Ceramics MONTHLY

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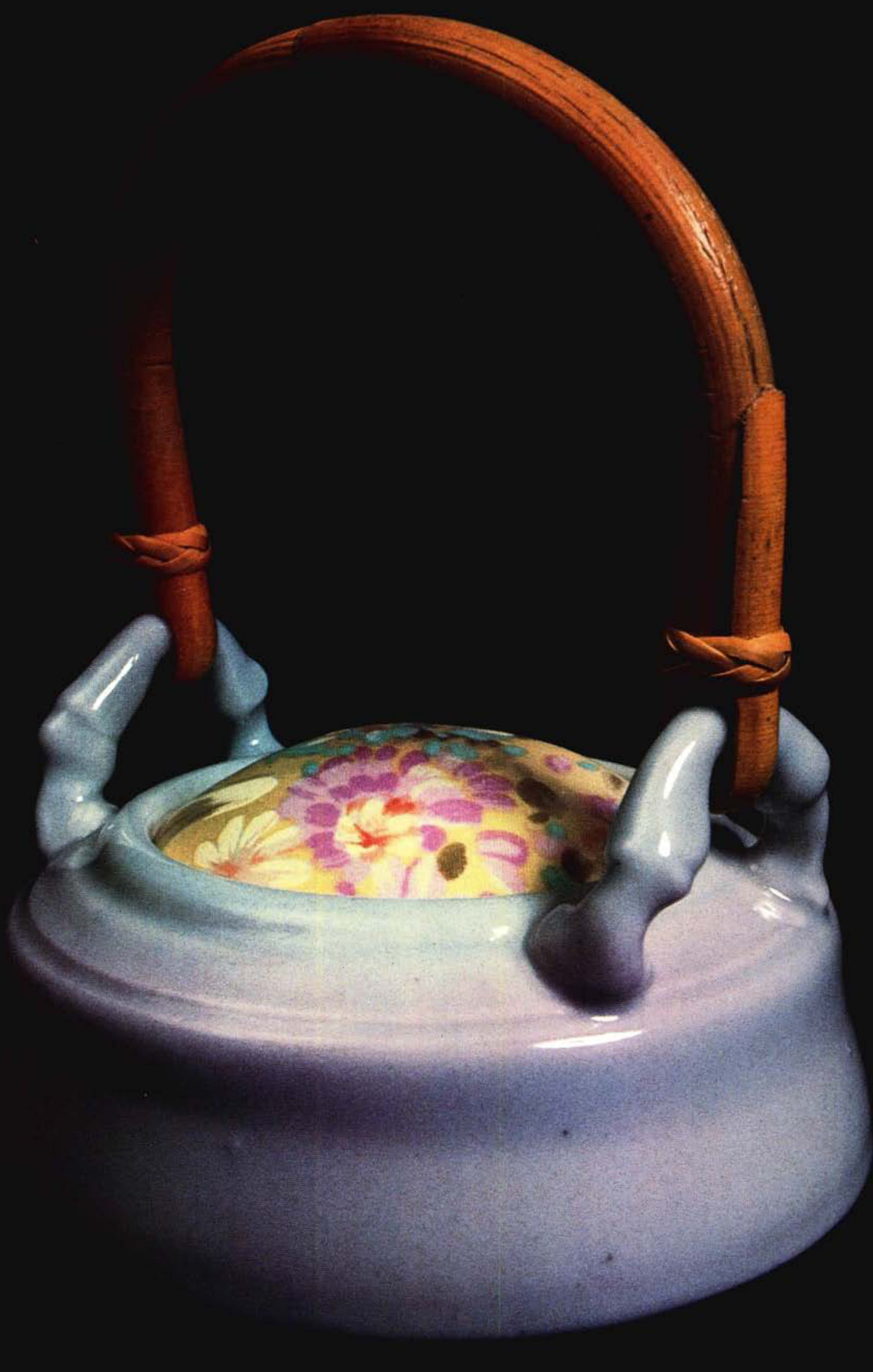

ized with crafts through exhibition publications and programs, and that craftspeople need technical, managerial and marketing information together with increased crafts scholarship and criticism. Suggested communication improvements included exchanging information inside and outside the field, and gathering data from regional sources for central storage and dispersal to craftspeople and the public; in addition to providing for identification, documentation and preservation of ethnic and minority craftspeople or those working outside the mainstream. Market development and the exploration of new arenas for selling craft works, as well as the identification and cultivation of funding sources, were the panel's primary monetary concerns. In advocating the crafts, they considered legislation at local, state and federal levels for support of health issues; promotion for increased markets; increased recognition and related matters were also discussed.

So that an agenda can be formulated for the national congress, the panel of administrators adopted a resolution for the appointment of task forces to document findings, set objectives and prepare written reports of their activities, including recommendations for action. They also are to provide opportunities for reaction from the field throughout the development of the study and investigate the possibilities of increasing cooperation and utilization of existing channels such as state arts agencies.

COMPUTER GLAZE FORMULATION

With rapid developments in smaller, less expensive computers, ceramists may find the machine can become an economically feasible tool for experimenting with new glazes. In fact, the computer may be programmed to accurately predict a glaze's properties from its formula.

Before graduation in 1979, *John Lewin,* a George Washington High School (Denver) advanced computer student, with assistance from ceramics instructor *Mark Zamantakis* and computer mathematics instructor *Irwin Hoffman,* developed a program in Fortran IV on a Univac 1106 for experimental glaze formulation. Beginning with fundamental information, John explains their approach to the program and identifies significant results in the following essay:

"Glazes can be represented in two ways, by the batch recipe of the glaze materials and by the empirical formula of the oxides. The former method has the advantage of being immediately usable for mixing the glaze, while the latter allows the potter to predict the resulting glaze. Developed by *Hermann Seger*, glazes expressed by empirical formula are often called Seger formulas. Glaze formulas, however, are unlike chemical formulas. As defined by *C. E. Ramsden* in 'The Solubilities of Metallic Oxides in Glazes,' 'A glaze is not a chemical compound, inasmuch as its

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constituents are not present in definite unalterable proportions, though it is perfectly homogeneous, and possesses properties quite distinct from any of these components.' Seger formulas do not represent the chemical arrangement of the elements in a glaze, but merely their relative amounts.

"Oxides used in glaze making are classified into three categories: 1) bases (RO), including alkali metals, alkali earth metals and other fluxing agents; 2) neutrals (R_2O_3) such as aluminum and chromium; 3) acids ($R0_2$), the most important of which is silica. $Si0_2$ is the basis of glass and practically all glazes have that oxide as their foundation.

"With this data we devised a computer program to convert an empirical formula to a batch recipe and to determine when the transformation with particular materials is impossible. As our starting point, we used the classic porcelainous stoneware glaze published in the writings of Hermann Seger. This glaze consists of 0.3 moles K_20 and 0.7 moles CaO as fluxes, 0.5 moles $A1_20_3$, and 4.0 moles $Si0_2$. This is a transparent, colorless glaze which accepts coloring oxides well and matures at Cones 4-10. Materials for this glaze and its alterations included potash feldspar, the chemical composition of which we assumed to be 1 K_20:1 $A1_20_3$:6 $Si0_2$; kaolin, 1 Al_20_3:2 $Si0_2$; whiting, a form of $CaC0_3$ which evolves $C0_2$ to become CaO upon firing; and silica, $Si0_2$. Lithium carbonate also was added in the file to show that many materials may be stored without using each in every glaze.

"Because glazes are not specific chemical compounds, their precise properties do not follow rigid patterns in relation to their composition. The assumption that one's feldspar is of exactly a 1:1:6 ratio is inaccurate. Many glaze materials are extremely hard to purchase in a pure form and each supply the potter receives is likely to be different. Therefore much of formula-to-recipe transformation is somewhat theoretical. However, knowing reasonably accurately the proportions of the oxides in a glaze gives the potter an idea of the type of glaze he is mixing and, after a trial, how he can alter his glaze by changing the formula to achieve better results.

"Our first change in the base glaze was to the ratio of fluxes, keeping the sum at 1.0 mole to comply with the rule of Seger glaze formulation. We raised the K_20 to 1.0 mole by increments of 0.1 mole while lowering the CaO accordingly. At 0.6 K_20 the glaze would no longer compute because the further addition of feldspar would raise the Al_2O_3 above the desired amount. We programmed the computer to suggest Li_2O as well as K_2CO_3 as substitutes and to give the advantages of each.

powerful flux and will lower the glaze's firing temperature and thermal expansion,

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while potassium will cause some opposite effects. In the next two glaze calculations we raised the alumina and silica, and the formula computed.

"We then increased the CaO to 1.0 mole and decreased the feldspar. An increase in calcium, in general, will decrease the glossiness, raise the firing temperature and decrease the expansion of the glaze.

"Our next step was to decrease the silica. Again starting from the classic formula, we lowered the $Si0_2$ 0.5 moles at a time. A decrease in silica may cause a glaze to undergo some devitrification and with very little silica a glaze becomes matt. At 2.0 moles the recipe would no longer compute because enough feldspar and kaolin could not be used to fulfill the 0.5 moles of alumina in the formula. We then lowered the $A1_20_3$ to 0.4 and the glaze computed.

"In the next set of calculations we increased the $Si0_2$ by increments of 0.5 moles. Increases in silica generally raise a glaze's firing temperature, lower its thermal expansion, and increase its hardness and resistance to water and chemicals. With a high silica content the glaze may devitrify and form crystals as it cools. There was no problem fulfilling the formulas because the amount of pure $Si0_2$ could always be raised.

"In the next four calculations we decreased the $A1_20_3$ by 0.1 mole down to 0.2 mole where it would no longer compute. Used for matt glazes, high alumina adds hardness to a glaze and raises its firing temperature. Decreasing the alumina should lower the firing temperature and increase the glossiness. Alumina is the ingredient that differentiates a glaze from a glass, so at low alumina the glaze becomes more like a glass.

"Our last eight examples were to show how the potter could use the program to formulate and test any miscellany of glazes. We randomly altered the amounts of each of our materials by changing the empirical formulas and the computer determined if the glaze could be made of the ingredients on file. In the final glaze we used the Li_20 in our data and the computer made the glaze using all five materials. Any number of materials may be put on file by making only slight alterations in the program. The order of the data will determine the computer's preference if more than one material can be used to fulfill an oxide requirement. Also, with only slight changes in input and output statements, any number of oxides may be incorporated into the formula.

"In the program printout, general comments were listed below the glazes to show how the potter might vary an oxide to achieve a desired effect. Along with these comments on specific glazes, we had the computer check for an absence of clay in the recipe since it is instrumental in keeping the other materials in suspension and in adhering the glaze to the ware before firing."

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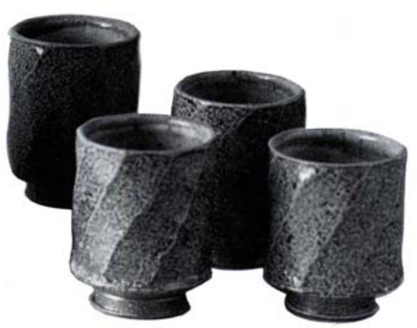
Inquiries about the program may be directed to the Denver Public School System, Denver, Colorado 80224.

THE CRAFTSMEN'S GALLERY

"For the Bride and Groom," a multimedia exhibition of objects selected for their appropriateness as wedding and anniversary gifts, was recently presented at the Craftsmen's Gallery, Scarsdale, New York. The works by approximately 30

Seth Duberstein

American craftsmen included ceramics and glass by *Jan Axel*, *Roberta Bloom*, *William Brouillard, Cindy* and *Steven Chandler-Worth, Seth Duberstein, Robert Forrest, Don Gonzalez, Andrew Magdanz, Joan Reep, Harriet Ross, James Rothrock, Liz Rudley, Todd Sadow*, *Bruce Sevick, Jane*



William Brouillard

Sinauer, *Tom Spleth*, *Rick String Fred Tregaskisy Peter VanderLaan* and *Sally* and *William Worcester.*

Shown (top), from the exhibition is a glazed porcelain canister set, averaging 8 inches in height, by Seth Duberstein.

Also shown (above), is a set of salt-glazed stoneware teacups, wheel-thrown with faceting, by William Brouillard. *Photo: Robert Barrett.*

PHYLLIS GREEN

Organically fired clay suspended on wood structures composed a recent solo exhibition of sculptures entitled "Stone and Sticks" by *Phyllis Green* at the Artist's Gallery in Vancouver, British Columbia. Accented with acrylic paints and integrated with weathered wood constructions, the smoked clay objects were cast from a mold of the artist's body.

In a statement about her work Phyllis said, "The wood structures began merely as supports for the clay, but became more integral parts of the pieces. The support

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