



AN ELEGANT LITTLE INSTRUMENT: THE JAPANESE STANDARDS ASSOCIATION AND THE BIRTH OF THE MODERN D20

Peter D. Evan

Abstract

This article traces the history of the twenty-sided die or d20. The story of how the d20 became synonymous with wargames and role-playing games is an unlikely one, full of bizarre twists and fortuitous encounters. It includes some familiar characters, such as game designers Gary Gygax and Lou Zocchi, but others less well known in gaming circles, including eminent science writer Martin Gardner, and Ishida Yasushi, a quality control engineer at Toshiba. It spans several decades and three continents, from the seaside town of Kamakura in the autumn of 1950, to the shores of Lake Geneva in the winter of 1973-4.

Keywords

TTRPG, d20, dice, polyhedral, *Dungeons & Dragons*, *D&D*, industrial design, history, Japanese Standards Association

[Disclaimer: The author would like to thank the Japanese Standards Association for the use of figures 1, 3, 4, 5, 6, and 7, and also Manami Hirayama for helping to secure permission for their use. Please note that the content of this article is the responsibility of the author and does not represent the views of the JSA.]

Role-playing and wargaming encompass an almost limitless expanse of human imagination and activity, from the distant past to the far future, from the fantastic to the quotidian, from battles fought with foam swords, to those played out with pencil and paper, to still others conducted entirely in digital realms. Even sketching the barest outline of all of these rich and varied worlds would be a daunting task. And while these phenomena defy categorization, one item has arguably come to serve as a symbol able to represent all of these related hobbies and the communities that engage in them: the humble icosahedral twenty-sided die, or d20. It can be seen in all manner of merchandise from t-shirts to socks, and in branding for books, virtual tabletops, and entire game systems. While

some games use entirely different dice or no dice at all, the d20 has, in the public consciousness at least, become synonymous with wargames and role-playing games.

The story of how this came about, and how the modern d20 came into being, is an unlikely one, full of bizarre twists and fortuitous encounters. It includes some familiar characters, such as game designers Gary Gygax and Lou Zocchi, but others less well known in gaming circles, including eminent science writer Martin Gardner, and Ishida Yasushi, a quality control engineer at Toshiba. It spans several decades and three continents, from the seaside town of Kamakura in the autumn of 1950, to the shores of Lake Geneva in the winter of 1973-4. Between those extremes this tale unfolds over the boardrooms of Tokyo in the 1950's, the classrooms of the US Naval War College in the 1960's, and the tabletops of wargamers in the US and Britain in the early 1970's.

Its first chapter begins at the Japanese Standards Association, an administrative body formed in post-war Tokyo as part of the effort to revitalize Japanese industry in the wake of the devastation of WWII. A key component to this strategy was the enforcement of rigorous standards of quality control, for which random sample selection was vital. This was usually achieved through the use of complex randomization tables, but such methods were seen as unwieldy and inefficient. It was in this context that a group of young Japanese engineers looked back to ancient geometrical theories for a solution. The result would be the creation of the first mass-produced twenty-sided die.

The clearest and most complete narrative account of the development of the Japanese Standards Association's "Icosahedron Random Numbers Generating Dice" appears in a 1958 article published in the official JSA journal *Hyōjunka*, "Ransūsai to sono Shiyōhō" [Random Number Generating Dice and their Method of Use].¹ Although published several years after the dice had already gone on sale, it is perhaps best to start here. The relevant passage is brief and worth quoting in its entirety:

QCC-TID

In the spring of 1950, the Quality Control Management Committee (QCC) of the Japanese Standards Association was founded, and the Tools and Instruments Division (TID) was established as one of its five subcommittees. While the Tools and Instruments Division was subsequently renamed the Measurements Division, Mr. Ishida Yasushi of Toshiba remained its chairman throughout. Although the TID's meetings were held frequently, it was at the 4th meeting that the question of "the instrumentation of random number tables" was first raised. It was at this meeting that the chair himself proposed his idea of a "random number device," going on to introduce the specific concept of a "rotary random number device."

Random number devices

The idea for this was that the 10 numerals from 0, 1, 2, ..., 9 would be engraved on a rotating board which, after momentum had been applied, would stop of its own accord, and that the number indicated by a needle on the board would be read as a single-digit random number. With the cooperation of many members of the division, this scheme was realized as conceived. If I may give the names of some of those involved, they included Mr. Nishikawa Jinta of Yokogawa [Electric Corporation] and Mr. Kuwahara Zen'ichi of Toshiba, and so on. After many years had passed, this concept was developed outside the TID, and a random number device that could be spun automatically by a complex spring mechanism appeared.

¹ QCC Secretariat, "Ransūsai to sono Shiyōhō" [Random Number Generating Dice and their Method of Use], *Hyōjunka* [Standards], 11(3), 1958, pp. 203-5.

Within the TID a “ball toss style” random number device was also conceived, and ideas in this field continue to be suggested in the present day.

Random number dice

From what the author was told by the chairman of the TID, despite the use of polyhedrons being raised by the chairman himself during the 4th meeting, because this did not make its way into serious debate before the end of the meeting, this valuable idea slipped out of grasp by a whisker. It would not be until one night that September, about a month later, that the chairman hit upon the idea of using regular icosahedral dice because of an event at an informal family gathering at his home in Kamakura.

Regular polyhedrons

Regular polyhedrons have been known since antiquity in Greece, and there exist only five types, which are represented by Figs. 1, 2, 3, 4, and 5. The dice usually used, d6 dice, belong to the type shown in Fig. 2.

Fig. 5 is a regular icosahedron which, as its name suggests, has 20 regular triangular faces. Because this is exactly double 10, the 10 numerals from 0-9 can each be inscribed twice. Because these dice have 20 faces, they roll around lightly and, once they come to a halt, a single number will appear on the level surface, which can be regarded as a random number.

Base-6 and Base-10 numeral systems

The history of dice is ancient, dating back 3,000-4,000 years according to records. In primitive civilizations and cultures, the base for measurements and counting was not decimal; rather base-3, base-6, and even base-8, base-12, base-16, and base-24 numeral systems were used, but as science flourished the decimal numeral system was ultimately settled upon. As for dice, while d6 dice followed a base-6 system, the development of random number dice has for the first time allowed for decimal dice.

The aforementioned random number dice have finally been born. Other matters — such as inscribing the indicia, manufacturing methods, and certification — remain to be discussed, but that will be left to a future opportunity.²

That future opportunity never seems to have arisen, but we can trace the development of the dice in short reports and descriptions published in JSA journals and in other publications throughout the first years of the 1950's.

Almost from its inception in 1950, the Quality Control Management Committee (QCC) of the JSA was concerned with devising a simple mechanical replacement for the cumbersome random number tables that were indispensable to its work. The committee published regular reports of its activities in the journal *JIS: Industrial Standardization*, and through these we can see how their solutions to this problem gradually took shape. The January 1951 issue includes a report of the first few meetings of the Tools and Instruments Division (TID), during which they undertook the development of a *ransūki*, or “random number device.”³ This first report seems to have been published some months after those early meetings took place, since the above narrative in the 1958 *Hyōjunka* article describes the formation of the division in the spring of 1950. In the next report, published March

² Ibid., pp. 203-4. I am indebted to Dominic Veveris for this translation.

³ “QCC JSA no Genjō” [The Current State of the JSA QCC], *JIS: Industrial Standardization* 4 (1), 1951, p. 32.

1951, we learn that the TID had begun to test two devices in prototype, one of which is described as being “cigarette lighter shaped” and the other “icosahedral.”⁴ Taken together with the *Hyōjunka* account quoted above, we can piece together the following sequence of events: the QCC and its subdivision, the TID, were formed in the spring of 1950. The TID had met four times by roughly August of that year, and at the fourth meeting the chairman, Ishida Yasushi, proposed the use of polyhedral dice, though this was not taken up in earnest. One month later, while relaxing with family at his home in Kamakura, something happened which inspired him to consider that idea more seriously, and by the following March, the TID had adopted an icosahedral die as one of their two front-running designs, which they began testing in prototype.

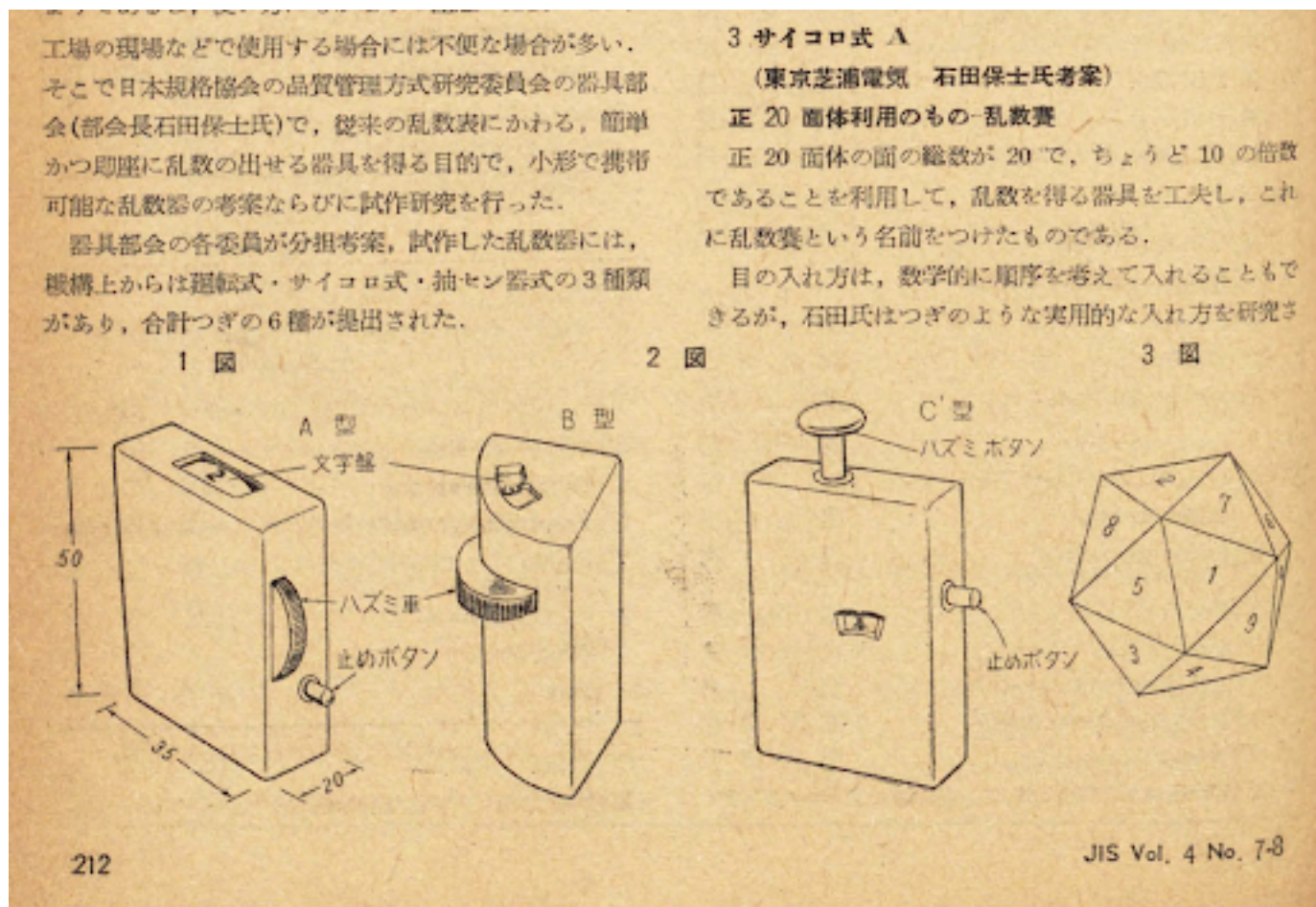


Figure 1: Random number generator prototype designs, JIS July-August 1951 (vol. 4, no. 7-8, p. 212). Used with permission.

The TID’s June 1951 report reveals that the search had expanded to six possible designs, but only the aforementioned cigarette lighter and icosahedral types are referred to specifically. Furthermore, the creators of those two designs are mentioned by name for the first time: the icosahedral design is

⁴ “QCC-JSA: Hinshitsu Kanri Hōshiki Kenkyū Iinkai” [QCC-JSA: Quality Control Systems Research Committee], *JIS: Industrial Standardization* 4 (3), 1951, p. 96.

credited to Ishida, and the cigarette lighter type to Nishikawa Junta of Yokogawa Electric.⁵ The August issue of *JIS: Industrial Standardization* devotes three pages to this project, including detailed descriptions of all six proposed designs.⁶ The article includes illustrations of five of those designs, including Ishida's icosahedral device, which is instantly recognizable as the sort of decimal d20s that would eventually be adopted by the gaming community decades later.

While the TID was releasing these regular reports, Ishida published his design in the April 1951 issue of *Kikai no Kenkyū: Science of Machine*.⁷ The article includes diagrams and instructions for making an icosahedral die out of thick paper or card and gives a complete die map. This map is consistent with the illustration from the August issue of *JIS: Industrial Standardization* mentioned above but is different from that which seems to have been adopted as standard once the dice were put into production. Ishida's article went on to be cited in several papers in related fields over the next few years and seems to have been instrumental in disseminating his design outside of the JSA. One of the more interesting of those papers describes making dice in this style cheaply and easily out of old business cards,⁸ and one wonders whether such a material was used for the prototypes and perhaps accounts for the small size of the final production models.

By 1952, the TID must have been content that their search for a compact, simple and reliable random number generating device was over, and that Ishida's design was the solution. A product manual recently collected with a set of the dice includes the patent number 195222⁹ (Figure 2), implying that the patent was applied for, published, or granted in that year.¹⁰ By June, the JSA had begun including advertisements for sets of these dice in many of its publications, and would continue to do so for several decades.¹¹

⁵ "QCC Nyusu" [QCC News] *JIS: Industrial Standardization* 4 (6), 1951, p. 179.

⁶ Kamiyama, Tadao, "Ransūki no Kenkyū" [Research into Random Number Devices], *JIS: Industrial Standardization* 4 (7/8), 1951, pp. 212-4.

⁷ Ishida, Yasushi, "Chūshutsu Kensa ni okeru Ransūhyō to Ransūsai" [Random Number Tables and Random Number Dice in Sampling Tests], *Kikai no Kenkyū: Science of Machine* 3 (3), 1951, pp. 197-200.

⁸ Takenouchi, Isao, "Kantan na Nijyūmentai no Saikoro no Tsukurikata" [A Simple Method for Constructing Twenty-sided Dice], *Hinshitsu Kanri* [Quality Control] 3 (1), 1952, p. 36.

⁹ Japanese Standards Association, *Random Number Generator 20-Face Dice (Icosahedron)*, product manual, undated.

¹⁰ It should be noted that the format of this patent number seems to be unusual. Dates seem to have been used in patent application and publication numbers, but not in the final patent numbers themselves. Furthermore, most sources agree that the western dating system was not used to number patents in Japan before 2000. There may therefore be some sort of error or ambiguity in this document. For more information on Japanese patent numbers see, for example, Steve Denny, "Making Sense of the Japanese Patent Numbering System," *Kita-Aoyama International Patent Bureau*, January 31st, 2022, <https://www.kipb-jp.com/making-sense-of-the-japanese-patent-numbering-system>, accessed March 13th, 2023.

¹¹ *JIS: Industrial Standardization* 5(6), 1952, back cover. The latest advertisement that this author was able to find was dated October, 1995 (*Standardization and Quality Control* 48 (10), 1995, p. 25). In this ad, the dice continue to be described as being 18mm in size and sold with a dice cup, and the photo used to illustrate them appears to show dice essentially identical to those in the earliest photos.

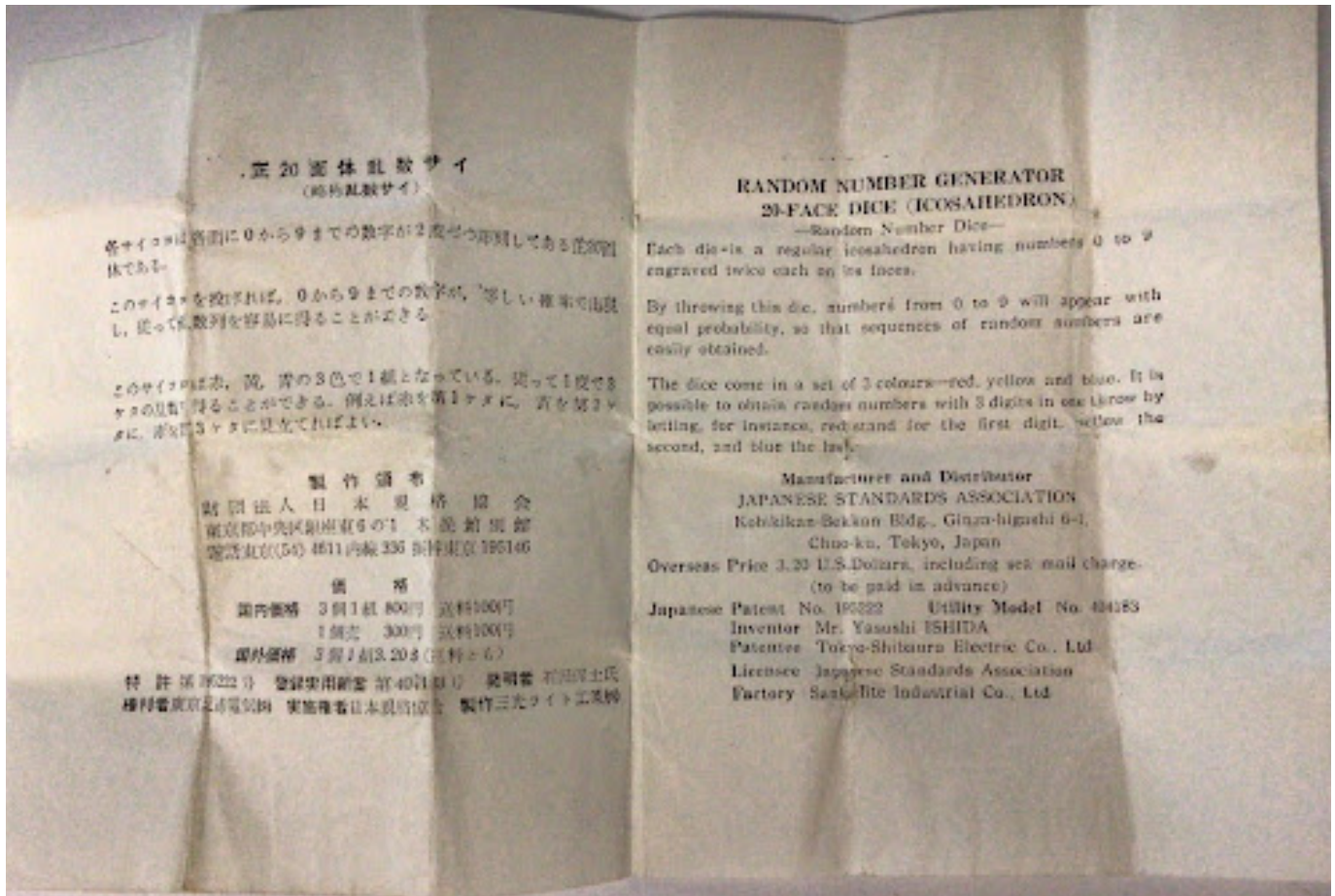


Figure 2: Manual collected with a small-case variant of the JSA dice. Used with permission.

規格票の様式 65 * 15

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0 から 9 までの数字が
ランダムにできる十進サイ

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定価 1 組 (3 個) 2400 円 千 120 円

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係の皆様のご愛用をおすすめします。

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日本工業規格表示工場

通商産業大臣許可
商標第 132 号 丸商標第 137 号

定価 1000 円
(送料別)

● 鉱山保安警標

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保証つきのもの各種
あります。

値段は種類により、
それぞれ合理的単価にてお願いいたしております。
ご用命によりご相談に応じます。

通行禁止

消火器

坑口

注意

申込先 日本規格協会

Figure 3: An early, possibly the first, advertisement for the JSA dice, from the June 1952 issue of JIS (vol. 5, no. 6, p. 195). Used with permission.

From these early advertisements we learn that the dice were marketed under the name *Ikosahedoron*, and that they originally retailed for 2,400 yen for a set of three, plus 120 yen for postage. This was a considerable sum at the time, in keeping with what one might expect to pay for a serious scientific instrument, rather than a piece of gaming kit. However, that would soon change: the ads included in the 1957 and 1958 editions of the *JIS Yearbook* reveal that the price had dropped by two thirds in the intervening year, to 800 yen per set plus 100 yen postage. Furthermore, the 1958 *Yearbook* also advertises individual dice at a price of 300 yen each. Perhaps this dramatic reduction in price is indicative of a change in methods or materials, or an increase in production volumes. It is also worth noting that the distinctive and practical tripartite cases that were made for these dice had either not yet been developed or were not seen as a selling point, since no mention is made of them in any of the advertisements of this period. The earliest evidence for such a case that this author has been able to find is a photo included in the 1958 *Hyōjunka* article mentioned above (Figure 4). Since this photo is roughly contemporary with the dramatic drop in price between 1957 and 1958, it's possible that the case was introduced as part of whatever changes allowed the JSA to sell the sets at that lower price, though of course it's also possible that it had been part of the design right from the start. This new lower price would only remain in effect for a few years, and by the 1963 *Yearbook* it had risen to 1,000 yen for a set of three and would continue to rise gradually over the coming years.

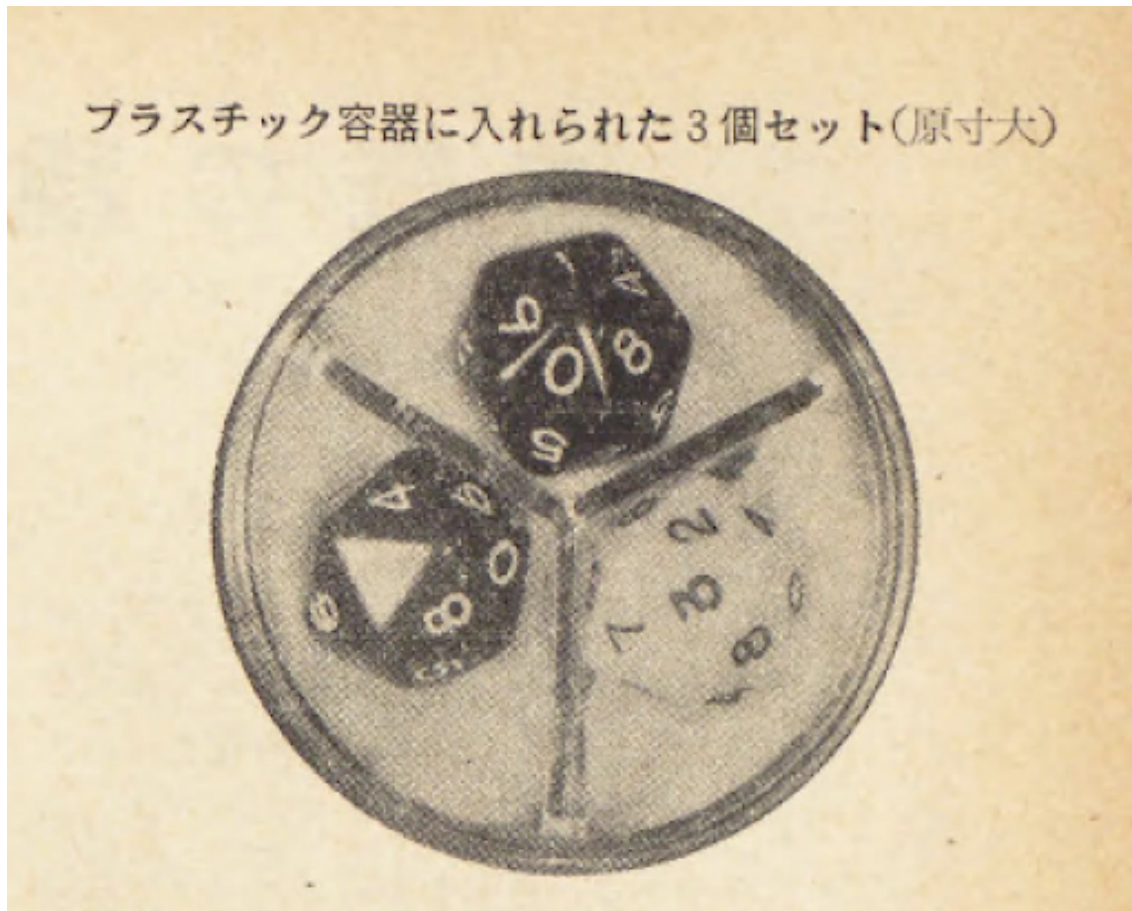


Figure 4: Photograph of the small case design, from the March 1958 issue of *Hyōjunka* (vol. 11, no. 3, p. 205). Used with permission.

Throughout this time, frequent mention of the dice in the scientific literature shows that they had been taken up with enthusiasm in fields as diverse as sociology, economics and medicine. The JSA seemed well aware that they had a useful and desirable product on their hands, and they were keen to get the word out to as many people as possible. One member of the QCC, Shirasaki Fumio, describes a visit to the USA in July, 1952, in which he showed them to Harold F. Dodge at Bell Laboratories. Dodge's response seems to have been one of reserved enthusiasm. He was struck by their simplicity, but skeptical that they could be truly random and unbiased.¹² This type of word-of-mouth promotion continued for more than a decade. A brief report published in *Hyōjunka* in 1963 boasts of the popularity of the dice in Asia and North America and includes the text of a postcard sent by JSA member Miura Shin of Mitsui Chemicals, in which he recounts having dinner in Milwaukee with members of the American Society for Quality Control. Miura's American counterpart mentions his interest in the dice and places an order for a set on the spot. Miura jokingly cautions the recipient of his correspondence back in Japan to fulfill the order completely and promptly, since the international reputation of the JSA is at stake.¹³ The JSA even made the dice a feature of the regular "Quality Control Quiz" section of their journal, giving away a free set to each of the first three correct respondents. In one case, they report that one lucky reader had successfully responded to two quizzes, and since he had already purchased a set of the dice for his research, he was now in possession of a number of sets. As those were already being put to use in his lab, he intended to use his latest prize "for his own enjoyment."¹⁴ The demand for the dice would temporarily outstrip supply, leading to a situation mirroring that of TSR's own supply issues with dice in the early 1980's. In January, 1962, the writer of the QC Quiz regretfully informed readers that that month's winners would receive vouchers for 1,000 yen of JSA products, since the highly popular dice were currently out of stock.¹⁵ However, they must have resolved this issue relatively quickly, because by July of that year they were back in stock and available to winning contestants once more.¹⁶ All of these reports reveal the efforts that the JSA made to promote the dice both at home and abroad, and the interest and enthusiasm with which they were received. Perhaps the most conspicuous example of this promotion is the February 1958 issue of *Hyōjunka*, in which photos of the dice feature prominently on the front and back cover (Figure 5).¹⁷

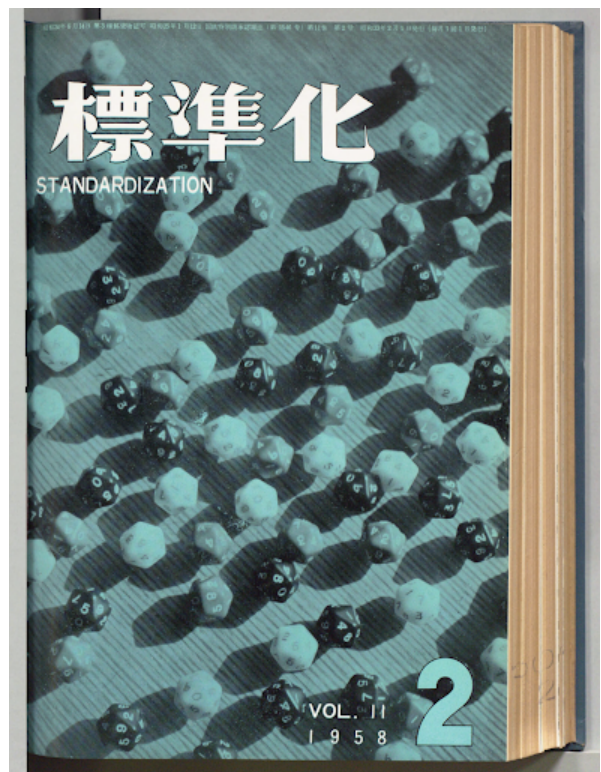


Figure 5: Front cover of the February 1958 issue of *Hyōjunka*. (vol. 11, no. 2). Used with permission.

¹² Shirasaki, Fumio, "Amerika Tsūshin (2)" [American Correspondence (2)] *JIS: Industrial Standardization* 5 (9), 1952, pp. 261-3.

¹³ "Kokusai Hyōjunka no Ugoki" [International Developments in Standardization], *Hyōjunka* [Standards], 16 (4), 1963, p. 104.

¹⁴ "Tōzainanboku" [North, South, East, West], *Hyōjunka* [Standards], 12 (8), 1959, p. 68.

¹⁵ "QC Kuizu" [QC Quiz], *Hyōjunka* [Standards], 15 (1), 1962, p. 55.

¹⁶ "QC Kuizu" [QC Quiz], *Hyōjunka* [Standards], 15 (7), 1962, p. 39.

¹⁷ *Hyōjunka* [Standards], 11 (2), 1958, from and back cover.

At around the same time, the dice also start to appear outside the narrow confines of academic publications, though still in contexts very much connected with scientific research. In 1956, and again in 1959, articles by prominent scientists in the pop-sci magazine *Kagaku Asahi* make mention of the dice.¹⁸ Knowledge of the JSA dice and their potential applications would certainly have reached a wider audience through publications like this, but just what sort of impact this may have had remains uncertain. It is tempting to imagine young *Kagaku Asahi* readers growing up to become members of the nascent wargaming community in Japan, bringing knowledge of the dice with them, but so far no evidence for this has been found.

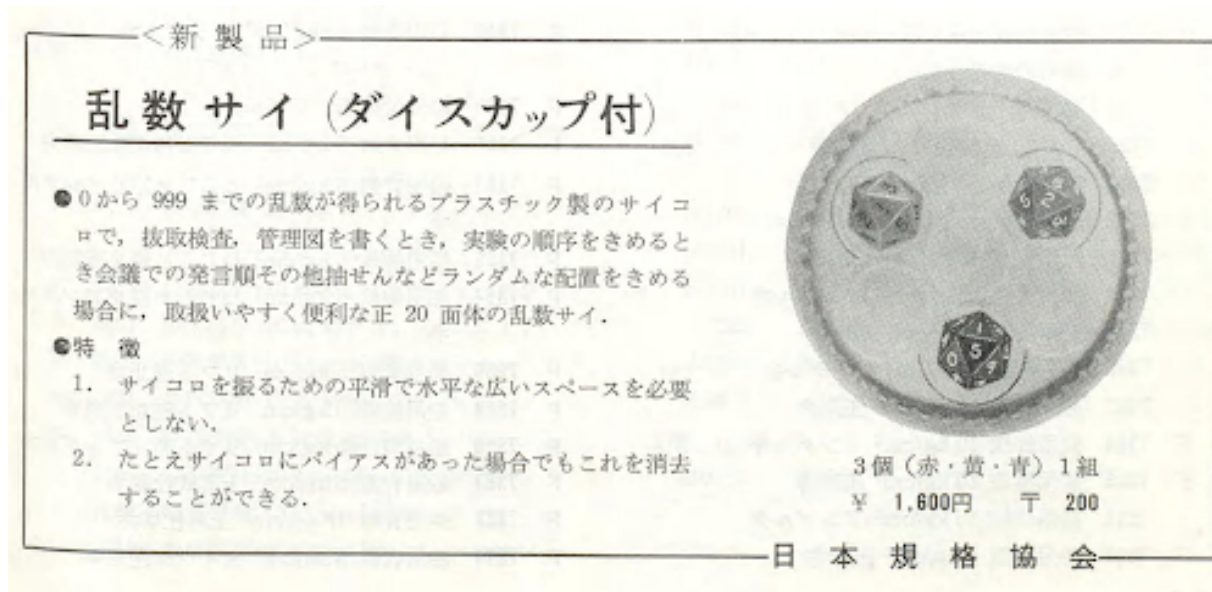


Figure 6: New case design first advertised in the February 1967 issue of *Hyōjunka to Hinshitsu Kanri* (vol. 20, no. 2, p. 77). Used with permission.

Returning to JSA official publications, we can chart the further course of the dice and the market that was developing for them. In February, 1967, advertisements start to feature a new and larger case design, which is described as a “dice cup” (Figure 6).¹⁹ This is called a “new product” in the ads printed over the following few months, but even after that designation had been dropped, the dice cup would continue to be mentioned in the marketing for as long as the dice were sold. The product line was expanded at the end of 1973, with the introduction of a new type of die intended for use in schools. The old dice with cup were now described as “A-type”, with a measurement at their largest dimension of 18mm, while the new product, designated “B-type”, were described as being 22mm.²⁰ These new dice shipped without a cup, and would later be described as being packaged in a vinyl bag. Furthermore, while both types were available for sale directly from the JSA, the B-type sets were also sold in bookstores, presumably where textbooks or school supplies were sold. This increased size may have been intended to make the dice easier for young children to use, but it is

¹⁸ Moriguchi, Shigeichi, “Saikoro no Deru Me no Kisokusei” [The Regularity of Dice Rolls], *Kagaku Asahi* [Asahi Scientific] 16(9)(183), pp. 99-105.; and Masuyama, Motosaburō, “Nijyūmentai no Saikoro” [Twenty-sided Dice], *Kagaku Asahi* [Asahi Scientific] 19(1)(211), pp. 57-60.

¹⁹ *Hyōjunka to Hinshitsu Kanri* [Standards and Quality Control], 20 (2), 1967, p. 77.

²⁰ *Hyōjunka to Hinshitsu Kanri* [Standards and Quality Control], 26 (11), 1973, p. 79.

also much closer to what would eventually become roughly standard in the gaming community. By this time, the price for the smaller A-type dice and cup/case had risen to 2,000 yen a set, while the larger, case-less B-type set provided a more economical option at 1,000 yen per set of three. Also of note is that advertisements from this period mention that the dice had been certified for use in junior and senior high schools in 1972 and 1973 respectively, and they also begin to appear in school supply catalogues.²¹ It should be noted that educational applications for the dice had been anticipated as early as 1958,²² but evidence for them actually being marketed for such use doesn't appear until these ads from the early 1970's.

Both types of dice continued to be sold throughout the 1980's and into the 1990's. However, the May, 1990 issue of *Hyōjunka Jyānaru* includes a notice that the larger, B-type dice would no longer be sold.²³ The A-type dice with cup/case continued to be advertised for a few more years, with what may be the last ad appearing in the October 1995 issue of *Hyōjunka to Hinshitsu Kanri*, ending a sales run of over 43 years.²⁴ By this time, the JSA dice would have been in competition with much cheaper alternatives. At a final price of 3,605 yen a set, they would have been at least an order of magnitude more expensive than d20s marketed to the gaming community by specialist companies such as Chessex, Koplou or Gamescience. It should also be noted that even though the dice were still on sale throughout the first half of the 1990's, that doesn't necessarily mean that they were still in production during that time. It's quite possible that the last production run had been made several years prior, with the JSA slowly selling off its remaining stock as cheaper and cheaper competitors appeared on the market.

One final, poignant note deserves attention before moving on. The October 1975 issue of *Hyōjunka to Hinshitsu Kanri* includes a full-page ad for the dice, as was typical at the time. The facing page is devoted to a eulogy for Ishida Yasushi (Figure 7), the head of the TID who first proposed using icosahedra as random number generators, and the inventor of the JSA dice.²⁵ He died at his home in Kamakura, perhaps the very place where he was inspired to create them during that informal family gathering back in September 1950.



Figure 7: Ishida Yasushi's obituary and an ad for the dice on facing pages of the October 1975 issue of *Hyōjunka to Hinshitsu Kanri*. (vol. 28, no. 10, pp. 54-5). Used with permission.

²¹ *Gekkan Kyōzai Kyōgu* [Monthly Teaching Materials and Supplies Catalogue] 24(12)(282), December 1972, p. 59.

²² QCC Secretariat, "Ransūsai to sono Shiyōhō" [Random Number Generating Dice and their Method of Use], *Hyōjunka* [Standards], 11 (3), 1958, p. 205.

²³ "JSA Dayori" [JSA News], *Hyōjunka Jyānaru* [Journal of Standardization] 20 (5), 1990, p. 116.

²⁴ *Hyōjunka to Hinshitsu Kanri* [Standards and Quality Control], 48 (10), 1995, p. 25.

²⁵ Fujita, Tadasu, "Hinshitsu Kanri no Paionia Ishida Yasushi-sensei no Omoide" [Memories of Ishida Yasushi, a Quality Control Pioneer] *Hyōjunka to Hinshitsu Kanri* [Standards and Quality Control], 28 (10), 1975, pp. 55-7.

The Japanese sources outlined above have allowed us to trace the history of the JSA Icosahedron Random Numbers Generating Dice from their development in 1950-1, through their initial availability in the summer of 1952, and ultimately their quiet disappearance from the market 43 years later. In these sources we sometimes come across brief reports of international sales or encounters with western academics, but the precise route by which they became known to western researchers, and were subsequently adopted for use by wargamers and role-players, can be seen more clearly in western academic journals and in the vibrant wargaming fanzines of the 1960's and 70's.

Already in 1956, we find Japanese scientists mentioning the dice in western journals. For example, Masuyama and Hatamura describe them as being "fairly widely used" in biometric studies in Japan.²⁶ This particular paper was from the proceedings of a symposium on biometric techniques held in Brazil the previous year, and is an example of how word of the dice must have spread through other academic fields, without the direct involvement of the JSA.

The dice seem to have been readily available in the USA by 1961, when they were reviewed by C.B. Tompkins in the journal *Mathematics of Computation*.²⁷ They are described as being available for sale outside Japan for \$2.50 for a set of three, plus \$.70 for postage for up to nine sets. Tompkins measured each face of each of the three dice in his possession and found enough irregularities to conclude that "the casting was not particularly good."²⁸ Despite his misgivings, he tested each new die for 800 rolls, and again less meticulously after they had been used for several months. Although not entirely satisfied, he declares that "it seems unlikely that a person generating random decimal digits at a rate which can be met by these dice would notice any serious bias."²⁹ This recalls the concerns of Harold F. Dodge a decade earlier, and we can see that the perennial fear of biased or unbalanced dice had already been raised and dismissed even at this early stage.

Five years later in 1966, Birger Jansson mentions the JSA dice on p. 22 of his book *Random Number Generators*, and they feature prominently in an illustration used for the book's frontispiece.³⁰ In the same year, Francis J. McHugh of the United States Naval War College published *Fundamentals of War Gaming*, an overview of the history and principal techniques of war gaming, intended for use by students of the college. In an appendix on "chance devices" he describes the JSA dice and includes information on how they could be obtained.³¹ There is evidence that the Navy had already been using the dice for years at the time of this report. A portable wargaming kit produced by the college in 1963 required the use of a pair of d20s marked 0-9 twice, and a set of the JSA dice is on display at the college museum.³² Although the kit doesn't appear to mention the manufacturer of the dice, between their inclusion in McHugh's book and the lack of any known alternatives on the market, it is

²⁶ Masuyama, M. and M. Hatamura, "Recent Advances in Biometry in Japan" *Biometrics* 12 (4), 1956, pp. 449-461.

²⁷ Tompkins, C.B., "Random Number Generating Icosahedral Dice (20-face Dice) by Japanese Standards Association," *Mathematics of Computation* 15 (3), 1961, p. 94-5.

²⁸ *Ibid.*, p. 94.

²⁹ *Ibid.*, p. 95.

³⁰ Jansson, Birger, *Random Number Generators*, Almqvist & Wickell, Stockholm, 1966. I am indebted to Jon Peterson for putting me on the trail of this and many other western sources referenced below.

³¹ McHugh, Francis J., *Fundamentals of War Gaming*, The United States Naval War College, Newport, RI, 1966, p. A-3.

³² The dice can be seen in Invicta, "Historical Naval Wargaming Kit Demo (US Naval War College Museum," <https://www.youtube.com/watch?v=cmTy8kBB76U&t>, uploaded October 27th, 2019. Note that the die in the kit that is the focus of the video is a much later replacement numbered 1-20, and is similar or identical to those manufactured by Chessex in the 1990's and later, but the kit laid out in the display case includes the JSA dice.

perhaps safe to assume that the JSA dice were being used in wargames by the US Navy as early as 1963. If so, this may be the earliest instance of their use in a wargaming context.

Not long after this, they were featured in an article in the pop-sci magazine *Scientific American*, recalling their appearance in *Kagaku Asahi* in Japan a decade earlier. The popular and influential mathematician Martin Gardner devoted the November 1968 edition of his mathematical games column to dice and dice games, under the title "On the Ancient Lore of Dice and the Odds against Making a Point." In discussing dice beyond the traditional six-sided cube, he mentions the JSA dice, calling them "an elegant little instrument for generating random digits to be used in Monte Carlo methods, game theory and so on."³³ Gardner had a tremendous degree of influence as a science writer at that time, and in circles that must have had considerable overlap with those interested in wargames. In describing his impact on another field, David Auerbach has said that "a case can be made, in purely practical terms, for Martin Gardner as one of the most influential writers of the 20th century. His popularizations of science and mathematical games in *Scientific American*, over the 25 years he wrote for them, might have helped create more young mathematicians and computer scientists than any other single factor prior to the advent of the personal computer."³⁴ With this column, the existence of the JSA dice would have been known to Gardner's readers throughout the English-speaking world, and whether through his influence, that of McHugh's *Fundamentals* and the US Naval War College curriculum, or some as yet unknown route, the wargaming community soon began to take notice.

The JSA dice appear in the November 1969 issue of the UK-based wargaming periodical, *Wargamer's Newsletter*. In a brief note, the writer of the "Must List" column mentions that they have "received details of 20-sided Random Generating Dice obtainable from the Japanese Standards Association [...]. These dice have very large applications to wargaming and are the answer to many objections put forward by opponents of the normal dice."³⁵ *Wargamer's Newsletter* was influential on both sides of the Atlantic, with both Gary Gygax and Lou Zocchi among its regular American contributors,³⁶ so it's perhaps difficult to overstate the importance of even this brief mention. Although the use of icosahedral dice to produce random percentages in wargames had already been proposed in theory elsewhere,³⁷ this must have been the first time for many members of the wargaming community to learn of the availability of commercially-produced d20s, and of how they might actually go about procuring a set.

One person who seemed less than thrilled by the prospect of *Wargamer's Newsletter* readers rushing to order dice from Japan was Mike Blake of the Bristol Wargames Society. In the "Must List" column of the January 1970 issue, the editor notes:

³³ Gardner, Martin, "Mathematical Games: On the Ancient Lore of Dice and the Odds against Making a Point," *Scientific American* vol. 219, no. 5 (November 1968), p. 140. I am indebted to Craig A. Tucker for this reference.

³⁴ Auerbach, David, "A Delville of a Tolkar: Martin Gardner's 'Undiluted Hocus-Pocus,'" *Los Angeles Review of Books*, November 4, 2013, <https://lareviewofbooks.org/article/a-delville-of-a-tolkar-martin-gardners-undiluted-hocus-pocus/>

³⁵ "Must List," *Wargamer's Newsletter* 92, November 1969, p. 19.

³⁶ See, for example, Gygax, Gary, "Counsels of War," *Wargamer's Newsletter* 107, February 1971, p. 7, in which he mentions use of twenty-sided dice in relation to the set of rules that would ultimately be published as *Tractics*.

³⁷ Peterson, Jon, *Playing at the World*, Unreason Press, 2012, pp. 316-7.

Last month's mention' of twenty sided dice from Japan aroused a speedy letter from Mike Blake of [...] Bristol. Mike's letter says:-

"We have the British patent on these fiendish devices, and have now started producing them in plastic from a metal master accurate to some 1000ths of an inch! Originally they were designed to go with our Advanced Modern Rules, but we now hope to sell them independently. Here comes the really good bit – they will sell at 10s.-d. a pair! This compares very favourably with the [Japanese] dice at 15s.-d. each. The mould is in the process of being made and by the time the orders come in we will be producing dice. [...]

We feel sure, as you seemed to when writing on the [Japanese] dice, that these dice have great use in Wargames, solving as they do most of the problems inherent in ordinary dice – nay, I dare say all of the problems!"³⁸

Blake's letter contains a detailed description of the great potential of 20-sided decimal dice and shows how keenly the need for them was felt within the community. But while icosahedral dice promised to solve most, or even all, of the problems facing wargamers looking for reliable randomization, the Bristol dice were facing problems of their own. In the October 1970 issue of the same periodical, Blake wrote in with an apology to those who had sent payment but were still waiting to receive their orders. The first fifty sets were in the process of being shipped, but there had been several unforeseen complications and they were beginning to regret the great task they had undertaken: "This venture has cost us dear in time, effort and cash, and had we known we would never have started!"³⁹ They promised to fulfill those early orders as quickly as possible, and would only advertise the dice once sufficient stock had been produced to meet anticipated demand. This doesn't seem to have occurred until exactly a year later, when ads for the Bristol Wargames Society "Percentage Dice" first appear within the pages of *Wargamer's Newsletter*.⁴⁰

The Bristol dice were an incredible milestone—the first produced by gamers for gamers—but until those early production issues were ironed out, the JSA dice remained the only commercially available alternative.⁴¹ Elsewhere in the wargaming community, others pursued still other means of generating random percentage values, but always with reference to the JSA dice, which seem to have become something of a standard against which new designs could be measured. In a column published in May of 1971, again in *Wargamer's Newsletter*, Lou Zocchi discusses his interest in dice beyond the traditional six-sided variety for resolving combat, saying, "you might not know that the Japanese make a 20 sided die which is available in 4 or 5 different colors. Each die is about \$3 and they are generally used as random number generators by scientific institutions."⁴² He then proposes an alternative design, a truncated octahedron with a total of 10 sides, similarly capable of generating decimal results. Zocchi would go on to produce his own set of icosahedral percentile dice, the first such dice to be made in the USA, and eventually also full polyhedral sets, including d10s similar to those proposed in that 1971 column.

While Zocchi was proposing novel designs for d10s, Robert W. Jones was grappling with some of the same issues. In an essay published in the June 1971 issue of the *Courier*, the bulletin of the New England Wargamers Association, he outlines some of the many problems inherent in using standard

³⁸ "Must List," *Wargamer's Newsletter* 99, January 1970, p. 20.

³⁹ *Wargamer's Newsletter* 103, October 1970, p. 23.

⁴⁰ *Wargamer's Newsletter* 115, October 1971, p. 7.

⁴¹ Awareness of the dice continued to spread during that time, and Jon Peterson has found a reference to their use by gamers at MIT in *Panzerfaust*, vol. 5 no. 6, October 1970 (private correspondence).

⁴² Zocchi, Lou, "Counsels of War," *Wargamer's Newsletter* 110, May 1971, p. 11.

six-sided dice in wargames, particularly the tendency for average results to cluster around 3.5 the more dice are used. The only rational solution, he argues, is to go decimal:

So what are we going to do? Go decimal, I answer. Our group has done this by two means. We have used special dice, which were originally created for quality control purposes. They have twenty sides on which the numbers 0-9 are repeated twice. They come in three colors; red, yellow, & blue. By setting up a reading order (red-yellow-blue): you can with three dice roll any number from 0 to 999. If you insert a decimal it can read 0-99.9%. Suppose you come across statistics for hit chance in musketry of 19%, then by stating that the roll has to be under 190 to hit, you are producing an absolutely accurate variable. Every number on these dice has an absolutely equal and random chance of occurrence.(sic) They are presently used by our armed forces in their wargaming with the statistical "chance" parameters supplied by computer. They can be purchased from American National Standards Institute, 1430 Broadway, New York, New York, 10018. The cost should be about \$6 for a set of three in a plastic rolling case. The latter item keeps the dice from careening among (sic) the troops like a hard shot.⁴³

The second means was through the use of a tube-based electronic number generator built by his local gaming group. This is described as an easy project for the electronically literate, but it's clear that he considered the dice the simpler and cheaper option of the two. Interested readers could use the included information to order the dice from their US distributor or write to Jones for a schematic for their homemade generator and build one for themselves.

But this era in which the JSA dice and inventive home-brewed solutions were the only alternatives to the standard d6 would soon come to an end. The Bristol Wargames Society would have enough stock of their percentile dice pairs to offer them for general sale by October 1971, Lou Zocchi would begin laying plans for producing his own designs, and members of the wargaming community discovered that an American school supply company, Creative Publications, also sold an icosahedral die numbered 0-9 twice, much like the dice made by the Bristol society and the JSA. This was part of a set that included dice based on all five of the platonic solids, and their almost limitless potential caught the attention of Gary Gygax, who wrote enthusiastically about them in relation to a set of rules he was then drawing up. Those rules would, in a few short months, be released as *Dungeons & Dragons*.⁴⁴ It was these Creative Publications dice that Gygax chose to sell through TSR, expressly for use with *Dungeons & Dragons*, making them in effect the first "official" dice sold for use with a table-top role-playing game.

The question remains as to whether the JSA dice were known to the members of the Bristol Wargames Society or at Creative Publications, and whether they exerted any influence on their designs. By this time, the JSA dice had been on the market for more than 20 years, and it certainly isn't difficult to imagine routes by which knowledge of those dice could have reached both groups. It would not be surprising for wargaming enthusiasts in Bristol to have learned about the US Navy's use of the dice in their own wargaming curriculum, and to have sought a means to create cheaper, locally-available alternatives. Likewise, educational use for the JSA dice had been anticipated right from the start, and by the early 1970's they were being actively marketed to schools in Japan. Could discussion of their use in schools have reached educators in the States who then went on to develop

⁴³ Jones, Robert W., "Deci, rather than Sexy," *Courier* vol. 3 no. 6, June 1971, pp. 8-9.

⁴⁴ Gygax, Gary, "Four & Twenty and What Lies Between," *Lowrys Guidon* 5, June 1973, recounted by Peterson in *Playing at the World*, pp. 319-20.

their own set of dice, and to further incorporate all of the platonic solids? All of this, plausible though it is, remains speculation.

However, even if these represent three completely independent realizations of what is ultimately a very simple concept, the JSA dice form a brief but undeniably influential chapter in the history of both wargames and role-playing games. What the JSA dice did, and almost certainly for the first time, was to demonstrate that differently colored icosahedral dice, numbered 0-9 twice, could be used to consistently and reliably generate random decimal numbers from 0-9, 0-99 or even 0-999 and beyond. They also showed that such dice could be manufactured on a relatively large scale. The wargaming community had slowly been moving towards adopting alternatives to the standard six-sided die, either through abandoning chance entirely, developing increasingly elaborate probability tables to be used with multiple dice, or using cards, chits or random number generating machines, etc., and while some had theorized and even started to develop decimal dice of their own, the JSA dice showed beyond a doubt that many in the community were eager to adopt such dice as a standard, and that demand would likely be high.

The Creative Publications polyhedral set was the first to be sold for use with *Dungeons & Dragons*, the Bristol Wargames Society percentile pairs were the first made by gamers for gamers, but the Japanese Standards Association Icosahedron Random Numbers Generating Dice had been there since 1952, waiting for enterprising and resourceful gamers to discover them as proof-of-concept and inspiration, “elegant little instrument[s]” that would become the hobby’s most enduring piece of material culture and its most recognizable symbol.



Peter D. Evan is a professor at Seikei University in Tokyo. He has a BA in Medieval Germanic Literature from Indiana University, an MA in Medieval History from Durham University, and a PhD in Anglo-Saxon, Norse, and Celtic from the University of Cambridge. His research primarily focuses on late Anglo-Saxon monasticism, liturgical commemoration, and codicology, but he is also interested in conceptions and portrayals of the medieval in tabletop roleplaying games, and the history of tabletop roleplaying games and wargaming in Japan.