Marmalade, Jute, and Video Games:
The story of how Dundee, Scotland became the home of a thriving video game development community

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Video Games…In Scotland?

Japan and the United States are sometimes thought to be the sole creators of the world's video games. This belief may stem from the fact that the most famous video game console and arcade game manufacturers (such as Atari, Midway, Namco, Nintendo, Sega, Sony, and Capcom) are located in Japan and the US. And with few exceptions, the best-known, most heavily merchandized video game characters (for example, Mario of Super Mario Bros. and Sonic the Hedgehog of the game of the same name) are of American or Japanese origin.

Over the past decade, however, many best-selling video games have come from Great Britain. English and Scottish developers have been responsible for such hits as Populous, Syndicate, Lemmings, Goldeneye, and Tomb Raider. Lara Croft, the main character in the Tomb Raider series of adventure games, has become a worldwide star, and Tomb Raider is currently set to be made into a motion picture. Nonetheless, with few characters as recognizable as Mario or Sonic and the absence of a major game console manufacturer, it is remarkable that game development has flourished in specific communities within Great Britain, namely Guildford (near London), northwest England (Liverpool/Birkenhead) and Scotland. Guildford is the home of Bullfrog, a development studio that has created numerous hit games such as Syndicate and Dungeon Keeper, and of a number of companies founded by ex-Bullfrog employees. Several development companies are also located in Northwest England, including Psygnosis's Liverpool studio (Wipeout), Bizarre Creations (Metropolis Street Racer), and Curly Monsters (N-Gen Racing). Scottish developers, the focus of this paper,

include DMA Design (Lemmings), Visual Sciences (Expert Pool), and Red Lemon Studios (Braveheart). This paper will examine DMA Design's role in starting Scotland's flourishing game development community and analyze trends in game development throughout Great Britain.

Screenshot of the popular space adventure game Elite.
(From "Space Traders Flight Training Manual" on Ian Bell's Elite website.)

Computer Hobbyists

The earliest British game developers were hobbyists (largely college students) who had access to the key technology that enabled them to write their own games: a home computer. The Acorn BBC Micro, released in December 1981, and the Sinclair ZX Spectrum, available in July 1982, were popular home computers in Great Britain that allowed hobbyists to write their own programs easily using BASIC.[1] [2] As hobbyists

"spoke" directly to the computer hardware. What inspired many hobbyists to write their own video games was an extremely popular title called Elite. Written by two Cambridge University students, Ian Bell and David Braben, Elite was released for the BBC Micro in 1984.[3] (A version of Elite for the Spectrum followed in 1985.)[4] In Elite, the player captained a spaceship on adventures through the galaxy, and the game became known by British gamers as "the game that all space-sims followed."[5] Andy Satterthwaite, production director at Curly Monsters, a developer in Birkenhead, England, recalled that Elite "was the first 3-D game I'd seen."[6] Like the "toy rubber-band-driven helicopter" that inspired the Orville brothers to pursue invention in flight, Elite inspired its fans to write their own video games and, therefore, had a definite effect on their choice of programming problems.[7] [8] The end result was a community of self-taught hobbyists in Great Britain with programming skills and a desire to write games.

A Little Town Called Dundee

One of these hobbyists was a student named David Jones at the Dundee College of Technology in Scotland. Dundee is a sleepy town along the River Tay known historically for marmalade and jute.[9] In 1986, Jones was not only a student, but also an employee of Timex, who was manufacturing the Spectrum computer in Dundee. A year later, Jones wrote his first video game, Menace, not on the Spectrum, but on the more powerful Commodore Amiga **Scenic Dundee, Scotland** ed by Psygnosis, a British video game publisher and was quite successful, earning Jones an estimated £20-30,000.[10] [11] (Video games are often written by development studios, then picked up by publishers who provide marketing and distribution of the final product.) Jones' second title, Blood Money, did "reasonably well" and convinced Jones to drop out of school to found his own game development company, DMA Design.[12] Alasdair Houston, a former DMA employee recounted, "Dave Jones came up with the name [DMA Design] as a result of working on the Commodore Amiga. This was (as far as I'm aware) the first home computer to feature a Direct Memory Access controller in it's custom hardware. The name was chosen purely because it sounded good..."[13] Importantly, Jones chose to stay in Dundee, a decision which enabled the creation of a development community in the area. Bill Gates' decision to settle Microsoft in Redmond, Washington and Michael Dell's establishment of Dell Computer in Austin, Texas also greatly affected the regions surrounding these companies, albeit on a much larger scale.

DMA's first employees were college friends that Jones convinced to join the company. Houston, who attended Dundee with Jones and later worked at DMA, described the early recruits as "social dropouts" from college life. About 98% of DMA's development staff was male, according to Houston, who attributed this imbalance to Scotland's "male-dominated society."[14] As Jamie Grant, a former DMA artist, explained, programming is seen as the "white man's magic."[15] However, the overwhelmingly male nature of game development may not be limited to Great Britain; Brian Woodhouse, a producer at Bizarre Creations in Liverpool, said that "the same types of people are attracted to game development in the US and UK."[16]

Lemmings Everywhere

Screenshot from Oh No! More Lemmings

The breakthrough title that firmly established DMA Design as a major player in video game development was Lemmings, released in 1991. The game is based on a

remarkably simple premise: lemmings are mindless creatures that the player must get from point A to point B. Lemmings will follow each other oblivious of numerous obstacles and hazards that can impede their progress or even kill them. By clicking on specific lemmings, the player can endow them with the abilities they need to pass obstacles. For example, the player can give a lemming an umbrella to soften its fall or provide it with digging, bridge-building, or climbing abilities. The player's success is based on the percent of lemmings she can get to the goal.

The eureka moment for Lemmings was a bet between two programmers at DMA, Mike Dailly and Scott Johnson. The pair made a bet that Dailly could not create a game character out of a sprite 8 pixels high. (Sprites are frames of animation used for a character in a video game.) To prove Johnson wrong, Dailly created a demo showing the tiny characters getting obliterated in various amusing ways.[17] Lemmings was, therefore, a result of an artificial reverse salient: an arbitrary limit on sprite size imposed by the bet. (A reverse salient, as described by Thomas Hughes in *American Genesis*, is a pressing limitation or need in a "technological system" that often spurs innovation.[18]) The desire for optimized solutions, or doing the most with the least, is an integral part of computer hobbyist culture. Often, the most admired solutions are the simplest—for instance, Steve Wozniak's floppy controller design for the Apple II computer in 1978 which used far fewer chips than the competition.[19]

From Dailly's initial demo, the character design and gameplay for Lemmings was developed.[20] This seemingly roundabout method of game design reflects the informality of the development environment at DMA in 1991. Russell Kay, who

programmed the PC version of Lemmings, described it as "four people throwing ideas into a hat" with "no documentation" and a desire to "keep it simple."[21] At Kay's current development house, Visual Sciences, the process is quite different: the features of a game are first written up into a product design document, then explained in greater detail in a full product specification, according to Klaud Thomas, one of the studio's game designers.[22]

The incredible popularity of Lemmings cemented DMA's reputation as a developer, which in turn helped convince game publishers to distribute the company's games. By 1998, DMA had grown to 92 employees and was ranked the #1 game company in Scotland.[23] A year earlier, Jones and his wife had sold their shares in DMA to Gremlin Interactive for £4.5 million.[24] [25] While Jones' success story resonates strongly with the legend of the dorm room startup told so often in the American computer and Internet industries, he can also be viewed as an inventor-entrepreneur in the vein of Thomas Edison. Much as Edison used innovation as the basis of "an entire family of interrelated manufacturing firms that became Edison General Electric," Jones utilized his creativity in game design to start a highly successful video game company and establish Dundee's game development community.[26]

Lemmings was commercially successful because of its wide appeal, challenging gameplay, and the sheer humor of the hapless creatures marching along to their doom. Along with Bullfrog's innovative titles such as Theme Park and Dungeon Keeper, DMA's Lemmings established "flippant, quirky, ironic" humor as a distinctive quality of British video games.[27] A *Next Generation* article said of DMA's Tanktics title, "All the

trademark (read: darkly humorous) DMA touches are here."[28] Guy Simmons, one of the founders of Mucky Foot, a Guildford development house, agreed that British games were unique for their humor and "slightly weird, original concepts."[29]

The success of DMA also affected David Jones' alma mater, the Dundee College of Technology, which in 1994 had become the University of Abertay Dundee.[30] In 1998, banking on the success of Jones and DMA Design, the university began offering a Master's program in Software Engineering (Games and Virtual Environments) and Bachelor's programs in Computer Games Technology and Computer Arts.[31] Two years earlier, the school had given Jones an honorary Masters of Technology.[32] Alasdair Houston, a lecturer for the Computer Games Technology program, previously worked at DMA Design and attended Dundee College of Technology at same time as David Jones.[33]

Visual Sciences

Visual Sciences game designer Trevor Gamon demonstrates Expert Pool

In 1995, Russell Kay, head of development at DMA and author of the PC version of Lemmings, decided that he "didn't agree with how things were going on" at DMA

and founded his own company, Visual Sciences, in Dundee.[34] While Kay did not

provide specific reasons for his decision to leave DMA, Jamie Grant, a former DMA

artist currently at Red Lemon Studios in Glasgow, recalled that David Jones' managerial

style involved "nail[ing his employees] to the wall with contracts."[35]

One of the Visual Sciences' key technologies is its Visual Sciences Operating

System, or ViSOS. ViSOS is a response to a pressing reverse salient in the video game

industry—the need to convert titles to multiple platforms. Currently, these platforms

include PC, Macintosh, Sony PlayStation, Nintendo 64, and Sega Dreamcast, with Sony

PlayStation 2, Nintendo Dolphin, and Microsoft X-Box on the horizon. Once a game is

successful on a particular platform, producing ports, or versions of the title for other

platforms, provides access to large additional consumer markets. The conversion

process can often be expensive and time-consuming, offsetting the benefits of doing the

conversion in the first place. ViSOS, a programming framework that facilitates game

development for multiple platforms, reduces conversion costs and maximizes the

potential benefits of a successful port.[36]

Among Visual Sciences' first products were ports, a sequel (Lemmings 2), and a

spin-off (Lemmings Play Paintball) of Lemmings, DMA's first blockbuster hit. Visual

Sciences also wrote conversions of other popular titles like Cyan's Myst and a sequel

(F1 '98) to Psygnosis' popular Formula 1 racing title.[37] These titles provided the

company with "a good source of income," Kay recalled, and are a good example of

pursuing conservative innovation (writing ports and updates of existing hits) for the

purposes of establishing track record and financial stability.[38]

By comparison, DMA's stellar reputation from bestsellers like Lemmings gave David Jones the luxury of pursuing radical innovation rather than more conservative ports and sequels. Jones was proud of the fact that "[at DMA,] we only do original games, and that turns on a lot of people."[39] In another interview, he explained, "…we lead by continually creating new genres and ideas. And while this approach can be risky - particularly for smaller companies with no track record - we tend to get away with it because of our reputation!"[40] Jones' words are reminiscent of Thomas Edison's "long[ing] for the exhilaration of exploring undiscovered intellectual ground…of solving problems of his own choosing."[41]

With several "safe bets" under its belt, Visual Sciences has since developed original titles like Expert Pool, which was released in September 1999 to very positive reviews.[42] In the six and a half years since its founding, the company has grown from 3 to 43 people.[43]

Building a Community

**Visual Sciences founder Russell Kay (left) enjoys E3 '98
with two other Scottish developers**
(From "Photo File: Scottish companies present at E3 '98"
on Scottish Games Alliance website.)

In 1996, the Scottish Games Alliance (SGA) was formed to publicize the Scottish game development community and stimulate communication between its developers.[44] The SGA and Scottish Enterprise Board co-sponsor a Scottish game development booth at the Electronic Entertainment Expo (E3), a huge annual trade show in the United States for the video game industry.[45] Trevor Gamon, a game designer at Visual Sciences, believed that the SGA-sponsored trips to E3 strengthened the Scottish game community.[46] Kay, the founder of Visual Sciences, agreed that the SGA promoted "idea-sharing" and "cross-fertilization."[47]

In sharp contrast, the Guildford game development community that sprung from Bullfrog, the highly successful game studio founded by Les Edgar and Peter Molyneaux in 1987, sees no support whatsoever from the local government.[48] The developers at Mucky Foot, a company started by ex-Bullfrog employees, "don't expect to be helped" by the town as it is "not aware of the existence of computer games," according to one of Mucky Foot's founders, Mike Diskett.[49] Edgar, one of Bullfrog's founders, echoed, "It's surprising [the people of Guildford] don't realise what's here."[50]

The strong support of Scottish developers by the SGA and Scottish Enterprise may have its downside: increased expectations from the rest of the British development community. Cathy Campos, public relations manager for Lionhead (Peter Molyneaux's current development house) and Mucky Foot in Guildford, noted that aside from Braveheart and DMA's work, she saw more hype than hits coming out of Scotland.[51]

The SGA website noted an article in Computer Trade Weekly that expressed "a feeling that Scottish companies had it easy when it came to funding" compared to English studios; however, Chris van der Kuyl of Scotland's VIS Interactive responded, "I smell sour grapes…but if [English developers] want to get old and tired and grouchy and sit in their rocking chairs and moan…fantastic."[52] This regional rivalry between game development communities may, however, have positive effects by encouraging even closer ties between developers within a community and by providing pressure to produce better games than the competition.

Despite the lack of local support or a formal trade association, the Guildford developers stay in close contact with one another. The Guildford Game Developers e-mail list, or GGD, helps keep former Bullfrog developers updated on each other's current projects.[53] As Gary Carr of Mucky Foot described, "We all pretty much help each other out. We cross-reference potential staff and CVs with Lionhead, and we've used their sound studios, too."[54]

Similarly, many Scottish developers have either worked or gone to school with each other, promoting a sense of community spirit. The presence of an established development community in Scotland encourages game designers on the move to work at other Scottish companies or start new companies in the area. Jamie Grant of Red Lemon believed that the increased "salaries and opportunities" afforded by the growing community helped slow "brain drain," the outward flow of talent to development houses in the US.[55] One other possible benefit of the close-knit community may be opportunities for business sharing between companies. For example, Visual Sciences

did the PlayStation conversion of DMA's hit PC title Grand Theft Auto.[56] Visual

Sciences' ties and proximity to DMA (both companies are located in Dundee

Technology Park) may have made it a more attractive choice than other developers.[57]

The close communication within the development communities in Guildford and

Scotland seems akin to the relationship between high technology companies in Silicon

Valley described in AnnaLee Saxenian's *Regional Advantage* that allowed the region to

outpace Massachusetts' Route 128.[58]

Trends, Changes, and Conclusions

Video game development in Great Britain has changed significantly since David

Jones made the decision to found DMA Design. In particular, there are definite trends

toward more education, larger teams, and bigger companies.

Development houses today are looking to hire people with more formal training

than in the past. According to Kay, Visual Sciences expects its artists to have a college

degree and its programmers to have university degrees, "unless they're exceptional,

and even then we want them to go to college."[59] (In Great Britain, a university degree is

more advanced than a college degree.)[60] While successful game companies have been

founded by people who dropped out of college (like DMA's Jones) or who never went

to college at all (like Bizarre Creations' founder Martyn Chudley), today's would-be

game designers may have a better chance of landing a job with a college degree in

hand.[61] The trend toward more education is true in the games industry in the US as

well. As David Perry, founder of Shiny Entertainment in Laguna Beach, California,

writes on his website, "Q. How do I become a video game programmer? While a college education is not essential, it's rare to find any 'new' programmers in the industry who don't have a higher educational degree somewhere in their background. Also, Math is DAMNED important these days!"[62] Still, the most important factors in getting a job in game development are "talent and experience" combined with a "strong demo" according to Andy Satterthwaite of Curly Monsters.[63]

The video game industry is also shifting from the paradigm of the lone programmer to one of large development teams. Explained Russell Kay of Visual Sciences, "We've been forced to grow by the market. It is just not possible to develop games these days with small teams. Consumer demand for more and more content in the games, together with market pressure for faster production times, has meant that you now need much larger development teams,"[64] In addition, the increasing capabilities of new game platforms like the Sony PlayStation 2 has resulted in a corresponding increase in the complexity of game development. As the Bizarre Creations website described, "Then the PlayStation came along, and changed the face of development as we'd known it. No longer could a game be written by 1 person!"[65] Another pressure toward larger teams is the knowledge that Japanese companies are developing games in "big teams on 8 hour shifts, 24 hours a day," according to Red Lemon's Grant.[66]

The necessity for larger teams also drives a need for increased funding. One way for small development houses to ensure a constant stream of development funds is to sell themselves to a large publisher. In 1995, Les Edgar and Peter Molyneaux, co-

founders of Bullfrog, sold the company to the game publishing and development giant

Electronic Arts (headquartered in Redwood City, California) once they "saw film

corporations moving into the industry," according to Mike Diskett, a former Bullfrog

employee.[67] [68] Edgar and Molyneaux also "saw themselves getting into Aston Martins,"

quipped Diskett in reference to the amount the founders made from the sale of the

company. This February, Rage Software acquired two development houses in Scotland

and hired none other than David Jones to head them.[69] [70] Other large publishers like

Eidos hold full or part ownership of a number of development houses.[71] These

arrangements provide publishers with guaranteed access to developers with a proven

ability to develop video games that will sell.

The need for more formal training, bigger teams, and more funding all make it

more difficult for new game designers to start their own companies. According to

Houston, publishers will only pay $1-2 per unit sold of the first game from a new

developer—a paltry reward for an 18 to 24 month development cycle.[72] This situation

may be similar to the transition at the turn of the 20th century from inventor-

entrepreneurs like Edwin Armstrong to corporate R&D labs such as the Bell Telephone

Laboratories and General Electric Research Laboratory.[73] As "industrial corporations,

with their industrial laboratories, were displacing the independent inventor, who had to

work on a small scale," so may the large game corporations such as Electronic Arts,

Acclaim, and Eidos end the day of the lone programmer in his dorm room.[74]

Despite these trends, it is possible for new games to be developed outside the

umbrella of corporate giants like Electronic Arts. There is still the occasional lone

programmer who finds success, such as the author of the extremely popular title Worms which was published in 1995.[75] In addition, team development efforts over the Internet like Parsec, a "commercial-quality freeware" space combat game, may be able to muster the amount of labor necessary to compete with conventionally developed titles.[76]

In addition, companies like Visual Sciences that are founded by ex-employees of established development houses can succeed by relying on their experience. By pointing to the quality of their team members' previous work, these spin-off studios can convince publishers that they are capable of bringing their game concepts to life. Curly Monsters, for instance, is working on N-Gen Racing, a fighter jet racing title that banks on the development team's experience from Psygnosis, where they worked on the highly successful Wipeout series of futuristic racing games.[77] [78] Some of these spin-offs are resisting the trend toward increased size; in particular, the Guildford studios started by ex-Bullfrog employees want to avoid the incredible growth "from 40 people to 140 people," according to Bullfrog co-founder Edgar, that occurred after the company was sold to Electronic Arts.[79] Guy Simmons and Mike Diskett, two of the three founders of Mucky Foot, a Bullfrog spin-off, plan to keep the company to two development teams totaling "below 25" people with "no plans to go to three teams."[80] [81] Simmons recalled the nightmare of working at Bullfrog after the EA buyout surrounded by "nameless people you didn't know."[82] Diskett said that he "prefer[red] a small happy group of developers together" in a "family environment" where he could focus on making video games rather than on management.[83]

Nonetheless, it is clear that the video game development in Great Britain today is a much different endeavor than it was during its infancy in the mid-1980s. While in the past, a single hit title like Lemmings could establish an entire regional development community, current opportunities to do so in Great Britain are limited by a need for larger teams, more education, and a proven track record. The game design paradigm has shifted from the lone programmer, to the development studio, to the publishing/development corporation. Independent game studios in Great Britain may find that maintaining strong regional development communities is essential to meeting this challenge of change.

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