PJIM PARSONS JOURNAL FOR INFORMATION MAPPING

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Visualizing Alien Life

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KEYWORDS *Infographic, aliens, extraterrestrial life, Popular Mechanics*

DATE 2013

ABSTRACT *Popular Mechanics* is a general-interest publication that covers news in science, infrastructure, space, technology, DIY, and home, among other areas. We reached a circulation of *more than 8 million print readers, and 4 million unique visitors online*. By capitalizing on a data-rich story in the July/August issue, *PopMech* designers visually express the possibility of alien life in our galaxy in a massive, full-spread infographic executed by graphic designer Kelli Anderson. This article will discuss the creative process behind the art direction of "The Case for Alien Life" (*Popular Mechanics*, July/August 2013) from its first visualization as a series of sketches to the final work available on newsstands.

We take you to a brightly lit 4:00 PM in the *Popular Mechanics* headquarters at 300 West 57th Street. It is the barren middle of a long week, drawn out by a difficult close that had ended just the week before. Assignments undertaken this week will be printed in the July/August double issue, which is slated to contain four features—a desert adventure story, a piece on military technology, an article on automated lawn mowers, and the last on the possibility of alien life in our galaxy. "The Case for Alien Life," or simply "Aliens," as it will be known throughout the production of this issue, is a science-driven news article that suggests that the likelihood of alien life existing in our galaxy has risen exponentially. Citing a number of recent discoveries using the Kepler telescope and the Mars rover Curiosity, as well as research on Earthbound organisms known as extremophiles, author Sarah Fecht makes a persuasive argument for the possibility of alien life in a 2,600-word essay that will span six pages.

When investigating the possibility for alien life in our galaxy, scientists often begin by searching for evidence of water. In November 2012, it was discovered that Mercury contains 100 billion tons of water ice deep in its core—despite an overall surface temperature of up to 800 degrees Fahrenheit. In 2011, with the help of Curiosity, scientists observed evidence of freezing and evaporating water on the surface of Mars. Analyses of meteorites recovered on Earth have been shown to contain nitrogen, sulfur, sugars and amino acids, as well as some components of genetic material. The discovery of hardy bacteria dwelling miles beneath the surface of a nearly frozen Antarctic lake indicates that life can exist without the luxury of sunlight or bountiful oxygen. Environments previously thought to be sterile are teeming with rough-and-tumble life forms known as extremophiles. Planets within our galaxy that were once considered too extreme to support life might, at this very moment, be populated by extremophiles similar to those that inhabit the depths of Earth's lightless oceans and acidic hot springs. Recent discoveries made through the Kepler telescope have suggested that there are many millions more planets in the galaxy than astronomers had once estimated. Fecht reports that "as of January, Kepler had discovered 2,740 potential planets—up from 1,235 in February 2011 ... if past experience is predictive, 90 percent will turn out to be real planets." In addition, a fair number of these planets may exist within the habitable zone, the ideal distance from a star in which a planet can orbit and maintain liquid water, the strongest predisposing factor for alien life.

Alongside the hard science and news reporting contained in the text for "Aliens" is a short sidebar covering the history of Drake's equation, a thirteen-component formula that initially seems more algebraic nightmare than scientific interest. The equation multiplies a slew of unknowable variables, including the average number of star formations per year in our galaxy (R) and the fraction of habitable worlds where life originates (f_l), in order to reach N, the number of civilizations in our galaxy that use detectable communications (FIGURE 1.) Drake's equation has produced a wide range of solutions, varying according to historical period, available technology, and differing interpretations of data. The value of N as calculated by Drake in 1961 was roughly 500, while the modern-day figure is closer to 2,100. Nevertheless, it is this quasi-mathematical leap in the dark that first ignites the interest of the dreamers in the *PopMech* design team. Could it be possible to visually depict this equation, or the values it incorporates, in a way that is both engaging and intellectually meaningful?

While initial sketches have relied on expected imagery—the swirls of the Milky Way galaxy and photos of Curiosity as it traverses the surface of Mars—the sheer enormity of the article's concept seems to expand beyond a literal approach. A photographic focus zeroes in on a single

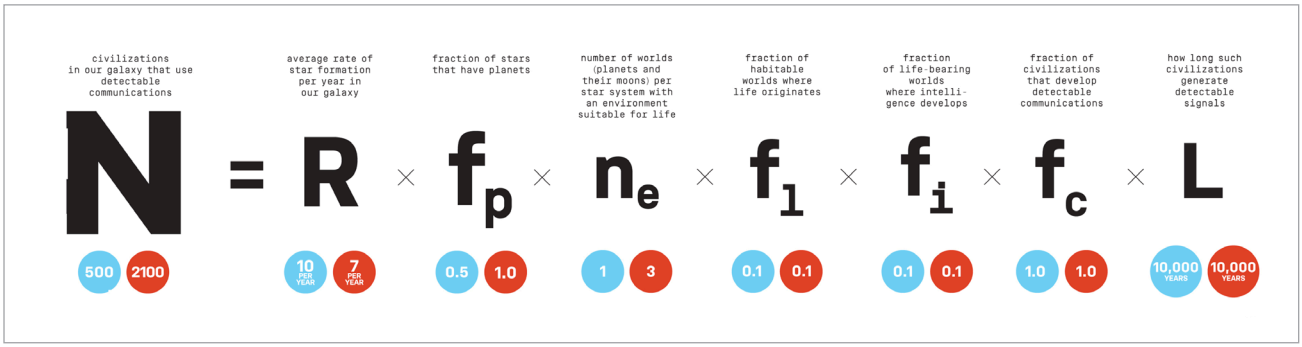

FIGURE 1: *Drake's equation was created in order to find the number of civilizations in our galaxy that might generate detectable communications. That number is represented by N and derived by seven factors: the resultant numbers in blue are those as calculated by Drake in 1961. The numbers shown in red represent the modern-day calculations based on more recent data about the universe.*

instant in time and one specific location, but the reach of the article expands throughout the entire galaxy and its growing future (FIGURE 2.) A wide-format infographic will not only capture the massive scale of this abstract concept, but also provide useful information to explain it. Having an intellectually demanding readership greatly enables such an approach, but it also creates some expectations. Design must reach a comfortable balance between creativity, visual impact, and scientific accuracy. The essential challenge of every issue is to make sure that this balance is intact and fair. A close working relationship with the expert editorial staff is the most certain method of achieving an infographic opener that is both accurate and visually gripping.

The design team approaches Deputy Editor Jerry Beilinson, the assigning editor of the story, with a series

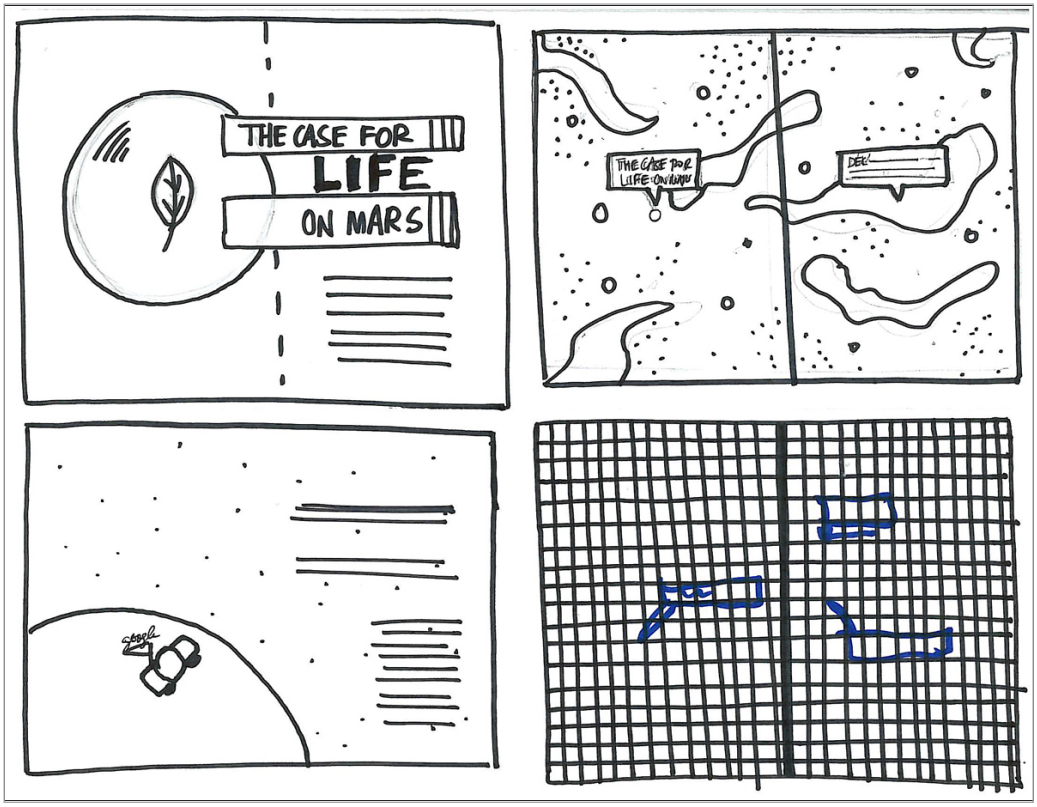

FIGURE 2: *The initial sketches were made with the concept of using photographs of space, a pictorial approach. However, the scale was too vast and this would represent only one part of the universe, so the logic became more diagrammatic in scope.*

of sketches that exemplify the concept. In what becomes a more refined version for presentation to the editor-in-chief, Jim Meigs, the spread is divided into 12,500 square units that represent the 100 billion planets of our galaxy. Colors are randomly assigned to groups of planets that boast certain life-sustaining features, such as the presence of liquid water on a planet or its existence within the habitable zone. (FIGURE 3) In order to pursue the concept, designers petition the editorial staff for data that will fit the needs of the infographic. After conversing with Fecht and doing more research, Jerry returns to the design team with a wealth of useful statistics. Namely, that there are 100 billion planets in the galaxy, 50 billion of them being small (about half the size of Earth), another 17 billion Earth-sized, and, of those, 11 billion being Earth-sized planets within stars' habitable zones.

Preeminent graphic designer and infographer Kelli Anderson is commissioned to complete the project.

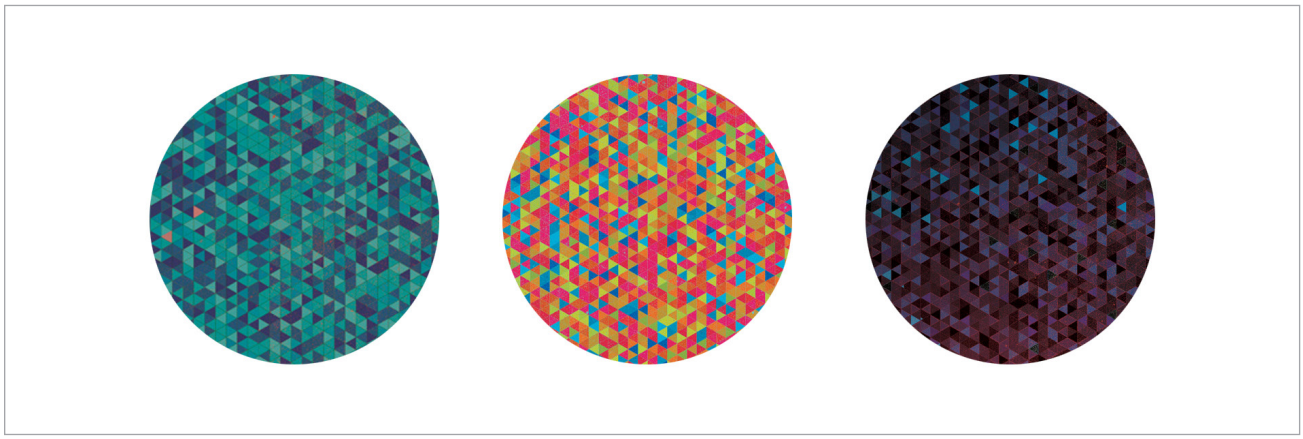

FIGURE 3: *Colorfield alternatives were tested and discussed; color were chosen for indicative values, such as assigning a color-code to illustrate as to whether there was a presence of liquid water on a planet or its existence occurred within the habitable zone. Also, certain colors were eliminated if they were overtly representative, green too easily equates to forest, etc.*

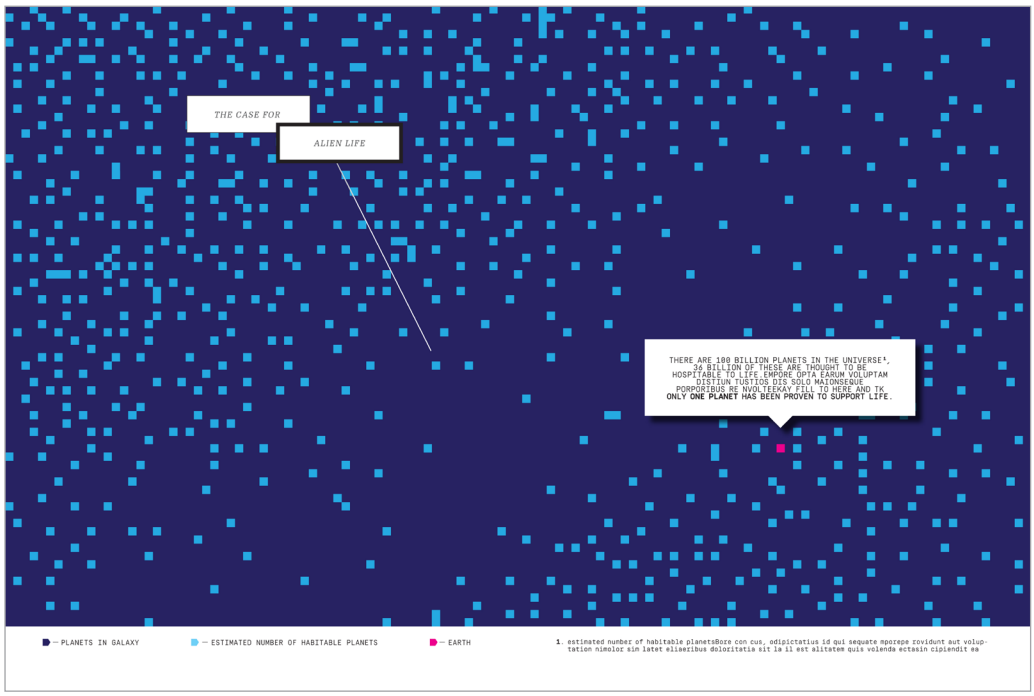

FIGURE 4: *This initial drafts were diagrammatic and indicative of quantities and percentiles, but they were not engaging enough or did not convey the depth of the proposed concept.*

FIGURE 5: *Once the basic visualization method had come into focus, it then became possible to pursue layout variations and consider how supporting text might be incorporated into the intended final rendering. Multiple variations were refined, compared, and evaluated.*

She creates an isometric grid that spans the entire spread, and colorizes proportions of the grid to fit the data (FIGURE 4). Several versions are presented for the consideration of Design Director Michael Lawton, who responds with a lightning-fast series of edits and rejections (FIGURE 5):

A. The more I look at this type treatment the more I like it.

B. The more I look at this type treatment, the more I think I like the other one. Overall, too dark. I understand that it's supposed to resemble space, but in combination with the rest of our feature openers it's entirely too dark, Chief. What if it was something totally different—green, orange, yellow?

C. The color choice is tough, blue looks like the ocean, green looks like the forest or the jungle, red looks like fire. We need something different—how about orange? Perfect!

The opener evolves from a predominately dark palette to a much brighter selection of colors, abandoning the appearance of space in favor of setting the infographic apart from a collection of exceptionally dark feature openers. (FIGURE 6) The type treatment is subject to a quick-moving evolution as well. Organizing the various elements of the opener—headline, dek, lengthy caption, and key—in a clear visual system is paramount to the reader's understanding of the story. Through various iterations, the design is simplified, and eventually most of the technical information is contained in a narrow white column with the headline hovering over the graphic in isometric relief. An arrow from the headline draws attention to the last accent of the graph, an overlay of 10,000-times magnification that locates Earth, a mere fraction of a triangle in this geometric galaxy, as the one planet with confirmed life.

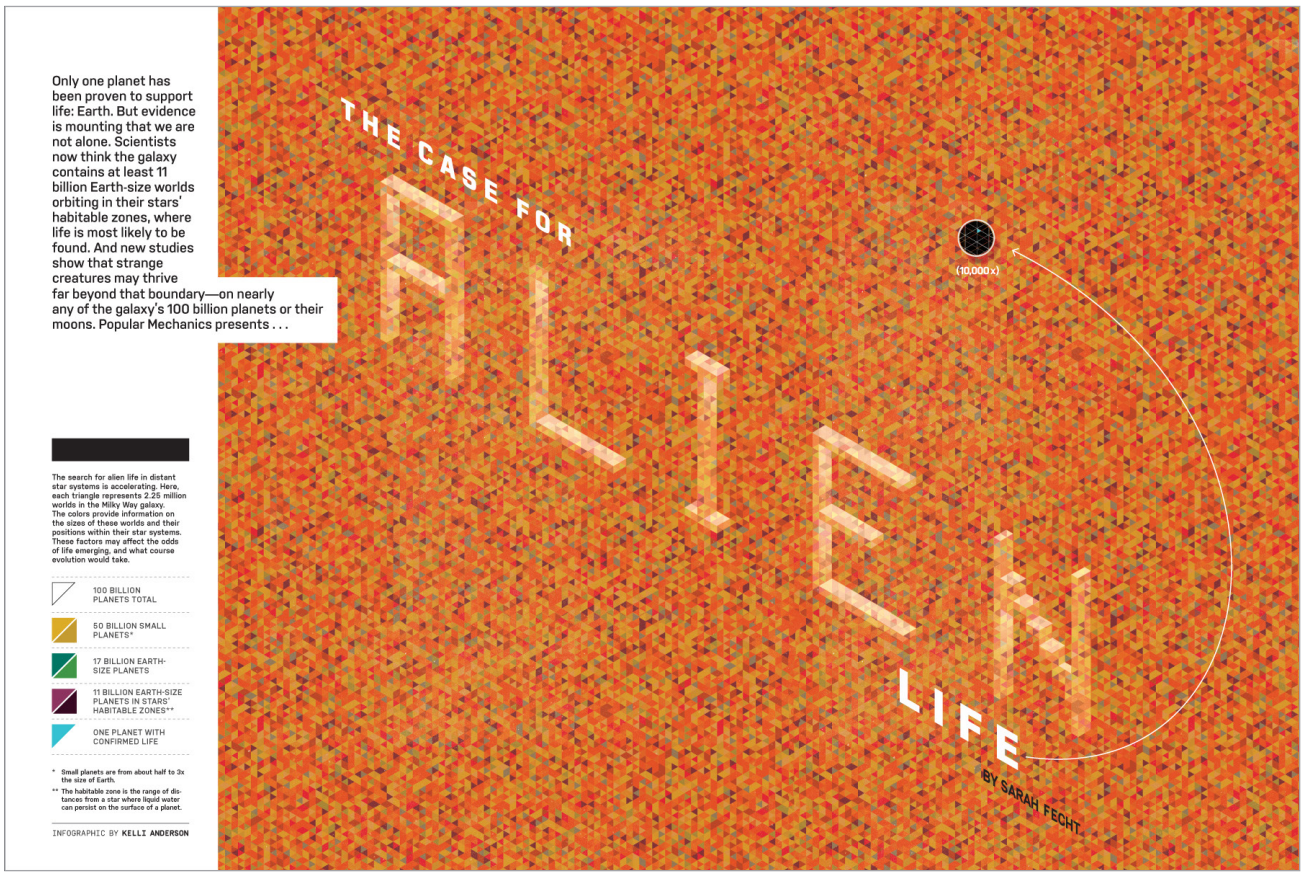

FIGURE 6: *The final spread incorporated the three main areas of graphical considerations: the core information graphic composed of cells and chosen color schemes, the system designed for the key to orientate the user, and the overall typographic treatment. After rounds of concepts, the team at* Popular Mechanics *decided on the final spread, shown here.*

BIOGRAPHY

Michael Lawton is the design director of *Popular Mechanics* magazine and is responsible for the design of both print and tablet editions of the 111-year-old brand. His work at *Popular Mechanics* has recently been recognized by the *2012 Society of Publication Designers, Ad Week, MIN's Tablet Editorial & Design Awards, and ASME.*

Jerry Beilinson is the deputy editor of *Popular Mechanics*. In addition to working in print and online, he leads the magazine's tablet app initiatives.

Kristie Bailey is currently an associate art director at *Popular Mechanics*. She was previously employed as a designer at *O, the Oprah Magazine*, and was recently recognized by *SPD* for her work on *Howler Magazine*.