1
CLIENT RELATIONSHIP AND BUSINESS MANAGEMENT				
MARY SUE MARSHALL	Portfolio Specialist	38	18	18
PRAJAKTA NADKARNI	Portfolio Specialist	14	11	7
MCKENZIE BURKHARDT	Portfolio Specialist	15	15	15
EARL PRYCE	Portfolio Administrator	18	18	11
ROBERT ROSS	Portfolio Administrator	26	21	<1

Global Opportunity Team

Hong Kong

KRISTIAN HEUGH, Lead Investor Global, International, Asia

- 3 Investors
- 1 Portfolio Specialist

"Investor" refers to an analyst or portfolio manager on the Counterpoint Global Team.

Team members may change without notice from time to time. Years of Experience listed above refers to Industry Experience.

Years of Experience, Years with Firm and Years with Team are as of April 2018.

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