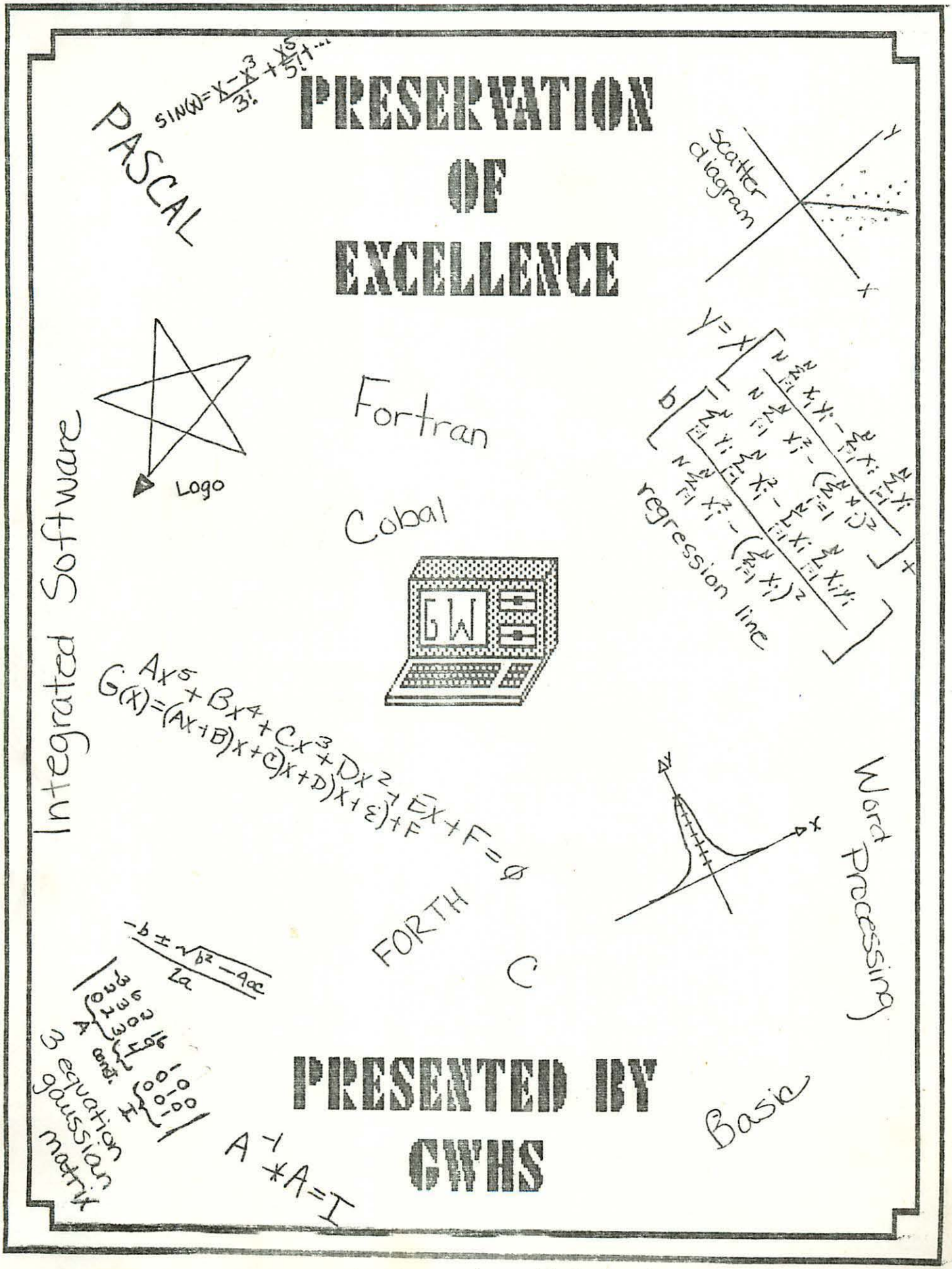
PRESERVATION OF EXCELLENCE



PRESENTED BY GWHS

cover design by Heidi Schempf

PRESENTATION

FOR THE

PRESERVATION OF EXCELLENCE

George Washington High School is an urban, average high school. We are close to the median on all standardized tests of achievement. Our student population is 54% black, 37% anglo, 5% hispanic, and 4% oriental. Half of the total population goes to college. One-half of all freshman get at least one F, and one-third of all sophomores receive at least one F. Our accelerated classes are usually unique, with a small enrollment.

The Computer Education Department offers formal courses in four disciplines: mathematics, English, business education, and alternative/special education. The laboratory provides an informal program for its constituents by being available to both students and teachers on a sign up procedure. In the lab library-music, art, graphics, and subject-matter software can be checked out.

Please engage any student in a conversation regarding the opportunities afforded them by their education. These students range from children with special handicapping conditions in special education to extremely capable scholars. None of the students has been prompted in any way. As in any human endeavor, all is not perfect, and you may even hear constructive criticism.

GRAPHICS/MUSIC
7:30 am to 8:30 am

The first student demonstrations will show the use of graphics/music in the laboratory. Students will show examples of graphics in language arts, mathematics, recreation and social science. Graphics appear in various ways – as part of another course, as research, or simply as a result of student interest.

MARY DUNBAR **Bilingual Education**

In 1982 the United States Department of Education awarded a three year Title VII grant to the Denver Public schools for George Washington High School to develop a computerized series of English lessons that brought up translations of instructions for Vietnamese, Laotian, Spanish and Hmong refugees. The 40 completed lessons and the management system were programmed and designed by 19 high school students. Only the English lessons and the translations were designed by adults. Many school districts and state departments of education use these lessons. They are being distributed world–wide by the Gessler Publishing Company of New York. Our laboratory gets a commission. Mary is one of the 19 students that developed this software.

She has taken all the computer mathematics courses that we offer and is not currently enrolled in the program. However, as so often is the case, she is a constant visitor to the lab and does all her word processing here. She has just been accepted to Northwestern University's early admission medical school. Mary has had part time work in the community utilizing her computer training. Techniques for the heap and shell sorts were researched by Mary. Our current curriculum uses the results of her work. She also developed a technique for random disk access in Atari BASIC. This was a very difficult task and involved tricking the BASIC language interpreter.

Mary is demonstrating our bilingual software, the LIRIC system.

MARK GOLDFOGEL **Music**

Mark is a senior at GWHS. He is an active participant in the school's extracurricular music activities. The non-music community also benefits from Mark's entrepreneurship. He has formed his own computer consulting company, MJW Enterprises, and tutors at homes whose owners have purchased personal computers. Other activities of MJW Enterprises include computer camp director for the Jewish Community Center, spread sheet and word processing instructor at the Colorado School of Dentistry, and privately contracted programming. Mark has finished our computer mathematics curriculum and is currently enrolled in technical writing. His project is a compilation and description of music software in our lab. His demonstration will be a pitch tester and "concert" he has produced on the computer.

RAHN BUTLER and SAM HOLMES **Animation**

Juniors, Rahn and Sam are our "jocks." Their letter sweaters leave no more room for medals. They have finished the five semester computer math curriculum and next semester are enrolling in advanced placement Pascal, technical writing with integrated software, and computer service. In their animation project for computer service these gentlemen have discovered that computer animation is tedious, hard work. The technical English class will allow Rahn and Sam to formally describe what they have discovered in this year's research. Ask them about next year's project.

These young men are demonstrating animation techniques they developed this semester.

DAVID GOTTNER **Modification of Touch Tablet**

David is finishing his senior year with the advanced placement Pascal course. He will probably make a career out of computer science. Computer education brought David out of an introverted shell created by his vision problems. His forte is research and he has mastered the technique of recognizing problems and solving them. David is not an accelerated student. His interests, however, have propelled him to a very high level of achievement in this discipline.

The Atari Corporation was marketing the Atari Touch Tablet and was getting requests for software to put textual descriptions on the artwork. They offered the laboratory a free tablet if one of our students could manage to design a method. David produced the required result and is demonstrating his invention. He is the school's expert on the extensible language Forth. This work was sparked by an earlier student's research and development of a useable Forth compiler and editor which resulted in a student authored textbook that is now being used as a primary instruction manual in our curriculum.

David is currently designing an application software package to provide graphic display of data beyond the circle graphs, histograms, and line graphs available in the integrated software packages in the PFS (Apple) and Assistant Series (IBM). This package will allow menu choices for regression lines, scatter plots, box graphs, and stem and leaf graphs. David's motivation to provide better graphic displays of data comes from the Woodrow Wilson Foundation's recently published work on data analysis.

David will be available again in the session listed under research.

BRAD AUSTIN **Fractals**

Brad is a junior currently enrolled in the 4th semester of computer math. He is working in the Logo language and has developed this fractal based on a generator in Benoit Mandelbrot's book. We are encouraging him to write an article regarding this program to submit for publication. The students have already seen two of their peers get published this year, so it does not seem like an impossible dream. Mr. Brucker, our Logo instructor, is so proud of this beautiful example of multiple recursion technique that he is including it in his presentation at the Logo85 International Convention at MIT this summer.

JANINE GOLDSTEIN **Tessellations**

Janine is a sophomore at East High School. Because of her interest in computers she has received special permission to take her computer math courses here at GWHS. She is presently enrolled in computer math 4. She is demonstrating a Logo program that places repeating polygons on the screen and checks for possible tessellations. Ask Janine to explain what a tessellation is and how she has had to use a broad range of mathematical knowedge and some creative synthetic thinking to complete this assignment.

LEE J. FINGERSH **Fonts**

Lee is a freshman at GWHS. He learned Wordstar on his own last summer in order to keep a summer job. Comfort in using a computer involves knowing what it can do to help you. Can it make your work more attractive or interesting? Obviously, the ability to design and use different fonts will give a pride to ones work. This demonstration involves the use of application software to impart readabilty and attractiveness to the written word. This software is part of what is available, if desired. Its use is not formally taught. We have discovered all learning does not take place by assignment.

CHARISSE BROWN — **In-House Produced Software**

Charisse, a sophomore, was part of Mr. David Arterberry's class that was brought in to learn African geography. This application program was designed and written as a year long endeavor by two students from the computer service curriculum. Mr. Arterberry requested that we write this program for him. The students who wrote this had to design special routines so that the boundaries of the countries could be stored.

RANDY SUSMAN — **Graphing Software**

Last year's student Steve Cohen produced an application software program for Dr. Hoffman that would facilitate the teaching of graphing functions in rectangular and polar coordinates. Dr. Hoffman used this program at a National Council of Teachers of Mathematics Convention as part of his presentation. A publisher saw the demonstration and paid Steve $4,000 and a 10% royalty for the program.

Randy is showing you how this program helps in mathematic's instruction. One example you can see is how a Taylor series approximates a sine wave. He is planning on attending Carnegie-Mellon University next fall.

MARK LAGRONE and STEVE SATTERFIELD — **FORTRAN Graphics**

Steve is a senior and is presently enrolled in advanced placement Pascal. He and two other students, David Gottner and Randy Susman, under the direction of Mr. Russell Anderson, developed a graphics package for the Apple Microsoft FORTRAN. Steve is planning to attend Colorado State University.

Mark is a junior currently enrolled in computer service. He is busy implementing a "turtle graphics" system in FORTRAN, using the graphics package mentioned above. Mark is also enrolled in technical writing and is producing a user's manual for the FORTRAN graphics system. He is enrolled in the advanced placement Pascal course for next year.

The FORTRAN additions are important because our FORTRAN compiler does not provide for graphics.

TONY PICKETT **Architecture in Logo**

Tony is a new student at GWHS. Although he has been interested in computers for several years, this is the first time he has been able to work with powerful microcomputers using powerful languages. Because he enrolled at GWHS after the start of the semester an independent study was arranged with Mr. Brucker. Tony has been examining the potential of the computer as a tool for learning.

Tony's primary project for the semester has been the creation of a random disk access (RDA) program in Logo. This has been made possible through the acquisition of IBM Logo. Tony has built a floor plan with a number of rooms. Through the use of the RDA routines each room can be seen separately.

The original idea for using Logo as an architectural tool comes from Dr. Fred Riss, a computer researcher at IBM and a GWHS alumnus. Dr. Riss often travels through Denver. He makes time on these trips to speak to the students.

KRIS SULLIVAN **Electronic Spreadsheets**

The curriculum in office information practice has only recently begun spreadsheets. Kris is one of our computer mathematics students, but she is demonstrating Multiplan on the IBM, one of 3 spreadsheets available in the laboratory. Kris kept track of our invitation list for us through Multiplan. Kris, a varsity tennis player, is a senior who has taken the entire computer math curriculum. She is currently enrolled in computer service and plans to attend the University of California next year. *(Because of the demand for the IBM PC's Kris is showing this business application package now instead of next hour.)*

CARL GARDNER **Signs**

Carl is a very active freshman. We have channeled this energy and made Carl into "the little old sign maker." You can see his products all around the lab. He is demonstrating a popular commercial software package "Printshop."

GARY HAWKINS **Video Digitizer**

Gary is a sophomore enrolled in computer math 3. Gary has set up his equipment in the corridor just outside the computer lab. He is more than willing to take anyone's picture with the video digitizer. This device allows television pictures to be saved and printed by the computer. He will be taking "pictures" all morning. A certain amount of fun motivates learning. Watch the birdie!

STEVE KELLEY **Publishing/Speaking**

Steve is a senior at GWHS. He has been taking computer classes by special arrangement since the 8th grade. Because of his early start he was able to complete the curriculum ahead of schedule, freeing himself to do original research. He has done original work on Atari screen switching graphics, Apple music and speech, and research on RDA techniques.

Steve has also had a hand in revising our curriculum. He helped with RDA teaching, and has done much in the area of graphics. Most recently, Steve revised our old random walk program, updating it to microcomputer use. He made it an educational program, including Turtlegraphics, trigonometry, and the RANDOM function itself. The program is now in use in other Denver high schools.

He also wrote an accompaning article that was published in The Consortium, a journal for teachers of mathematics. Steve's program was submitted to the Mathematics Association of America, and he was invited to speak at their spring meeting in Casper, Wyoming. At this meeting Steve had a chance to discuss his work with professors in both mathematics and computer science from all over North America.

Spurred on by the suggestions and ideas of these professors, Steve has revised his program. Now it not only demonstrates the RANDOM function, but keeps a record and will analyze the degree of randomness for the user.

Through his experiences at GWHS, Steve has gone through the complete cycle of publishing a paper: research, publication, presentation, revision, re-publication. Because of success in areas not usually open to high school students, Steve can boast a record of college acceptances (including Stanford and Claremont McKenna) envied by many of his peers. Steve attributes his success to the teachers and opportunities at GWHS. He's glad he went here.

Besides all of these academic kudos, Steve has spent his summers working in the Denver community. Ask him about the Gove Community School Computer Camp or the computer networking problems at Mobil Oil Corporation.

Steve's station in the hall we be available all four hours of the exposition.

BUSINESS EDUCATION/ALTERNATIVE EDUCATION
ELECTRONIC COMMUNICATIONS
8:30 am to 9:30 am

The business department offers two classes in BASIC programming, one in word processing, and one in other types of application programming. Alternative education includes our federally sponsored programs like Hold Youth and special education. Hold youth, as the name implies, works with students with attendance problems. Special education works with students who have significant learning impairments because of emotional, mental, perceptual, or other handicapping conditions. Electronic communications deals with the new, but highly important area of computer communications over phone lines.

ETHEL SMITH **Wordstar/Word Processing/Secretarial**

Ethel is a senior enrolled in computer service. She has completed the business computer education curriculum. Ethel intends to major in business at the Parks Business School. Her work at school involves intense business correspondence using Wordstar. She uses it to maintain the extensive correspondence of the computer department. This correspondence ranges from lawyers, to senators, to the White House, to the National Science Foundation, to publishers, and to college admissions officers. Her demonstration is showing how Wordstar and Mailmerge can effectively be used to send individualized letters to a large audience. Ethel's portfolio of correspondence is all real.

GLENN RADINSKY **Electronic Communications**

Glenn is a junior who is currently enrolled in computer math 2. He is using the Hayes Smartcom II communication software to contact various educational bulletin boards and several national public utilities whose clientele are "elite" educators. He also keeps track of various educational databases on the EPIE network, which has been set up for use by educators. Glenn also teaches others how to use CARL, the area wide library database system. Through CARL students and faculty have instant access to six large libraries in the Denver, Northern Colorado area. Next week Glenn will receive and send the debate

messages that will develop at GWHS. Dr. Hoffman has been designated "educator of the week" on the EPIE network. He has sent out four provocative ideas that he will have to defend or explain as educators from all over North America debate these ideas.

ILANA STEINBERG **Word Processing/Writing Assistant**

Ilana Steinberg is a junior enrolled in the word processing class. While her career plans are indefinite, she is sure that she will go to college, and possibly graduate school. She knows that she will use her computer skills in whatever field she decides to enter. Being in the word processing class has helped Ilana immensely. She is taking an accelerated English class, and she reports that she types all of her papers on the word processor. "It's amazing--all the functions a word processor can perform. It makes correcting my mistakes much easier. I get much more accomplished in a set period of time."

Ilana has previously taken computer math 1. This was extremely valuable. It helped her to use logical methods for problem solving, and taught her about certain mathematical functions that she learned about later in other non-computer math classes.

Ilana feels that the knowedge she has gained from taking these computer classes has been invaluable. They have certainly been an important part of her curriculum during her high school years. Her demonstration will include the operation of the IBM word processor, the Writing Assistant, along with samples of her work.

CANDACE DAVIS **Office Information Practice**

Candace is a senior who is enrolled in three computer education courses, two in business and one in English. In the past she has taken microcomputers 1 and 2. She has learned a variety of skills such as editing and composing documents, creating "user friendly" programs, putting together charts and graphs, and inputting information. These computer classes have helped her immensely at her current place of employment. Candace's employers are so impressed with her computer skills that they intend to help further her computer education after graduation. She hopes that other schools will be able to inititate a computer curriculum like that at GWHS.

Candace is demonstrating the final product of a project included in the Tax Advantage program on the Apple II. She is printing the end result of a 1040 tax return. The Tax Advantage program has been designed to compute the amount of federal taxes owed, or the amount to be refunded. She is also printing the product of a payroll program designed to use previously entered data to compute and print out payroll checks.

You will see Candace again in the technical writing portion of the exposition. In her project for this class she is contrasting the styles of two ghetto poets, Langston Hughes and Countee Cullen. Imagine using technology to study humanism.

LYNETTE SHIRAISHI **Beginning Programming (Microcomputer 1)**

Lynette is a sophomore finishing her first year of BASIC programming in the business department. There are no prerequisites for this class and it moves more slowly than its mathematics counterpart. Lynette is demonstrating a class requirement involving a sort routine. She wants to continue her computer education by taking word processing and other business application programs.

AARON BROWN **BASIC Programming (Microcomputer 2)**

Aaron is a freshman at GWHS who has formed his own computer consulting business. He is demonstrating a portion of the curriculum in microcomputer 2. The programming classes in the business department have no concurrent requirement as is the case in the mathematics department. Aaron's prerequisite for this class was the beginning programming class being demonstrated by Lynette Shiraishi.

MATT MCCOY **Handicap Remediation/Word Processing**

Matt is a junior enrolled in special education. He is very restricted in his ability to verbally communicate, so he has learned to communicate through the word processor. He is able to write fluently in both English and Spanish. He is demonstrating his proficiency in using a word processor. Because of his handicap do not expect him to respond verbally to your questions.

RON TAYLOR and JOE BELL **Hold Youth/Trigonometry Software**

Ron is a freshman at GWHS. He did not like school in the 8th grade and ended up getting mostly D's and F's. He did not finish his work. He refused to do homework. He was bored. He ended up going to summer school, had several fights, and just did not get along with others. He enrolled in the Hold Youth program his freshman year at GWHS. His grades quickly improved because of teacher interest and individualized assignments. His parents got together with the teachers and encouraged him to achieve. School is exciting for Ron for the first time. He is on the junior varsity baseball team with a batting average of .650 – and "things are great at home."

Joe is also a freshman at GWHS. Although he did well in middle school, he found GWHS big and cold. He began to "ditch," and started failing the semester. Through his counselor's suggestion he was able to get a fresh start in Hold Youth. He is now passing all his subjects and hopes to go in the electronics field.

Ron and Joe are demonstrating a public domain trigonometry tutor, programmed in Atari Forth by Dr. Klotz of Swarthmore College. This provides an alternative trigonometry education for students who are not in the mainstreamed math program.

ROBBIN PROCTOR **Hold Youth/Typing Tutorial**

Robbin is a 10th grader who came to GWHS last year and was admitted to the Hold Youth program. One period a day the class went to the computer lab. This is where she learned touch typing and the Writing Assistant word processing program.

This year Robbin is a serious student and can see high school graduation as a practical and realistic goal. Eventually Robbin hopes to become a court reporter.

Robbin is demonstrating the typing tutor program which refined her typing skills. She is now mainstreamed. Robbin is an example of what Hold Youth does.

ANDY ROBBINS **Special Education/Mainstreaming**

Andy entered GWHS as a special education student, enrolled in classes for the learning disabled. He became interested in computers through a special education computer course in Logo. Andy's fascination for computer technology is so strong that he began taking regular computer math classes. Eventually he became totally mainstreamed, taking all regular GWHS classes. He is now a senior and is enrolled in the advanced placement Pascal course. He took one of the prerequisites for this course through independent study. Two short years ago, (b.c.) before computers, Andy did not even have the remotest hope of attending college. Now he has been accepted at Fort Lewis College.

Andy is presenting some of the work he has developed as part of an outreach program, teaching Logo and BASIC at McMeen elementary school.

BETH NOVY **Database Manipulation/Special Education**

Beth is a junior at GWHS. Although she is enrolled in a special education class she spends many of her class periods working in the computer lab and learning business application programs. Last semester she learned the basics of word processing, finally mastering the rudiments of Wordstar and Mailmerge. This semester she has performed an invaluable service for the lab by learning the IBM Assistant Series filer and grapher and putting most of the lab's student survey onto disk.

She is demonstrating the IBM Assistant series, using the survey on computer lab students in Filing Assistant and Graphing Assistant. She is planning on taking computer business classes next semester and sees a need for similar courses in college. Her long range goal is to become an independent businesswoman.

CLINTON BAILEY **Computer–Aided Instruction/Special Education**

C.B. is a freshman. He is demonstrating a series of commercial programs developed by the Learning Company. Because of his problems in understanding spatial and quantitative concepts this program has been most helpful for him. Notice, however, that CAI at GWHS is not the rote "drill and practice" used in many places. C.B. has to think and act, not react. While C.B.'s language skills are not polished, he is more than willing to show you what he is doing.

MATHEMATICS/RESEARCH
9:30 am to 10:30 am

The laboratory provides 5 semesters of computer mathematics. Only then can students enroll in computer service and begin computer research. Our students typically involve themselves in research projects that are both sophisticated and meaningful. The primary beneficiary is the student. Such in-depth research promotes good study habits, a deepening and enhancing of knowledge, and, most importantly, a love for learning. Students learn how to deal with not knowing the answer, or even if there is an answer.

Because of our collegial approach to learning, one important by-product of such research is the increased knowledge base of the lab. Frequently, what starts out as research ends up in the regular computer math curriculum. If this happens, the students become authors and provide our text material for the class.

PHILL HEIN **Research/Mini's & Bulletin Board**

Phill presently works, in his spare time, as a mainframe researcher and manager. He is getting the bugs out of our most recent acquisition, a Sycor 445 minicomputer, a recent gift from the United Distributing Company. We hope to be able to begin teaching COBOL on this machine next year. Before the Sycor arrived Phill kept busy by doing the initial design work on our electronic bulletin board system. This bulletin board will serve as a communication link between all the high schools in the Denver area. Students and faculty are anxious to take advantage of this new means of networking. Phill is also trying to write a new operating system for our machines that will introduce a friendly "virus" into the system. This will keep our software from running on non-lab machines and will increase, even more, our disk security system. Have him explain this system in the new jargon of the computer "aficionado."

Phill is most appreciative of our flexible independent study and advancement program. Because of this policy, being a freshman has not been a handicap for Phill. By allowing Phill this kind of flexibility he has been able to make good use of his time dividing his attention between original research and computer math. His transcript shows 3 semesters of independent study in computer mathematics. He is too busy to include a formal course in his load. Among other things he is teaching himself COBOL. Next semester Phill will be in the International Baccalaureate program.

Ask Phill about the Sycor 445, the bulletin board, or "viruses." We are one of the few schools that could provide an education in this area for a student like Phill. If it arrives in time Phill will be working on our PDP 11–45 (a gift from the Honeywell Corporation) when you come.

ALEX KOVATCH **Making Modems Useful**

Alex is a very energetic freshman who got started with computers at home and took a summer course at GWHS two years ago. He, like many others, is presently going to GWHS on a hardship transfer for computer education. He wanted to come to GWHS because of its fine computer lab and has or is taking computer math 2, computer math 3, and laboratory assistantship.

Alex's special research project deals with modems (electronic communication). He is presently working with another student to develop the GWHS bulletin board. He has also collated a list of public bulleting boards that are considered acceptable. He has deleted the "freak," pornographic, and pirating boards from the list. He also periodically examines all the boards in use, and is continually looking for good new ones that will benefit the GWHS population.

In addition Alex is an expert with the Atari 800. He frequently helps the lab staff in both software and hardware repairs on our Atari machines. Ask him to describe some of the things he has done to his home Atari. Today, he is demonstrating the CARL system for accessing library databases.

HEIDI SCHEMPF and LESLIE WHITNEY **Databases**

Heidi and Leslie are juniors and are currently enrolled in computer service. They have completed the computer math sequence and will be enrolled next year in the advanced placement Pascal and the technical writing classes. One of their most endearing projects this year was the customizing of IBM Logo (the language) to allow graphics in a pink environment with a heart–shaped turtle. Presently, they are working on published databases from the Woodrow Wilson Foundation and the Targeted Learning Company. The girls are comparing and organizing the data into graphs and reports for further research. Their efforts are directed towards discovering the most effective ways of protraying different types of data. Heidi has access to an Apple IIe at home and much of the girls' work on the PFS system is accomplished away from the lab. They find it interesting, yet demanding, work. These girls produced the invitations that you received.

The girls usually arrive at the lab around 6 am. Dedication!

PAUL FARMER **Computer Math 5/Forth**

Paul is a senior who is enrolled in his 6th computer education class. He works for the Denver Public Library installing terminals for access to the Carl system. (cf. electronic communications). Paul's technical English project is a manual on the heap and shell sorts that are taught in computer math 3.

Paul is demonstrating one of the newer computer languages, Forth. Two years ago one of our students, Steve Cohen, undertook an independent research project involving the implementation of Forth on the Atari. One of the results of this research was a Forth manual for the Atari that is now being used by all of our Forth students. (cf. graphics/music). The Forth manual is on display in the hall. Paul will be attending Fort Lewis College next year.

FULTON JACKSON **Computer Math 4**

Fulton is a sophomore who is enrolled in computer math 5. He is demonstrating a random disk access (RDA) program that is a major part of the computer math 4 curriculum. Through RDA information can be stored on a disk, manipulated by the computer, and restored on the disk. Commercial names for this technique generally involve the word "file." This is the basis for all computer filing systems. Fulton has RDA programs written in four computer languages–Applesoft BASIC, Microsoft BASIC, FORTRAN, and Pascal. Generic problem solving is taught here as an application in procedures and functions.

CAROL SCHEUER **Computer Math 5/Logo**

Carol is a junior who attends private school for her primary source of education. She attends GWHS for computer classes. She is in her 5th semester of computer programming and has developed an interest in Logo. Currently, she is working on a Logo program that will show the matrix continually changing as it is manipulated by the rules of Gauss–Jordan reduction.

Carol is explaining the Logo curriculum and its place in the computer math program. She has a number of programs that display Logo's unique graphic and recursive abilities.

JILL CHOPYAK and JOY WAGNER **Computer Math 2**

Jill and Joy are both freshmen presently enrolled in computer math 2. In computer math 2 they have learned how to solve linear equations and quadratic equations on the computer in three languages: BASIC, FORTRAN, and Pascal. They can demonstrate these programs and talk about this entry level course. They are currently learning about subroutines, functions, sorting, and elementary statistics. In this portion of the course they are struggling, as does everyone. For students with less mathematics, the entry level course would be computer math 1.

AARON BIRENBOIM **Curriculum Development**

When we become aware of deficiencies in our curriculum computer service students are assigned a project that will fill the gap. Last year it became obvious that the heap and shell sorts should be taught as "in memory" sorts. Steve Kelly and Mary Dunbar developed this for our computer math 3. Aaron, a senior, was assigned the difficult task of developing a new disk sorting technique for the computer 4 curriculum. His research led to the development of a sophisticated linked list insertion in Pascal, now being taught as a sort from the disk.

KIM ENARD **Mathematics/Independent Study**

Kim is a senior with very diverse interests. Because of these interests she has consistently been enrolled in one-class offerings which have prevented her from taking computer courses, due to time conflicts. However, with the help of the computer staff she has been able to take some of the computer curriculum through independent study.

Kim's computer background is very limited. She has taken only one previous semester of computer math. However, because of her mathematics background she has been able to understand the mathematical applications without a great degree of difficulty. The entire computer staff has played an important role in her learning experience.

Future plans for Kim include attending the University of Texas at Austin and majoring in business administration. She is confident that the computer education she has received at GWHS will be a valuable asset in both her college and business careers. She is demonstrating various programs she has completed in her independent study courses.

Kim has already received three academic scholarships to help pay for her college education. The United Bank of Denver has agreed to train her in their executive program.

CARLA and CARMEN GORDON **Computer Math 1**

Carla and Carmen Gordon are enrolled in a computer math 1 class. They have completed one year of algebra and one semester of geometry. They are currently in their second semester of geometry. They are also enrolled in word processing and both of them plan to take technical writing next year. Carla and Carmen are demonstrating a program that evaluates a series and produces an approximation of pi. They also have printed copies of other programs they have written in their computer math 1 course.

No, you have not been seeing double. Carla and Carmen are our two delightful twins.

JAY BRUNGER **Computer Math 3/Polynomials**

Jay is a freshman enrolled in computer math 3. He is demonstrating a program studied in this class. It finds roots of a **fifth degree** polynomial. He uses an interval halving method for isolating the root. The theorem for finding the bounds of all roots was developed by one of our students in 1967. (The student who developed this theorem while at GWHS went on to get a Ph.D. in number theory.) This program uses functions for finding ordinate values. Jay takes business programming at CEC (Career Education Center) in the afternoons.

RON SCHECHTER **Computer Math 3/Gauss**

Ron is a sophomore. He is showing a mathematics assignment in Computer Math 3. He is solving a 5 x 5 system of linear equations using a method called Gaussian Reduction. He finds the inverse of the coefficient matrix and writes an algorithm to perform matrix multiplication. Unfortunately, this sophisticated mathematics does not lend itself to a visual medium. Talk to Ron and have him explain declarations, procedures, the use of Booleans and functions. Remember the theoretical underpinning of his algorithm will be restudied in our second year algebra classes. Ron had to compute this entire operation by hand on a 3 x 3 system before he was allowed to write this algorithm. Ugh!

EHUD LISSAUER **Pi Series**

Ehud is a senior presently taking computer math 5 and technical writing. He is showing a group of programs that give an approximation of pi through the calculation of various types of series. The more terms that are calculated in the series, the closer the approximation. Ehud plans on attending the University of Colorado next year.

CANDACE DAVIS **Technical Writing**

Candace is producing a paper that compares the conflicting poetic visions of Countee Cullen and Langston Hughes. She is using the Assistant Series to store, retrieve, and graph necessary aspects of her report. You saw Candace earlier (7:30 to 8:30 am) reporting on the third semester course in the business department. Candace plans on going to the University of Colorado, Denver Center, while she works. *(Although Candace's project is more appropriately shown next hour, she is demonstrating it now, so that she can get to her outside job on time.)*

TECHNICAL WRITING/OUTREACH
ADVANCED PLACEMENT/BUILDING CURRICULUM
10:30 am to 11:30 am

The pinnacle of our program and the culmination of the student's education lie in the advanced placement Pascal and technical writing classes. Students in the technical writing class represent a wide variety of computer experiences. Some have worked intensively with computers for three years; others have had but one semester of BASIC. The range of projects they have chosen to pursue is staggering - from literary research - to a sociological profile of our computer population - to an explanation of complicated mathematical operations - to the writing of articles for national publication. In this portion of the exposition you will be truly amazed at the products of these students.

Some students came to this class in great need of stylistic improvement, while others were already accomplished writers. Ms. Rottmann made use of student strengths and weaknesses to produce this fine body of work.

In advanced placement Mr. Anderson probes the murky depths of the Pascal language.

PETER BAILEY **Central America/Politics**

Peter Bailey is a junior attending GWHS. He started taking computer math in the second semester of his freshman year. He has completed all the computer math courses and is now taking the advanced placement course and the technical writing course. He has gained proficiency in MT+ and Turbo Pascal, FORTRAN, Applesoft and Microsoft BASIC. He has also done some work in Atari Forth and IBM Logo.

He has learned the Gauss–Jordan method of solving equations, linear programming, and polynomial analysis. It is important to realize that the above projects were learned in computer math before he learned them in algebra, trigonometry, or calculus. Other projects have included biorhythmical analysis, infinite series to determine pi, and random disk access in four languages. He has also solved an extended sort program that finds the mean, assigns letter grades, finds coefficients of correlation and gives a linear regression line. The median and mode are also found for all data entered. The standard deviation and

mean are found for seven columns of test scores. The students are also sorted alphabetically in ascending order and in descending order by highest mean. (He uses five different types of sorts in various editions of the program.) Remember, he is a junior.

Computers, however, hardly dominate all of his time. He is an active member of the speech club and NHS. He plays baseball, raquetball, and rides a bicycle. He and his team recently went to the state competition of the Olympics of the Mind.

Although he is interested in computers, and math, planning to major in math, computers, or engineering in college, his technical writing project is on politics, another interest of his. Specifically, he is writing on Central America, examining its problems, the sources of these problems, possible solutions, and courses of action for the United States in Central America. Peter sees all knowledge as related, not compartmentalized.

Peter is demonstrating how he draws data from his data file and portrays the data graphically, as he explains issues involving Central America.

STEVE SCHECHTER **Linear Programming Manual**

Steve is a senior enrolled in advanced placement Pascal. He is discussing how the mathematics taught in the computer curriculum have helped him in calculus and other traditional math classes. The discussion highlights the wide range of mathematical applications taught in the computer math sequence. Steve's project in the technical writing class is a teaching unit on linear programming for computer math 5. In addition Steve's portfolio is his computer education history at GWHS. Ask to see it. It is very interesting.

In the fall of 1984 the enrollment in computer 3 and 4 was such that Mr. Johnson was assigned a split class. Steve took the 7 computer 4 students and taught them the semester's work in random disk access. He had to teach this technique in 4 languages: Applesoft BASIC, Microsoft BASIC, FORTRAN, and MT+ Pascal. His students did very well. For this work Steve was awarded the computer education department's "Outstanding Student Award." Steve will be at Colorado State University next fall.

ALLAN GOLSTON **United Bank Survey/Adopt-a-School**

Allan is a senior at GWHS. He plans to major in business and is already taking classes to prepare him for such a career. One class that Allan finds most helpful is technical writing. This class provides the vital writing skills that the business world demands. It allows exposure to English structure and vocabulary that students are not exposed to in regular English classes. Allan finds technical writing to be a challenge.

Allan's project entails a research report for the largest bank in Denver, the United Bank of Denver. This report will be a summation of a survey designed by the bank to determine the future of the conventional bank. To complete the project Allan must learn how to employ data bases and graphic illustration. The final report will be presented to the bank's board of directors.

Allan has had five semesters of computer math. He is quoted as saying, "The computer math classes have taught me math techniques I never knew existed." Allan stresses the importance of the computer math curriculum because he feels it prepares one for college and the "real technical world." Allan plans to attend the University of Colorado, Denver Center next fall. United Bank of Denver has also admitted him into their executive training program.

CALVIN MA **Database Analysis**

Clavin is an active junior. Not only does he excel academically, he is also a member of the GWHS baseball and tennis teams. Calvin enjoys a diversity of interests. Next year he will be president of both the National Honor Society and the Mathematics, Engineering, and Science Achievement club. He was recently nominated for the University of Colorado, Boulder Book Award, which honors the outstanding juniors in Colorado.

As a junior, Calvin is in the process of finishing the computer math curriculum. His program on biorhythms was published in the January issue of The Consortium. He recently successfully defended portions of the article from an attack by a mathematics professor at Beloit College. His latest project is an analytical report on the types of students enrolled in computer courses. The raw data for the report is easily maintained and updated because it is kept on a computer database.

Please remind Calvin to talk slowly. He thinks faster than he talks. Please pardon any grammatical or idiomatic mistakes. He has only been in the United States for five years. His native language is Chinese.

JEFF ERICSON **Chemistry Database/Meteorology**

Jeff Ericson is a junior at GWHS, and is currently working on a project for technical writing that will discuss the methods that meteorologists use to forecast the weather and the role of the computer in this endeavor. This project incorporates the use of the IBM Assistant Series to produce charts, graphs, reports. The project is being done as a requirement for the technical writing class.

Jeff is also in an advanced Logo class, and is working on a project that will demonstrate random walk techniques. He is building a test program to determine if the random function in IBM Logo is truly random.

A project for a chemistry class occupies much of Jeff's time. This program uses random disk access to give fast and accurate data on the 103 elements in the periodic table. The program includes a notepad for quick note taking and calculator function that will include room for a sixty character equation and will utilize most scientific math functions. All sections of the program run from a special menu that Jeff will explain. Any subroutine can call any other subroutine. This eliminates the need for a traditional menu and makes the program both faster and more useful. Other students are already planning on using Jeff's chemistry program as the basis for further research. An article for publication in a chemistry journal is in the offing.

RON MAUER **Pastoral Database**

Ron Mauer is a senior at GWHS and will attend Western Bible College next year. Currently, he is working on a database that stores information for sermons. He is developing a system that allows a Pastor to have easy access to desired information. The key to the project is the development of proper searching systems. Ron is thinking about marketing his procedure.

The experience he has gained in computers leads Ron to feel more computer literate, and has also provided practical implications for his vocational choice.

REBECCA LESSER **Technical Writing/Child Abuse**

Rebecca is a senior and plans to attend Bradford Business School next year. She is demonstrating her research paper on child abuse that she prepared in our technical writing class. She used the Assistant Series word processor and graph generator to prepare her paper.

GUNNAR BEHRENDSEN **Advanced Placement**

Gunnar is a senior taking the advanced placement class. He is editor of the school year book. Sorts, linked lists, searches, queues, stacks, trees, and recursion are topics included in the arcane discussion you encounter here.

RANDY SUSMAN and MARK GOLDFOGEL **Entrepreneurs**

You have already met Randy and Mark. Randy has done a number of computer projects for agencies and companies in the Denver area. His most ambitious project was building a complete database for the Rocky Mountain Drug Consultation Center. Mark has formed his own computer consulting company.

These two seniors are presenting a computer–generated report describing current students and the outside jobs they have held that require computer expertise. Be prepared to be astonished at the wide range and expertise of our entrepreneurs. Handouts of the report will be provided.

JOHN SMILLEY and JON GOLDBERG **C Language Research**

John Smilley is a senior who has been working with computers since the 5th grade. Since there were no computer courses in elementary school he taught himself the basics. In junior high school he tutored many students in computer use. Since coming to GWHS he has completed all the computer math courses and is now enrolled in computer service. Jon Goldberg is a junior who has also completed the computer math curriculum. In his spare time he has done programming projects for a number of corporations in the area. Jon does consultant programming for Central Services.

These students are researching the possibility of taking the small C compiler (public domain), and transforming it into a usable and teachable language. The main problem they face is the necessity of converting this integer only version into a version that will implement real numbers and make use of common mathematical functions. From this research will spring a six week unit in C.

THO NGUYEN and ALAN ROSEN **Outreach**

Tho is an Asian – American who came to the United States ten years ago as a Vietnamese refugee. He has used his time in America to learn English and study computers. Tho is currently enrolled in computer math 5. Tho plans to study robotics after he completes an electrical engineering and computer science curriculum.

Alan, a senior, has found many ways of using the computer. While originally interested in graphics and music, Alan has recently using his creativity to teach fourth, fifth, and sixth graders.

Presently, Alan and Tho teach the students at Steck elementary school Logo and BASIC. Through the technical writing course Alan is creating a manual to aid in curriculum development for elementary schools.

Alan's latest project is to setup an Outreach Center at GWHS. Through this center GWHS students, in a variety of academic areas, will be matched with elementary schools eager for this kind of mentoring. Alan is not a gifted academic. His interests, however, have propelled him to compete with those students who are academically gifted. Alan is achieving success in these classes and, without computing, would never have had the opportunities to work with this portion of our student body.

Tho and Alan are looking for a couple of "volunteers" to continue their outreach work at Steck next year. Any takers?

FACULTY 1985
GEORGE WASHINGTON HIGH SCHOOL
SHARED RESOURCE COMPUTER LABORATORY

Vaughan Aandahl – Mathematics
Pat Barnes – Business
Ted Brucker – Special Education
John Daly – Mathematics
Augusta Hardy – Business
Irwin Hoffman – Mathematics
Ed Hoing – Mathematics

Gil Johnson – Mathematics
Tim Larson – Hold Youth
Lori Lazuk – Mathematics
Deborah Ramirez – Business
Liz Rottmann – English
Ann Speck – Business
Frankie Trelikes – Special Education

Russ Anderson – Software Specialist
John Calabrese – Hardware Specialist
Len Hawkins – Laboratory Assistant

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Ted Brucker for the invitations and program
Major Perry and his staff for the ROTC assistants
Barbara Smith and the lunchroom personnel for the lunch
Bob Crews and the custodial staff for all their assistance
Heidi, Leslie, Kris, and Carl for all of their help

to all the teachers for their cooperation and support

most of all to our principal, Ann Casey, who supported, facilitated, and energized the entire project.

Irwin J. Hoffman
Chairman, Computer Science Department